

Traces of Water 3 – Shaping water practices by infrastructure

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Workshop Report for the 3rd Workshop of the UKWIR funded seminar series
Traces of Water, Thursday 10th November, 2005

<http://www.lec.lancs.ac.uk/cswm/dwcworkshops.htm>

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1. Introduction

The water industry equates demand with 'the consumer'. Put simply, because consumers use water, they are believed to create demand. The corollary is that the industry, traditionally, is concerned with supply. The industry supplies water to meet the demand of the consumer. Demand side management has changed this relationship in so far as the industry is now also involved in trying to shape the demand of the consumer. However, the distinction between who makes demand – the consumer – and who meets it – the supplier – is still maintained. However, the reality is that infrastructure managers, engineers, planners, designers, and marketers, for example, all play a role in making demand. To understand demand the industry therefore needs to look at the 'systems of provision' through which demand is shaped.

By a system of provision we mean the array and sequence of activities, technologies and institutional arrangements that come together in the provision of a particular product or service. For example, different systems of provision mean that drinking water can be supplied from, for example, a household tap, from bottled water in a shop, or from a cooling system in the office. In each case there is a different set of arrangements which enable the consumer to drink water. This provokes the question, how do different systems of provision structure options and thereby shape demand?

Currently, the water sector in the UK is heavily indebted to a system of provision designed and built in the Victorian period. It is one that involves large scale regional supply networks the maintenance of which requires medium term planning forecasts as well as everyday decisions. Given new housing developments and the need to repair aging infrastructure, the time is ripe for asking, could the industry develop different systems of provision? Could new systems of provision shape demand in different ways? How might they be organised? What social, technical and institutional opportunities are current available for such innovation?

Workshop one demonstrated how the concept of the water *consumer*, rather than the water *customer*, helped us understand the different values of water in everyday life. Workshop two showed how water consumption occurs through the

routine practices of everyday life rather than active decisions based on information and cost. In this third workshop the focus on the systems of provision requires a change in orientation away from the household to the routes through which demand is structured. From this perspective the problem of changing demand is not one of directly influencing end consumers but of analysing patterns of demand built into current and future systems of provision.

First we note the tensions between current approaches to engineering demand and the focus of demand management strategies. Second we highlight the systems of provision perspective. Third we examine how new modes of 'sustainable' provision involve combinations of both large scale technological networks and localised forms of provision. Fourth, we ask what this means in terms of understanding the context of change and the role of the industry in shaping future demand.

2. Engineering (and) demand

To understand the significance of the systems of provision perspective we need to think through the relationship between technology and demand. It is reasonably clear that technologies impact on demand, without technology there is no water consumption as we know it. From the near universal access to constant drinking water supply to the reliability of the waste water disposal systems, infrastructure networks have enabled the majority of the population to undertake what have become, by and large, taken for granted daily water consuming routines. They have also enabled the development of demands such as those associated with toilet flushing, power showering and jet-pressure hoses. In a context where the industry is trying to limit the growth of demand, questions about the intended and unintended consequences of new technologies have become increasingly significant.

The investment in large scale technological networks for water supply and waste-water disposal is based upon assumptions of medium to long term stability in patterns for demand. In other words such networks are premised on a philosophy of supply-side management, inherited from the Victorian era, in which supply is designed to meet demand. By contrast, demand side management (DSM) strategies aim to change what demand is, changing the amount of water people use. DSM focuses, for example, on the development of water saving technologies at the level of the household. One of the unintended consequences of DSM is the introduction of new uncertainties about the future of demand. For example, while it is possible to measure how much water a new technology, such as a water efficient toilet, might save in a laboratory setting (see for example Defra's Market Transformation Programme) the actual saving in practice remains less clear (for example will people flush twice?). Such uncertainties are amplified in relation to schemes such as grey water recycling in new build houses where the extent to which people will accept and use new devices is not clear. So while supply-side management is premised on patterns of stability in demand, demand side management creates new uncertainties about patterns of demand. In this sense the strategies of DSM and the traditional engineering model are at odds.

Examples of different strategies to reduce water used in toilets, which account for the highest component of household demand, demonstrate the relationship between DSM and the engineering model of demand. David Butler presented three case study examples which each revealed different issues in relation to people, practices and technologies. In the first example, David discussed issues of designing 'fit and forget' toilets. He demonstrated the need to incorporate users in the design process in order to understand how people reacted to the technology. For example attempts to develop automatic flushes have proved problematic, and simple flush buttons behind toilets have been found to be more effective. The second example is of urine separating toilets. Though a relatively

simple technology, they require cultural acceptance and some behaviour change (men would have to sit). Their uptake in the UK has been very limited. The third example was an evaluation of a community engagement campaign directed at changing sanitary waste disposal habits. This process made visible the effects of personal habits of sanitary disposal on local watercourses. It also showed other waste stream options. This campaign led to some change in disposal habits by some households. However, in terms of water course management, relying on campaigning and public engagement was deemed too 'risky' and the alternative of traditional engineering – to build a large scale filter – was chosen. All three examples demonstrate the different roles that new technology can play in shaping demands and the different ways in which technological solutions relate to established habits and practices.

