Issues of water supply and contemporary urban society: the case of Greater Amman, Jordan

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Over the last two decades, Jordan has suffered a chronic water crisis, and is the tenth most water-scarce nation on Earth. Such water stress has been well illustrated in the case of Greater Amman, the capital, which has grown dramatically from a population of around 2000 in the 1920s, to 2.17 million today. One of the distinctive characteristics of the water supply regime of Greater Amman is that since 1987 it has been based on a system of rationing, with households receiving water once a week for various durations. Amman is highly polarized socio-economically, and by means of household surveys, both quantitative and qualitative, conducted in high- and low-income divisions of the city, a detailed empirical evaluation of the storage and use of water, the strategies used by households to manage water and overall satisfaction with water supply issues is provided in this paper, looking specifically at issues of social equity. The analysis demonstrates the social and economic costs of water rationing and consequent management to be high, as well as emphasizing that issues of water quality are of central importance to all consumers regardless of their socio-economic status within the city.

Keywords: urban water supply; rationing; water stress; social equity; Greater Amman; Jordan

1. Introduction: where Amman’s water comes from and how it is managed

A major issue for Amman, Jordan, is the supply of potable water and this reflects the physical geography of the region and the rapid growth of the city. In 2004, the total consumption for the urban area was 105 million m$^3$ (LEMA 2004) and local resources are insufficient to meet this demand. In the National Water Master Plan (GTZ 2004; MWI 2007), the Jordanian Government has stressed that the first priority is to meet the basic needs of the people. Indeed, as the population of the city has grown, various strategies have been implemented, most notably the transfer of waters from the Jordan Valley, from distant reservoirs and aquifers and the recycling of wastewater.

Today, Amman receives around 50 per cent of its water from the Jordan Valley. Water is pumped from $-225$ m below sea level in the Jordan Valley to a modern treatment plant at Zai, which is located to the northwest of the city at an altitude of 1035 m. The remaining water demands of the city are met from

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the Al-Mafraq well and the Azraq aquifer, some 70 km east of Amman, and from Qatrana, Swaqa and Wala to the south of the city. Looking to the future, providing the city with adequate water is an avowed priority for the Government. One of the major proposals to achieve this is the Disi Project. This involves the proposed construction of a 325 km pipeline from the Disi aquifer that lies on Jordan’s border with Saudi Arabia. This will provide the city with around 100 million m$^3$ yr$^{-1}$ for the next 100 years at an estimated base capital cost of US$ 600 million.

Unlike many cities in the developing world, 98 per cent of households in Amman are connected to the water supply network. However, since 1987, the supply of water to households has been rationed. For most parts of the city, water is supplied on just 1 or 2 days of the week and the problem for households is of storage. From the first, the rationing of the urban water supply system in Amman reflected not just the relative scarcity of water, but also the generally dilapidated physical state of the network. Until 1999, 54 per cent of the water entering the city’s distribution system was classified as ‘unaccounted for’, with half of this being lost through leakage. This situation reflected the fact that, over time, extensions to the network have not generally been planned and have consisted of small-diameter pipes. Over the years, operators have generally responded to problems of water supply by increasing the pump size rather than by reinforcing the network, thereby increasing overall pressures within the system (LEMA 2004). The remaining ‘unaccounted for water’ has been due to inadequate billing, lax payment collection and illegal use of water, which in 2004 amounted to over 30 000 instances. The Water Authority of Jordan (WAJ) calculates that, on average, an illegal user of water consumes two to three times more water than a legal subscriber.

In order to meet the demand, especially in the dry summer months, various sub-markets for urban water have developed in the city, such as private water tankers, water bottled from private wells and distilled mineral water derived from small reverse osmosis machines. In this context, household income and family size are likely to be vitally important variables. The costs of purchased water, storage tanks, pipework and filters are prohibitive for poor households in the eastern and southern areas of Amman. This is one of the reasons for the low average domestic water consumption of 94 litres per head per day recorded for the city (GTZ 2004). Not surprisingly, the social polarity that characterizes Amman is, therefore, also likely to be reflected in patterns of water consumption within the city.

