Nine great British water myths

Oxford Strategies dispels nine common myths about British water which the author has heard in recent years from outside and within the industry.

1. Water companies are the biggest polluters in the country

'I read that water utilities are the worst polluters in the country – they should be ashamed.'

Yes, water companies should be shamed by their failures. And they are. But it is important to keep a balanced view: far more often than failing, wastewater utilities succeed in being the good guys who clean up behind us. We consumers are the true polluters, while water companies are the environmental cleaners whom we pay to scrub up behind us. This routine business activity makes them the most environmentally-friendly organisations in the country today – far 'greener' than Greenpeace. Greenpeace cannot claim, for instance, that because of their actions there are salmon and otters swimming today in rivers such as the Thames. Occasionally a wastewater company fouls up and fails to deal with our mess inside its treatment works. Then there is a spill into a river, and, because of the size of modern towns and the scale of the sewage produced, the Environment Agency fines the offending water company a sizeable sum for failing to do its duty. But statistically this failure occurs one day in a thousand. This one day can make headlines in the media, particularly if a company operates hundreds of sewage treatment works and its fines in a given year mount up to tens of thousands of pounds. When sewage treatment works function properly the media ignores the wastewater utility's vital, routine contribution to the environment as being un-newsworthy. Yet, in an environmentally-balanced picture, the nine hundred and ninety nine days' success is far more important than the one day's failure. In an Information Age it is ironic that the presence of otters and other top-of-the-food chain animals in your local river will give you a more balanced picture of your environment than the national media.

2. Water customers' highest priority is to reduce their bills

'Water bills are outrageously high; water customers' top priority is to bring them down'.

Water and wastewater bills account for 1% of the average family's expenditure in Britain today[1]. This is the same as the amount spent on sweets, less than the amount spent on household cleaning materials, or newspapers, or toys and sports goods, and less than a third of the amount spent on foreign holidays. The water bill cannot, therefore, be a source of financial worry to the average British household: if water bills doubled tomorrow they would still only equal what the average household spends on phone bills.

There *is* a problem for some households, but it is only for a small minority of customers. The problem is not an excessive water bill, but the household's lack of income, demonstrated by the fact that the household faces exactly the same problem with their gas, electricity, and other essential household bills which are bigger than their water bill. Government policies rightly address poverty problems directly, through social services

[1] Source: Office of National Statistics, weights used in the Retail Price Indices for 2002, Table A1.

and the taxation system, rather than trying to relieve 'water poverty', 'energy poverty' and 'housing poverty' separately.

Poll evidence suggests that most customers do not know the level of their own water bill, so they cannot be losing too much sleep about it. Indeed, the single most common question posed to some water companies' customer service departments is "Have I paid my water bill already?" This hardly indicates excessive worry.

3. To save water we should raise its price

'We should make water more expensive to encourage everyone to save it'

No. For most of us our demand for water is quite price-insensitive. So overall demand will not change much if prices double (or halve) from current levels. International studies of water demand and prices have failed to find any systematic change in demand for water used inside the house following large price changes, while the demand 'elasticity' for water used outside the house (in swimming pools, garden watering etc.) is found to average around -0.1[2]. This means that, if sustained over several years, a doubling of water's price (a 100% increase) would have, on average, no systematic effect at all on demand inside the home, but would reduce demand outside the house by just 10%.

Given that water is essential for life on our planet this may not seem surprising. What is surprising is the scale of this price insensitivity. The most dramatic examples of water's price inelasticity come from the world's poorest communities. While water bills in Britain constitute around 1% of the cost of living, in Calcutta research shows that the urban poor pay up to a third of their entire disposable income for water of very poor quality delivered by street sellers – a quality that is well below that of piped water in Calcutta. This dire situation occurs because these consumers are too poor to afford walls or roofs for their homes, let alone taps or sinks[3].

So, technically, water has a very low price elasticity – virtually zero. This is not to say that water necessarily ought to be more expensive, or cheaper, than it currently is, but simply that the normal economic logic that maintains that raising a product's price incentivises us all to use it more economically does not happen to work in the case of water bills *for most consumers*. Of course, there may be other reasons to raise or lower water bills.