These examples generate new questions about demand and how it is structured. As well as raising concerns about the ethical implications of shaping consumer behaviour there are also important questions about whether all service needs can be provided and what level of systems 'failure' is acceptable? For example, could periods of intermittent supply become normal? Further, David suggested we need to better understand the relationship between system design and user practice, i.e. how does each shape the other? Currently there is a tension between traditional engineering which relies upon assumptions of continued demand, and demand management strategies which seek to reduce demand, but the effects of which are hard to determine. What alternatives are there to current demand management strategies focused on individual or household end users on the one hand, and the large-scale infrastructures of supply on the other. Are there other options for re-design that can bring together these two ways of thinking about demand?

3. Changing systems of provision

One problem with talking about demand side management is the assumption that there is a distinct 'side', or domain, which can be described as 'demand' and an alternative side which we call supply. A growing body of work on the social science of infrastructure has questioned this simplistic relationship between infrastructure (supply) and consumption (demand). Guy and Marvin (2001 p.27) point out that, as technical systems have become integral to our everyday lives, we have become 'undeniably part of these systems ... when they are reshaped, parts of our lives are reshaped'. Consider how the development of regular water supply and waste water disposal has impacted on what we now take for granted as everyday domestic space, for example with indoor toilets, shower rooms, plumbed washing machines and so on.

One way of formulating a more accurate understanding of the relationship between infrastructures and consumers is through the concept of 'systems of provision'. The term was first coined by the sociologists of consumption, Fine and Leopold, referring to 'the inclusive chain of activity that attaches consumption to the production that makes it possible' (Fine 2005 p.79). Utilising a systems of provision perspective to understand demand means attending to the entire range of activities, technologies and institutional arrangements that make domestic water consumption possible (Guy and Marvin 2001). We must include, for example, the managerial and technical processes of abstraction, treatment, distribution, regulation as well as daily household practices (Chappells 2003). Further, we must start to think of those production and distribution networks through which devices such as washing machines, dishwashers and showers channel make possible much of our contemporary domestic water consumption (Shove 2003). Rather than focus on activities at the household level then, the system of provision perspective highlights the 'modes of design, production, distribution, access, use and disposal which prevail in the selected social practices or consumption domains' (Spaargaren 2004 p.29).

The systems of provision perspective draws attention to the ways in which institutional and technological changes configure demand. For example privatisation has modified the relationships between suppliers (utilities) and consumers in ways that have consequences for demand. This has been the focus of a number of EU funded projects in recent years (Guy et al 2001; Medd and Moss 2005, Spaargaren 2004, van Viet, Chappells and Shove 2005). These studies all point to the different ways in which, over the last 30 years, ideas about the 'integrated ideal' of supply side management have become subject to various processes of commercialisation (business efficiency), privatisation (private sector ownership) and in some cases liberalisation (competition). As with other networked infrastructures (not just water) there has been a differentiation in sources of supply; a differentiation of providers; a differentiation of types of consumers; and a differentiation of modes of regulation.

4. New systems of 'sustainable' provision?

In the workshop Heather Chappells presented case studies of new systems of domestic water housing provision in the UK and The Netherlands (Van Vliet et al 2005). The case studies each illustrate how different systems of provision could be configured. In the UK, for example, a self-build development of three houses at Allerton park, Leeds, aimed to create an autonomous water and sewerage system. By contrast, Harlow Park Ecolite Homes, a social housing project of 23 homes in Liverpool, aimed to improve the efficiency of water and energy within the homes (including grey water recycling) while remaining connected to the main grids. In The Netherlands, the case study of Het Groene Dak (see box below) also aimed to promote water and energy savings, generating autonomy through rainwater harvesting, but maintaining a dependence on the large scale networks in relation to drinking water supply and waste disposal systems. The case study of Amersfoort, also in the Netherlands, involves testing energy provision options, including photovoltaic technology installed house roofs. In some of the houses the installations are owned by the tenants and the power is fed into the main grid with residents receiving the normal domestic tariff for delivered solar electricity. In the half of the houses, the installations are owned by the energy company who remunerate the tenants for the use of their roofs.

In her presentation Heather Chappells made three key points about these case studies in relation to how we understand demand. First, they all showed how demand was negotiated and managed. For example when faced with a shortage of supply, some householders adopted strategies of rescheduling their activities to accommodate intermittent supply. In other cases the main grid offered a back-up systems to the other forms of provision. Second, the case studies demonstrate the ways in which infrastructures can be reconfigured in ways that can challenge the dominant mind-set that water has to be available around-the-clock. And third, the scope for demand management is variable and relates to socio-technical arrangements and renegotiation of service expectations. In these case studies the different technological arrangements as well as institutional arrangements involve different roles and responsibilities on the part of residents as well as utilities.

These sights generate further questions: How do current industry perspectives limit the development of alternative modes of provision? Can current institutional arrangements support the development of new modes of provision?