In respect of management, Amman’s water supply system was placed in the hands of the private sector in February 1999. At this time, a 4 year contract was granted to ONDEO, the commercial arm of Suez Environmental, of which Lyonnaise des Eaux, France, is a leading subsidiary. A local company known as LEMA was created, owned 75 per cent by Suez Environmental and 25 per cent by Arabtech Jardaneh (Jordan) and Montgomery Watson (UK). LEMA operated with an operational investment fund of US$ 25 million for urgent maintenance and repairs. The contract was extended twice and continued through to December 2006.

LEMA operated over an area of 3000 km$^2$, supplying 2 million people and managing 350 000 accounts. It is generally acknowledged that LEMA’s major contribution has been in improved billing and debt collection, customer service in general, and the regulation of rationing. For instance, in winter 2006, continuous supply was introduced to 15.8 per cent of LEMA’s customers, and it is clear that
some technical sources (Bobillier 2007) feel that the entire system should move towards continuous supply for both technical and supply reasons. However, it seems equally clear that, at the present time, the Government does not feel that this is a step in the right direction—or at least, one that they are able to follow.

After much debate during the period 2005–2006, the era of privatization came to an end in January 2007, with management of Amman’s water being placed in the hands of a new ‘public company’ named Meyahona (‘Our Water’). This is owned by the WAJ, but will be run on the lines of a private company. This is exactly the model that has been in operation in the second city, Aqaba, since 2004 and is being presented by the Ministry of Water and Irrigation as a crucial alternative to private sector involvement in the water sector in Jordan. In this sense, sources in the Ministry stress that, while the water system of Amman may no longer be privatized, it will remain commercialized.

In our research as part of the Water, Life and Civilization project at the University of Reading, we have been analysing these key development- and policy-oriented issues involved in the supply of domestic water in Amman. The work has being conducted by means of: (i) critiques of extant and future water policies, strategies and statements, (ii) semi-structured interviews with key policy-makers, and (iii) urban household social surveys conducted in different socio-economic areas of Amman. In the latter context, we focused on social equity aspects of the provision of water in Amman. For example, how equitable and efficient is the pricing of water; how well does household water rationing work, and does it have regressive social impacts; what household strategies have evolved and are they gendered; what do residents of Amman think was achieved during the era of privatization; and what are their reactions to the recent formation of Meyahona?

Our research is focusing on these critical issues of contemporary water supply in Amman.

Turning to the wider developmental context, in all geographical localities, access to adequate supplies of water is a universal component and an indicator of human development. The second World Water Development Report (UNESCO 2006) emphasizes that human development is inextricably linked with issues of water availability, in terms of proximity, quantity and quality. Thus, one of the main targets of the Millennium Development Goals is to reduce by half the proportion of the population without sustainable access to safe drinking water by 2015 (UNDP 2004; Potter et al. 2008; Rigg 2008). For good reason, the focus is generally placed on the quantitative dimension of providing enough water—but the qualitative aspect of supply is also fundamentally important—and connection to the network is not always synonymous with adequate access to water, in terms of quantity, frequency, duration, timing and the overall quality of water received (Zéraḥ 1988, 1999; Chikher 1995; Allain-El-Mansouri 1996; Darmame 2004, 2006).

The intermittent supply of domestic water can have fundamental impacts on households and can obviously serve to exacerbate socio-spatial differentials within society.