4. Economically, the price paid by water consumers is irrelevant

'So, if water's demand elasticity is effectively zero, changing its price won't matter to consumers at all, will it? We might as well slash water bills to zero'

Wrong. Most households, offices, and small businesses buy small volumes of water, so the water bill is a tiny part of our total running costs[4], and so, on the principle of

[2] Source: see Oxford Strategies for various international academic papers.

[3] And, unfortunately, the local water utility cannot afford to lose the water that would disappear if they installed standpipes in the street and effectively gave the water away.

[4] To give an idea of the importance of water bills across all sectors, water is around 1% of Gross Domestic Product.

neglecting the negligible, we are fairly insensitive to big changes in water prices[5]. This is one of the main reasons for water's low price elasticity. A second reason is that water has almost no substitutes for its main use as an environmentally-friendly bulk fluid for removing dirt or waste from our bodies, clothes, homes and work places[6].

However, there is a considerable difference between the millions of small domestic or commercial consumers of water, and water-intensive industries, such as paper-making, iron and steel, food processing factories, power stations, fish farms, or water companies themselves. These industrial consumers buy such vast quantities of water that water is not a negligible cost item. They, therefore, ought to take substantive management action if the price of a significant cost-driver changes dramatically. Changing the price of water should not be irrelevant to them.

5. Water is a natural monopoly because of its innate economies of scale

'Why don't they merge all the water companies? Water is a natural monopoly and the economies of scale should benefit us all.'

At first glance this seems plausible, but the argument needs close scrutiny, and will have to get technical. First, let us admit that it is entirely true that water and sewage industries have economies of scale at the *plant* level: the transport capacity of a pipe increases with the square of its diameter while its cost does not, so the unit cost of treating water or sewage in a plant for a huge city is far lower than that for a village plant. We routinely exploit these plant economies of scale by building only one water or sewage treatment plant in a town. So each community's water or wastewater treatment is a local monopoly where the unit costs depend to a considerable extent on how large your town is.

Note that this chain of logic cannot be reversed. Water services are only a tiny part of the cost of living, so, even if it were socially and environmentally desirable, we would not build giant water treatment works in order to persuade millions of people to leave villages and move to cities to take advantage of cheap water and sewage. As a matter of practical economics such incentives would never work. So the chain of logic runs only one way: the size of rivers available and the scale of settlement chosen by people determine the plant economies of scale used in your local water industry.

Plant vs company economies in water

So economies of scale at the plant level exist in the water industry and we already exploit them. However the question about merging water companies is really quite different. Whether private or not, water utilities larger than a single local treatment works exist because we believe that there are synergies from a single management team operating more than one plant. Most obviously, at the physical level there are grids linking water treatment works across whole regions, and, aside from physical links, there may be management synergies from operating many unconnected grids or hundreds of unlinked

[5] Evidence submitted to the Huff Inquiry into the 1995 Drought Incident at Yorkshire Water showed that industrial water consumers were frequently prepared to pay up to 35 times the value of their annual water bill to secure alternative supplies for a few weeks.

[6] There are many substitutes for water as a drinking fluid. Although many of these are a thousand times more expensive than tap water per litre, demand for them is buoyant, frequently exceeding tap water consumption.

sewage treatment works. Economically, therefore, we need to examine whether the water industry has economies of scale at the level of an entire region or *network*.

Network economies of scale in water

On the wastewater side each sewer network normally drains to one low point, from where the sewage is pumped up to a single sewage treatment works. Because there is no linking of sewer grids across a region there can be no physical synergies from merging companies across a region. It is true that several wastewater companies may discharge into the same river, and other companies may abstract that water for drinking purposes, requiring environmental regulators to look at the quality of natural water flows across a whole river basin. But this means that there should be only one environmental regulator for each river basin, not that there should be only one wastewater company.