Sustainable homes project

Het Groene Dak (The Green Roof) is a Dutch ecological housing project of 66 homes, opened in 1993. The housing project included: a rainwater harvesting and distribution system that supplied washing machines; composting toilets that used no water and were not connected to the sewer; a grey water tank, reed-bed filter and retention pond for all other wastewater treatment.

Van Vliet et al (2005 p.68-9) demonstrate the different dimensions of scale involved in this complex of water provision technology. First, the technology of the waterworks is scaled down from the large-scale water supply and sewerage networks to the household level (only drinking water was still supplied by the network provider). Second, the management is scaled down from utility companies to residents who were responsible for the daily management and maintenance of the technologies – residents have become both consumers and providers. Third, though the project was a small scale experiment, it had far reaching social and political impact. This included the failure of the composting toilets which were abandoned after 7 years and have consequently 'vanished' from further sustainable housing initiatives in The Netherlands. Finally, in terms of the relationship to the network, the project is a hybrid involving a combination of autonomy and dependence: the homes have autonomy through rainwater harvesting, but are dependent on wider networks in relation to drinking water supply from the main network and waste disposal through bio-waste collection systems.

5. Reconfiguring demand

While the UK can celebrate its position as having led the world in the development of water and wastewater systems (WWS), Gert Spaargaren asked, is this still the case? Building on Heather Chappell's talk, he argued that the industry needs to move beyond discussion about 'localised' versus 'centralised' modes of provision to look at 'modernised mixtures' that include aspects of each. In the context of societal pressures to include sustainable development considerations in the management of WWS, and the specific policy initiatives of the Water Framework Directive, he proposed that it is time to explore new modes of provision.

Spaargaren's work emphasises the variation in levels of 'green' provisioning within different national settings, as well as across different sectors. Using the systems of provision perspective, Spaargaren and colleagues on the DOMUS project, examined the ways in which 'modes of design, production and distribution at the provider end of the chain do, or do not, correspond with certain modes of access, use and disposal at the consumer end of the chain' (Spaargaren 2004 p.21). He argues 'where there is a high level – both in quantitative and qualitative respects – of green provisioning, people are more or less brought into a position in which the greening of their corresponding lifestyle segment becomes a feasible option' (Spaargaren 2004 p.19).

In his presentation, Gert emphasised that, as well as developing appropriate technological systems, there is a need to develop appropriate 'story-lines' at the social and symbolic level. If sustainable pilot type projects are to contribute to a large scale change, Gert argued a meaningful link must be established between technologies and provider networks, on the one hand, and between consumers as both end-users and as co-producers of services on the other. Referring to a 'blue transition' he identified a need to move away from a situation where water is removed as fast as possible and hidden from sensory experience, towards a 'retain and use' perspective which involves making water visible, keeping it as

long as possible, and reconnecting to sensory experiences and daily (consumption) routines of citizen consumers.

So: What are the 'story lines' for new modes of provision? Are they, for example, about sustainability, efficient housekeeping, saving money, creating resilience? What role does the industry play in making new patterns of consumption? Even if consumers are unwilling to pay more for the changes required for sustainable provision, why is the water industry not actively developing alternative modes of provision?

6. Conclusions

There are number of clear points that come out of this workshop.

First, demand as we know it is not the result of consumers' actions alone. Demand is constituted at many points in the systems of provision that make water consumption possible. *How can demand management initiatives shape the many points where demand is constituted? How might demand management strategies be tailored for different water uses (e.g. gardening or laundering)?*

Second, while public attitudes and opinion are relevant for enabling some types of change, the industry must also reflect on its own role in constructing demand. The dominance of an engineering mentality, premised on the need to ensure certainty of supply, coupled with risk averse water company policies, appears to be limiting the imagination in terms of conceptualising and constructing alternative modes of provision. *How is the industry inadvertently replicating current patterns of demand and limiting the possibility of new modes of provision? How could alternative approaches be developed that would change the context of demand and associated patterns of consumption?*

Third, when we start to examine new modes of provision, it becomes clear that the opposition between local off grid systems and wider infrastructure networks need to be overcome. New forms of provision require both autonomy and dependence and the challenge is how to accommodate that within existing water resource management structures. *How can existing water resource management learn to accommodate new modes of provision? Is incremental change enough or is more radical adaptation or even transformation required? How much heterogeneity in forms of supply can the industry manage?*

Fourth, the current climate of increased costs of water (under the Water Framework Directive) coupled with the growth of new build communities implies the time is ripe for change. *But what are the story lines for new modes of provision? Which are the best placed organisations to innovate? What levels of risk and failure might be acceptable?*

Finally, the existing struggle to maintain the ageing Victorian infrastructure and the need to meet the demands of new homes (particularly in the South East) seems to present an opportunity for doing things differently. *Will the industry take up this challenge or is it going to replicate systems that suppose and reproduce values of Victorian society?*

The next two workshops pick up on these themes. Workshop 4 (9th February '06) looks more specifically at the lessons learnt from times of water stress and Workshop 5 (6th April '06) asks, what sort of futures are we constructing? Please see the *Traces of Water* Website for further details:
<http://www.lec.lancs.ac.uk/cswm/dwcworkshops.htm>

7. Further reading

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