Over the last two decades, Jordan has suffered a chronic water crisis, and is the tenth most water-scarce nation in the world. This water crisis has been well illustrated in Greater Amman, which since the 1920s has grown from a population of around 2000 to 2.17 million today. Amman has become a major magnet for migrants, not least from Syria, Lebanon, Iraq and Palestine (Potter & Darmame 2010). As recorded in the Household Expenditure and Income
Survey of 2006 (Hashemite Kingdom of Jordan 2007), some 98 per cent of all households in Amman are connected to the public water network. But, since 1987 the basis of supply in the capital city, Amman, has been intermittent. Following a weekly rationing programme (Potter et al. 2007a, b, 2009), households generally receive water once a week for various durations, extending from 24 h to 1 week.

2. The research: quantitative and qualitative household water surveys

One component of our research was designed to investigate contemporary patterns of water use and attitudes concerning water-related issues in Greater Amman. The overall aim was to provide detailed empirical evidence concerning the contemporary storage and use of water, attitudes towards the private–public management of water and the strategies used by households under what may be described as ‘water stress’, accompanied by household water rationing and privatization from 1999 to 2007.

Given the highly polarized social structure of Greater Amman as a city (Potter et al. 2009), the study design was based on examining potential social equity dimensions in the use of water within the city, and, accordingly, housing areas were selected in both low- and high-income areas of Greater Amman. Amman can broadly be divided into relatively high-income (housing categories A and B) western and northwestern tracts (see Potter et al. 2007a, b, 2009; Darmame & Potter 2008) and its relatively low-income (housing categories C and D) eastern and southern portions as shown in figure 1.

Twenty-five households were selected in low-income eastern Amman. The interviews were carried out in five residential sub-areas of eastern Amman. These were: (i) Wihdat, the second largest Palestinian camp in Jordan; (ii) Wadi Haddada, an area of informal settlement; (iii) Al-Nasser, a Palestinian settlement area; (iv) Nazal and (v) Quisma, both popular housing areas within the city. The location of these five study areas in the central eastern and southeastern areas of the city is clearly shown in figure 1.

Similarly, 25 households were interviewed in five areas of high-income western Amman and these districts are also shown in figure 1. The areas from which respondent households were drawn were: (i) Abdoun, one of the wealthiest areas of the city, consisting of luxury houses; (ii) Swifieh, an area served by an up-market commercial district; (iii) Deir Ghbar, an area of luxury villas and houses; (iv) Jabal Amman, one of the earliest high-status residential zones; and (v) Jbeha, close to the University of Jordan.

In the case of both the high- and low-income residential areas, structured interviews, collating quantitative data, were conducted using a printed pro forma survey document. Then semi-structured interviews were carried out. Specifically, issues such as access to the public water supply, the means and extent of household water storage, the daily use of water and the management strategies employed, along with wider perceptions, attitudes and satisfaction, were investigated.

How different would different income groups of households be in terms of water use, storage, household water management strategies, satisfaction and attitudes? It was clear that a dual quantitative–qualitative approach to carrying out the social surveys concerning water use and attitudes needed to be employed. The social surveys were conducted from mid-May to mid-September 2007. In the
Figure 1. Greater Amman showing its social zonation and the residential areas sampled. Pale grey shading, category A and B residential land; dark grey shading, category C and D residential land; thick lines, Greater Amman Municipality (GAM); thin grey lines, district boundaries; the city centre (Al-Madeenah) is located just north-west of areas 2 and 3 in Amman East.

Our account that follows, we first look at the quantitative aspects of the situation before turning to the qualitative dimension, as exemplified by residents’ views concerning the extant water situation in Greater Amman.

3. Quantitative aspects of household water use

(a) The socio-economic and demographic characteristics of the low- and high-income respondent households

The main difference between the low- and high-income households surveyed in Amman was naturally in their respective average income levels. As shown in table 1, the high-income households interviewed recorded an average monthly income (Jordanian dinars) of 1932 JD, as opposed to 235 JD for the low-income households. This eightfold disparity in household income levels reflects the degree of social polarity that characterizes contemporary Amman (see Potter et al. 2009). As also shown in table 1, at the time of the survey, unemployment stood at 4 per cent for the high-income households, but was 24 per cent in the low-income households.