Looking at clean water networks in the UK, water grids now cover entire regions such as Yorkshire or the North West. Grids balance surpluses and shortages across the local (town) monopolies and provide greater security of supply in droughts. Grids also enable us to optimise water resources across a region. Assuming the hydrologists and water engineers know their trade – that we are not going to stumble upon some miraculous new source of water in the heart of the Home Counties – then the cheapest sources of water across an entire region have already been developed. Thus, as living standards and populations in a region rise, future sources of water will always be more expensive than current ones. This is a rising cost curve typical of many industries, and represents *dis*economies of scale. Strange but true: one of the most famous monopoly industries cited in economic textbooks faces a rising cost curve at the heart of its operations, not the falling cost curve some academics assume.

What about the pipes? Are there economies of scale in operating ever larger grids of pipes? There is no strong evidence that larger grids are cheaper to operate per unit of water delivered or mains maintained. Overall the evidence seems to be that costs are roughly flat: other things being equal, and beyond a certain minimum efficient scale, it costs £X to maintain and operate a kilometre of mains, because that is what a man-and-a-van can do with today's technology, whether they are maintaining part of 1000 km of mains or part of 10,000 km of mains. Of course common standards and procedures across a grid are not just necessary for health and safety reasons, but are also desirable for operational and engineering reasons. Adoption of common standards creates some economies of scale, but this does not necessitate a single management team or process: the evolution of Network Codes in electricity, gas and water shows that they can be agreed between quite separate management teams. Agreeing common standards may be cheaper between a dozen participants in a single management team than between dozens of management teams, but in practice this is a tiny incremental unit cost in a modern water network. When comparing two companies' unit distribution costs the vintage of the technology deployed is likely to be the largest difference in controllable management costs, and in general size is no advantage here because larger networks take longer to roll out totally consistent internal processes and standards across all areas. This latter effect is hard to quantify, except anecdotally or through the kinds of cross-sectional econometric comparisons that Ofwat routinely undertakes.

Management synergies

Regarding management synergies, the water regulator has been unable to find evidence of strong economies of scale; once allowances are made for local cost-drivers beyond any

management's control, it is certainly not the case that the largest companies are the most efficient. There are small management synergies on running capital programmes, customer services, IT systems, and regulation itself, but these seem to peter out once a utility serves more than a quarter to half a million people, and beyond a certain size there appear to be diseconomies of scale which may well be due to management diseconomies of the kind that ambitious water CEOs planning takeovers do not wish to contemplate [7]. Overall, the evidence on grid economies seems to be that costs are flat – i.e. above a certain minimum size, adding an extra thousand kilometres of pipes to an operator's responsibilities does not lead to lower unit costs, when all costs are fully factored in.

One piece of hard practical evidence was created in 2004 when the owners of the British gas pipe industry, National Grid Transco, chose to split what they could have run as a single national gas distribution company into five geographically disparate networks, and auctioned four of them off. These actions demonstrate one very experienced operator's conviction that beyond a certain minimum scale there are sufficient *dis*economies of scale in operating and maintaining (gas) distribution pipes to warrant divestment of more than half its network. The fact that each grid attracted several serious potential buyers illustrates that professional buyers shared NGT's belief that there are certainly no strong economies above a regional level and that there are probably diseconomies of scale in operating gas distribution pipes.

So water is a natural monopoly at the local level due to plant economies of scale, but this is irrelevant to the merger debate. At the physical network level there are no economies of scale in the treatment processes for wastewater, and actually diseconomies of scale for storing and treating clean water, due to the rising cost of finding an increasingly scarce natural resource. For water distribution and wastewater collection grids, common standards and processes may create minor economies of scale but these may well be offset by internal diseconomies of scale from technological progress or internal management diseconomies. In sum there is no evidence of strong economies of scale at the company level in network utilities. Many older economics textbooks blithely assert that utility networks are monopolies because of innate 'economies of scale'; these assertions are simplistic and wrong[8].

6. We need more reservoirs in southern England

'If raising prices won't save water, to meet rising demand won't we have to accept more reservoirs in southern England?'