But in wider demographic terms, the sample households showed broad similarity. Both income groups consisted of relatively youthful households, with the average age of those interviewed being in their 40s (table 1). For the sample as a whole, a preponderance of males were interviewed, although, as shown in table 1, this proportion was marginally higher in the case of the respondents.
Table 1. Socio-economic and demographic profile of the respondent households.

<table>
<thead>
<tr>
<th>socio-demographic variable</th>
<th>high-income households</th>
<th>low-income households</th>
<th>entire sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>male (%)</td>
<td>68</td>
<td>60</td>
<td>64</td>
</tr>
<tr>
<td>average age (years)</td>
<td>49</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td>married (%)</td>
<td>84</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>unemployed (%)</td>
<td>4</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>average house size (m²)</td>
<td>345</td>
<td>82</td>
<td>214</td>
</tr>
<tr>
<td>size of family (average persons)</td>
<td>5.20</td>
<td>6.44</td>
<td>5.82</td>
</tr>
<tr>
<td>average income (monthly net JD)</td>
<td>1932</td>
<td>235</td>
<td>1029</td>
</tr>
</tbody>
</table>

from high-income households, standing at 68 per cent. Families tend to be large in Jordan, and this is evident for the sample households, with an average family size of 5.82 persons for the respondent households, and with a somewhat higher figure of 6.44 pertaining to the low-income households (table 1). In terms of average house size, this is 345 m² for the high-income households interviewed and 82 m² for the low-income households (table 1).

(b) Household access to the public water supply

As already noted, Jordan is characterized by high levels of access to the water supply network. This was confirmed for the sample households, with an overall level of 98 per cent connection pertaining to the entire sample. The survey data also showed how similar the high- and low-income households are with regard to their connection to the public water network, standing at 100 per cent and 96 per cent of households, respectively, thereby attesting to the effective ubiquity of mains water in the Greater Amman urban area, regardless of income level and geographical area of residence within the city. However, as water is provided only once a week for various durations, the supply of water in a temporal sense depends on the ability of households to store water in roof-top tanks and underground cisterns, something that involves substantial costs in terms of the necessary infrastructure.

In order to augment storage capacity and to increase water availability, households have developed strategies for water use on a daily basis. For example, households store water in near-ubiquitous roof-top tanks with a capacity of 2 m³. In addition, households can invest in the construction of underground water cisterns as well as using a water pump to aid supply when the water pressure is low. To improve the quality of the water piped into the house for use, consumers may install and use a filter.

One of the most pronounced contrasts shown in our survey was in the total water storage capacity that characterized the two social–income groups surveyed. The average maximum storage capacity of the entire sample of households surveyed was 9.72 m³. However, when the high-income households were compared directly with the low-income households, the difference was revealed to be over fivefold. The high-income households had an average water storage capacity of 16.24 m³, while for the low-income consumers storage amounted to 3.12 m³.
Water supply and urban society

Table 2. Household water consumption and cost levels.

<table>
<thead>
<tr>
<th>aspect of consumption</th>
<th>high-income households</th>
<th>low-income households</th>
<th>entire sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>average consumption (m³ per quarter)</td>
<td>70.24</td>
<td>32.68</td>
<td>51.46</td>
</tr>
<tr>
<td>average water bill per quarter (JD)</td>
<td>55.80</td>
<td>14.84</td>
<td>36</td>
</tr>
<tr>
<td>households buying bottled water (%)</td>
<td>44</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>average spent on bottled water (JD per week)</td>
<td>10.45</td>
<td>8.2</td>
<td>9.75</td>
</tr>
<tr>
<td>households buying water from private water tankers (%)</td>
<td>24</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>average spent on water from tankers (JD per summer period)</td>
<td>20</td>
<td>17</td>
<td>19.57</td>
</tr>
</tbody>
</table>

(c) Water use by households and household water management strategies

The research also confirmed that, although not quite so unequal and socially polarized, levels of water consumption and household expenditure on water also closely reflect household socio-economic and income variations in Amman. On average, the high-income households we interviewed consumed 70.24 m³ of water per quarter, while the low-income households consumed around half this total at 32.68 m³ (table 2). Reflecting the payment subsidy given at relatively low levels of water supply, this twofold difference in consumption was paralleled by low-income consumers paying, on average, 3.76 times less for their water per quarter. Thus, the average water bill of the high-income households was 55.80 JD per quarter, against 14.84 JD for the low-income households (table 2). However, it is important to note that the low-income households are devoting a higher proportion of their income to the purchase of water: an eightfold disparity in income versus under four times disparity for water.

The ability of wealthier households to access water with greater ease was, of course, shown by their greater propensity to buy water directly from water tankers, standing at 24 per cent of high-income households who regularly buy water in this way, as opposed to only four per cent of poorer households. In purchasing water from tankers, on average, 20 JD was spent during the summer months by the wealthier households, as opposed to 17 JD by the lower-income households. Differential access to water resources was also shown by the fact that 44 per cent of high-income households stated that they regularly purchased bottled water, spending on average 10.45 JD per week, against 20 per cent for low-income households at an average cost of 8.2 JD per week.

The rationing of water has both financial and time costs for consumers. In order to cope with rationing, households have developed clear water management strategies. Some 74 per cent of households stated that they adopt specific strategies in order to carry out the household tasks at hand on what is commonly referred to as the ‘day of water’, whereby they organize bathing, housework, laundry, cleaning and gardening in a specific way or at a specific time (table 3). As might be expected, the proportion stating that they organize tasks specifically on the day that water is received was higher among the low-income households, standing at 84 per cent, as opposed to 64 per cent for high-income households.
Table 3. Details of the use of networked water by households.

<table>
<thead>
<tr>
<th>aspects of water use</th>
<th>households (%)</th>
<th>high-income households</th>
<th>low-income households</th>
<th>entire sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>special organization of tasks on the day of water supply</td>
<td></td>
<td>64</td>
<td>84</td>
<td>74</td>
</tr>
<tr>
<td>using networked water for drinking</td>
<td></td>
<td>12</td>
<td>52</td>
<td>32</td>
</tr>
<tr>
<td>using networked water for cooking</td>
<td></td>
<td>76</td>
<td>96</td>
<td>86</td>
</tr>
<tr>
<td>using networked water for laundry</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>using networked water for bathing</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>using networked water for cleaning</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>using networked water for gardening</td>
<td></td>
<td>40</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

Further questioning about how water is used within the household demonstrated all too clearly that water quality is a major issue. Thus, just less than a third of households, specifically 32 per cent, stated that they used networked water for drinking purposes (table 3). The proportion using mains for drinking purposes was as low as 12 per cent for the high-income households, but extended to over half (52%) in the case of the low-income households. All respondent households mentioned past incidents related to cases of water pollution and ill-health. Similarly, nearly all low-income consumers (96%) reported that they use networked water for cooking purposes; this figure is lower for the entire sample at 86 per cent as a result of the fact that a lower proportion, 76 per cent, of high-income consumers report that they use mains water for such purposes. All households interviewed, regardless of income level, reported that they used networked water for the purposes of doing the laundry, bathing and cleaning. When asked about the use of networked water for gardening, a clear socio-economic divide re-emerged, with 40 per cent of high-income households stating that they did so, but none of the low-income households (table 3).

The household surveys showed that the ‘day of water’ required the specific management of all household tasks in a limited time, including personal hygiene. In this respect, it was apparent that gender was a salient issue. When asked, revealingly, 84 per cent of low-income households reported that women take overall responsibility for the day-to-day management and control of the use of water within the home (table 4). The involvement of women in the daily use of water was shown to be somewhat lower in the case of the high-income households, but remained as high as 68 per cent of households. On the other hand, when it came to issues such as paying water bills and the maintenance of water-related equipment, the household surveys showed that the responsibility was primarily vested with men. Once again there was some variation by income group, with men’s primary involvement with maintenance and bill paying being recorded as noticeably higher in the case of the high-income families interviewed (88 per cent), than it was in the case of the low-income households (64 per cent), as shown in table 4.