The UK's population seems to be shifting away from northern Britain back to a relative distribution of population seen before the Industrial Revolution, when most people lived in the south. This has the consequence that water demand in southern Britain is rising. But this rising demand does not have to be met by building more reservoirs. Alternative solutions that will be economic and more environmentally-friendly in the future include:

- Water companies and other large users can continue reducing leakage to very low levels using finely-monitored distribution networks, and finer dynamic modelling, balancing, and control of water networks, including on-line

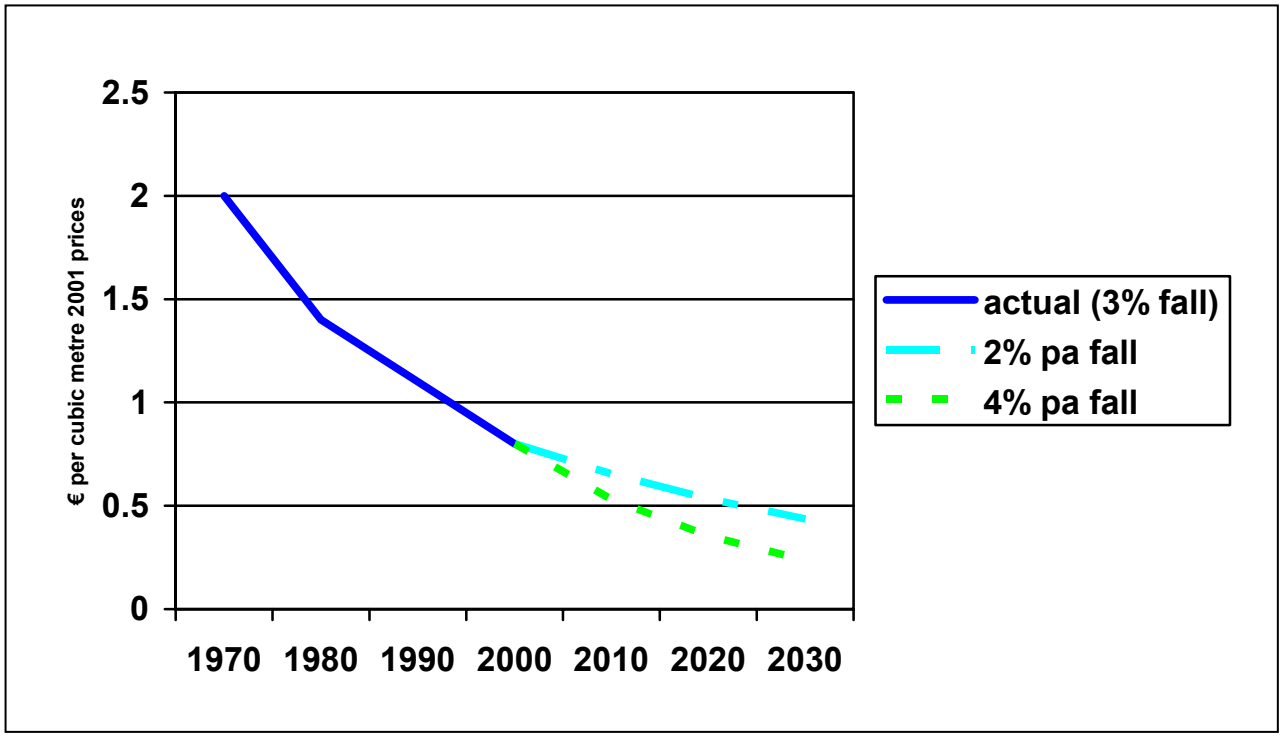
[7] See "An investigation into opex productivity trends and causes in the water industry in England & Wales 1992-2002" (May 2004) by David Saal and Scott Reid of Stone & Webster consultants, available on Ofwat's website.