In conditions of water scarcity, the education of children—and indeed, all members of the family—in the careful use and conservation of water is vital. Prior to the household surveys it was conjectured that women might be expected to be
Table 4. Gendered aspects of water management within households.

<table>
<thead>
<tr>
<th>aspect of water use</th>
<th>high-income households (%)</th>
<th>low-income households (%)</th>
<th>entire sample (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>managing the daily use of water</td>
<td>68 women</td>
<td>84 women</td>
<td>76 women</td>
</tr>
<tr>
<td>responsible for paying bills and maintaining equipment</td>
<td>88 men</td>
<td>64 men</td>
<td>76 men</td>
</tr>
<tr>
<td>children’s awareness of the need to conserve water</td>
<td>24 women</td>
<td>36 women</td>
<td>30 women</td>
</tr>
<tr>
<td></td>
<td>40 men</td>
<td>48 men</td>
<td>44 men</td>
</tr>
<tr>
<td></td>
<td>8 both</td>
<td>12 both</td>
<td>10 both</td>
</tr>
<tr>
<td></td>
<td>28 nobody</td>
<td>4 nobody</td>
<td>16 nobody</td>
</tr>
</tbody>
</table>

more involved in the instruction of children as to how to use water wisely and to conserve supplies on a daily basis. However, to our surprise, it was reported that men were generally more involved than women in such instructional activities (table 4). For the entire sample of households, of those whose primary role it was to oversee such education and monitoring within the home, 44 per cent were men, as opposed to 30 per cent females. In 10 per cent of households, it was reported that the task was shared between men and women: and as table 4 also shows, in the case of 16 per cent of households, it was reported that nobody undertook the instruction of family members in the use of domestic water (table 4).

In fact, the proportion of men reported as being responsible for such day-to-day guidance in the domestic use of water was higher, standing at 48 per cent, for the low-income households; for the high-income households the proportion was 40 per cent. Perhaps the most striking feature of table 4 is the fact that, in well over a quarter of the high-income households in the sample (28%), it was reported that nobody was concerned with ensuring that children are aware of the need to conserve water, presumably as a reflection of the fact that such consumers could easily pay their bills and use water without worrying too much about the conservation of supplies (table 4).

(d) Satisfaction with and attitudes in relation to water issues

However, when the households were asked to assess their satisfaction with different aspects of the water supply system of Greater Amman, the outcome was highly revealing, as shown by figure 2. Looking at all households, an overwhelming majority, 92 per cent, stated that they were satisfied with the reliability of the water supply system of the city and 80 per cent stated their general satisfaction with the standard of maintenance of the network. Notably, despite the clear constraints that rationing places on their daily lives, satisfaction regarding the reliability of supply was expressed by 96 per cent of low-income consumers, although this was marginally lower, at 88 per cent, for the high-income householders. Similarly, some 52 per cent of all households stated that they were satisfied with general management standards in the water sector and this was identical for both income groups (figure 2). The overall level of stated satisfaction was, however, shown to be much lower in respect to the price paid for water, standing at 40 per cent for the entire sample of households (figure 2).
As expected, more high-income households than low-income households stated that they were generally satisfied with the pricing of water, standing at 52 per cent as opposed to 28 per cent of surveyed households, respectively.

The satisfaction data clearly demonstrate that by far and away the chief concern expressed by consumers relates to the quality of the water, with 82 per cent of all households indicating that they were not satisfied with the existing quality of water supplied. It is noticeable that, when disaggregated by socioeconomic group, levels of dissatisfaction do not vary much, standing at 84 per cent in respect of the high-income households and 80 per cent of low-income households. In short, in respect of the two issues with which the respondent households show general levels of dissatisfaction, while price is more salient to the relatively poor, water quality clearly represents the chief issue for all households irrespective of their income level. This general concern expressed about the quality of water appears to reflect the appearance and taste of the network-supplied water, as well as fears about the impacts of water on health and general well-being.

4. Qualitative aspects of household water use

The semi-structured qualitative interviews were carried out with both low- and high-income households in the same way as the quantitative interviews. The interviews were digitally recorded, apart from in three instances where the interviewees specifically declined permission, and in these cases, detailed notes were taken and subsequently transcribed. The semi-structured interviews started with the key question ‘Water is a scarce commodity in Amman. How does this affect your daily life?’ The interviews were transcribed, coded and analysed to reveal commonly cited themes and notable narrative passages. Interesting themes thereby emerged, including the value of water and the salience of the ‘day of water’, gendered aspects of water use and management, issues of social equity and the overarching problem of water quality.

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As noted in the quantitative analysis, domestic water storage capacity is one of the most significant inequalities existing between households in Greater Amman. We witnessed that, within the urban area, storage is broadly related to income levels, and in turn, storage largely influences the water consumption of families. Of course, the situation is more difficult for the members of poorer households where they have to struggle with the generally small quantities of water they are able to store. As one of our interviewees stated:

I must make full use of one cubic metre to respond to the needs of five people in this house (...). I am divorced and I don’t have money to buy more storage or to buy bottled water. I receive social help and I can’t work as I have a handicap.

(a) The importance of the ‘day of water’

Some of those interviewed started their responses to our questions by citing a well-known passage from the Quran: ‘We made from water every living thing’. ‘Water is the nerve of life and the essence of human beings, animals and plants’ was typical of what they said to us. The majority of the respondents highlighted the influence that water supply rationing has on their daily lives, and a significant element in this was the ‘day of water’:

We are talking about a country which suffers from a water shortage and, of course, each consumer knows what is referred to as the Day of Water.

When water arrives we look like hungry people when they get food!

On the day that water is delivered, balconies are full of washed clothes, gardens are actively irrigated, cars are washed and domestic cleaners and gardeners are active throughout the city. The narratives provided by our interviewees exemplified all too clearly that wealthy households are not as affected by the rationing schedule, as they can quite simply meet their water needs from storage. Thus, a sub-sample of our high-income respondents commented in the following terms:

I am not affected at all by the rationing. I have a big house and I am the owner. So, I have eight tanks and a cistern at my disposal.

As an individual person, I am not affected. I have gardens, plants and lawns that I want to keep green and I have money to pay for this.

I have a garden and plants which need to be watered everyday. It is green like in England (...), so I don’t feel that I suffer from water scarcity.

However, the comment of one of our interviewees in Amman East made clear the situation for the majority of poorer residents of the city: ‘the day of water is a relief for all households’ as the basic needs of the people, including their personal hygiene, have to be mediated through the rationing process:

No water, no life—and our life with the rationing is hard! Water arrives not at the same time and they close it at different times.

The poor are the first victims. We don’t have gardens or swimming pools and we try to satisfy our basic needs.

*Phil. Trans. R. Soc. A* (2010)
(b) The organization of tasks on the ‘day of water’

Without exception, all the families interviewed said that the main activity during the ‘day of water’ is to do as much laundry as possible, often four to five loads, then clean the house, the terrace and the garden. As we have also seen, it is women who generally take the responsibility for water management inside the house. Men generally take responsibility for buying equipment and paying bills. Managing the use of water under rationing places heavy demands on women, especially for those who also work outside the home, as exemplified by our informants:

Women suffer from the rationing and it is physically hard for women. They should rush in order to finish all the weekly tasks in a few hours and to fill up the tanks.