[8] The reason why network utilities are frequently monopolies is explained in a forthcoming Oxford Strategies article.

monitoring of final consumption – in short running much 'tauter' networks than now using the sorts of pro-active operations and maintenance techniques that telecoms, gas and electricity networks currently use;

- Treated water could be moved and traded in bulk around the UK; the regional grids that water companies have constructed in the last twenty years could be linked by a series of transmission mains for a modest sum: one 1999 desk exercise estimated a national network of around thirty such large transmission pipes, valves and pumps (at either end) as costing around £100m[9], which equates to about two weeks normal capital expenditure by the English and Welsh water industry. Water could then be moved from north Britain to southern Britain by 'tipping' it over from one regional grid to the next, with its price progressively rising as it moves southwards; individual water molecules would not flow from Northumberland to Sussex, but the effect would be the same;
- Desalination of seawater using membranes in the UK is not yet economic, but it will become so eventually. Figure 1 shows costs of desalinating seawater have fallen by 3% a year for over thirty years, and compares two reasonable projections for the next quarter century: a 2% annual fall and a 4% annual fall. Either way desalinated seawater ought to cost less than 50 cents a cubic metre (35p/m^3) by 2030, which is likely to be less than the cost of conventional surface water, when the cost of purchasing land in southern England is included:

Figure 1: Costs of membrane desalination of seawater for a large city[10]



[9] Study by Hull, Loizou and Simon for PricewaterhouseCoopers Consulting in 1999; for details contact Hull at Oxford Strategies.

[10] Sources: for past costs see Klaus Wangnick's Global overview of water desalination technology, 2001 on www.wangnick.com; costs refer to a large city, probably larger than 40 Ml/day (200,000 people) and are in 2001 prices; future cost projections made by the author.

- Even cheaper than desalination is recycled sewage effluent, which has the considerable advantage that it is not saline, and has just been scrubbed in the controlled environment of a sewage treatment works. Although effluent from a modern sewage treatment works is biologically cleaner than the water which runs out of an adult's bath, the public perception of directly re-using effluent is poor in Europe and America. In practice, therefore, companies try to recycle sewage effluent through natural bodies such as rivers, lakes, ponds, lagoons, river gravels, or aquifers, even for just a few yards, before abstracting the water into a water treatment works.

7. Efficiencies cannot continue forever

'I work in a water company. Over the last ten years we've cut and cut costs – and staff. We must run out of possible cost savings to make very soon: efficiencies can't continue forever.'

It is hard to tell this person to their face they are wrong, but, economically speaking, they are. Consider a sector like agriculture, where we believe we now have good long term information. Efficiencies in agricultural productivity – technological progress – have been going on for at least ten thousand years, since men and women first domesticated animals or planted seeds in the hope of eating a crop. There is no reason at all to believe that this trend will suddenly cease in the next five or ten years. Indeed in the twenty first century, with genetic engineering raising new possibilities, the very contrary seems probable. And, looking across the entire economy, no sector that we can measure seems to have exhibited zero technological progress for a sustained period in the twentieth century, particularly with the universal adoption of general purpose technologies such as computers, the world wide web, and wireless data communication. So, from a general point of view one expects technological progress to continue more or less forever in all sectors. For water to be exempt from this general trend one would need to make quite exceptional claims about the innate qualities of the sector – e.g. that Information and Communication Technologies have no application at all in water (simply untrue), or that certain water technologies cannot possibly improve, even in theory[11]. Overall, however, politicians and regulators will not believe that the water sector can be totally exempt from the general trends of technology in a modern society, so they will tend to assume that general efficiencies can continue forever, albeit at a slower rate than in manufacturing industries.

On a personal level, of course, our water company worker has a serious motivational problem: working for a company with 100% market share, limited prospects of growing the market, and management forced by an economic regulator to cut costs every year, is psychologically depressing: he or she looks around the weekly meeting and wonders how many fewer faces there will be in ten years time, and what their own career prospects are. We can only suggest that a career in the water industry should be viewed as a journey involving stops at several different companies. Spells in small companies with limited British prospects may need to be alternated with spans working for

[11] A more plausible claim for special status for the water sector, for instance, might be that it is hard to see how one can improve the operational efficiency of an un-manned, un-maintained storage tank, and that quite a lot of the water industry's capital equipment is like this.

specialist suppliers, or periods in a large operating company with international growth prospects, but the inexorable replacement of people by machines will continue.

8. Water does not need an economic regulator

'The UK water industry doesn't need more regulation: we trust water companies with our lives, so we should just trust them to charge us what they need to in order to provide us with safe water.'

It is quite true that we trust water companies with our lives, but we also trust airlines, train operators and orange juice manufacturers with our lives. That does not mean we exempt them from the strictest health and safety regulation, or from economic regulation if competitive forces are weak.

For the reasons given above, the water industry is strongly monopolised, and has a profitable and highly inelastic demand curve. This combination of supply and demand factors means that *unchecked* private water companies could raise prices massively, extracting a vast monopoly rent amounting to regressive taxation[12] which would eventually be absorbed as inefficiency (a straightforward waste to the national economy), or windfall profits for a generation of investors who happened to own shares prior to deregulation. Water utilities' abnormally strong commercial position has been recognised for centuries. Long before modern economic theories had been devised, humans knew that if the destitute (nowadays of Calcutta) would spend a third of their income on water then richer citizens, with a hundred times their disposable income, would spend far more, if forced to by unchecked private water sellers. Consequently, whenever private water companies were allowed or mooted, citizen-customers protected themselves by creating the 'countervailing power' of economic regulators[13] with the power to cap water prices, or by devising other measures such as permanently limiting water companies' dividends.

An alternative economic theory suggests that, in the absence of a regulator, rather than increasing prices thirty-fold, privatised water companies might charge an entry-deterring price to dissuade competitors from entering their super-profitable market. A former economic regulator calculated this level, in another context, as being roughly three times current prices for an average English water customer[14]. This is a little more reassuring than a thirty-fold increase, but whether three-fold or thirty-fold, the extra revenue still amounts to a pointless economic rent. So, as the lesser evil, most of us prefer to retain an economic regulator with the task of keeping prices down to levels that enable water utilities to maintain sustainable networks without becoming abnormally profitable.

[12] Because water's income elasticity is low (around 0.1), water revenues are a 'regressive' tax – i.e. the poor pay relatively more tax than the rich. Most governments aim for the opposite effect: neutral or 'progressive' taxes.

[13] JK Galbraith coined this general term to describe the automatic checks that seem to emerge whenever one group or class of people is seen to grasp abnormal amounts of power within human society.

[14] Sir Ian Byatt when setting the methodology for calculating regulatory capital values in 1993/94.

9. Regulators are the problem – adding Regulatory Risk

'Regulators create problems for industries that are innately low risk by adding uncertainty. Harsh price reviews, and taxes like the Windfall Tax decimated investor confidence in the late 1990s.'

Risks to investors such as termination of licences, nationalisation without full compensation, or profits taxes, exist alright, but they are Political Risks created by politicians. The Windfall Tax was a Party Political proposal included in two General Election manifestos before the Labour Party was voted into office in 1997. Any investor surprised by the Windfall Tax was very poorly informed about the country in which they were investing.

Some regulators did introduce unexpected price reviews in the 1990s, but this was seen as an admission of failure and they were soon replaced. Professional regulators are acutely conscious of uncertainties resulting from their decisions, and so try to minimise Regulatory Risks while carrying out their legal duties. For instance, price reviews are nowadays run on timetables announced years in advance so as to minimise Regulatory, Investment, and Operational Risks.

There is evidence that views about who is really responsible for creating risks are maturing. In annual surveys of professional investors[15] Regulatory Risk in the water industry is perceived to have declined markedly since 1999, while Political Risk is now rated a high or very high risk by twice as high a proportion of investors as Regulatory Risk.

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[15] Water UK's Investor Survey March 2004 by Dr Angela Whelan showed 86% of professional investors thought Regulatory Risk had declined since 1999, with 14% saying it was the same. The same survey showed 76% of investors rated Political Risk as high or very high, compared with 38% rating Regulatory Risk as high or very high.