The day of water means for me as a housewife an emergency day to do the whole housework alone, in addition to looking after my six children.

We try to deal with it. It’s a challenge for women, because we must do as many tasks as possible during the day that water comes. It’s like an International Day of dirty laundry and cleaning from the morning to the evening! It’s very exhausting and if you miss those hours of water, you are forced to wait another week!

The other principal comment, of course, was that rationing serves to exacerbate and accentuate equity issues within society as a whole. This was a widespread perception and when we asked about the evidence we were often told that it was general knowledge:

Some areas have water every day due to social connections. So, how come all these hotels and some people have water that they use with ease, while we don’t even have enough water to take a shower?

The distribution is not equal at all, between the rich and the poor areas. How can you imagine that those ministers and businessmen in Amman West could fill up the huge capacity of storage and swimming pools in just 15 or 24 hours?

But our analysis shows, since the summer of 2005, Amman East has generally received water for a longer duration per week, as shown by the detailed graph included here as figure 3. However, as the graph also shows, this was not always the case before May–June 2005. As the figure also shows, from November 2004 to May 2005 there was a clear overall improvement in water supply hours witnessed in all areas of the city, although admittedly with the clear twin peaks favouring the most affluent western tracts of the city. However, this is all within an overarching context in which the residents of the western districts of the city have always been more able to store water in substantial quantities.

(c) Issues of water quality

‘The water we receive is very dirty’ and ‘water from the network is very polluted’ are the generic types of comments we received from around 80 per cent of those whom we interviewed. According to the users, water is frequently contaminated, it is generally over-treated with chlorine, and the presence of
dirt and sediments in the reservoirs was noted. In addition, specific water contamination events have occurred over the last 10 years and have generated general mistrust regarding the quality of the public water supply. One of the main cases of pollution occurred in 1998, when the water treatment station at Zai, where 40 per cent of the capital’s water is treated, became contaminated by algae. It emerged that the station was not equipped with filters to treat water contaminated in this manner. The areas most affected were those located in West Amman:

Ten years ago, the water from the network became like wastewater in its taste and smell. We had several children get sick due to this contaminated water.

Water comes once a week from Thursday morning until Friday mid-day and it is contaminated and full of chlorine.

Water is not suitable. So, I boil water for cooking, tea and coffee, while I drink rainwater which my father collects on his farm.

Such comments serve to affirm the findings of our quantitative survey that, despite all the problems that households in Greater Amman face on a day-to-day basis, the poor quality of the water received via the public network is a major concern for all, regardless of the socio-economic standing of households.

5. Conclusions

In overall terms, our analysis demonstrates that urban consumers in Greater Amman have developed well-articulated strategies to guide their daily use of water in order to try to minimize the substantial challenges of scarcity and
RATIONING THAT THEY FACE. CONSUMERS ARE GENERAL CONTENTED WITH THE RELIABILITY OF SUPPLY, THE STANDARD OF MAINTENANCE AND THE OVERALL MANAGEMENT OF WATER RESOURCES IN THE CITY.

quite simply, by means of carefully developed household water management strategies, residents of the city have accommodated to rationing and it is not the major problem they perceive to be affecting their daily lives—they have adapted to it. however, such adjustment does inescapably constrain the way in which residents conduct their daily lives and, as we have shown, the burden falls disproportionately on the relatively poor and on the female members of households. As might be anticipated, the cost of water is, of course, a concern to low-income consumers, in particular.

Our research has shown clearly that it is the quality of water that is the major concern. consumers try to avoid drinking mains water and report low levels of satisfaction in respect of water quality in general. But the poor have less choice in the matter. In these ways the issues of water use, management and satisfaction are revealed as being intimately linked with the structure of urban society as a whole in a water-scarce city such as Greater Amman. just as has occurred through the ages, access to, and power over, water as a daily resource remains closely and positively correlated with forms and practices of social power within the community as a whole (potter & lloyd-evans 1998).

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