Research
Discussion
Papers

PSI Research Discussion Paper 21

The social impacts of environmental taxes: removing regressivity

Towards the Design of an Environmentally and Socially Conscious Water Metering Tariff

Simon Dresner and Paul Ekins

Research Discussion Papers

Policy Studies Institute, 2004
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic or otherwise, without the prior permission of the copyright holder.

ISBN: 0 85374 819 5
PSI Report No: 899

Policy Studies Institute
For further information contact:
Publications Dept., PSI, 100 Park Village East, London NE1 3SR
Tel: (020) 7468 0468 Fax: (020) 7468 2211 Email pubs@psi.org.uk

PSI is a wholly owned subsidiary of the University of Westminster

psi
Policy Studies Institute

Research Discussion Papers

ACKNOWLEDGEMENTS

The research reported in this paper was conducted under the project 'The Social Impacts of Environmental Taxes: Removing Regressivity', funded by the Joseph Rowntree Foundation under its Programme on Environment and Social Concerns. Our thanks go to the Joseph Rowntree Foundation (JRF) for supporting the research and to JRF's Alison Jarvis who monitored its progress and helped it along with many useful suggestions. We are also very grateful to the members of the Project Advisory Group, which met on a number of occasions to address the topics with which the research was concerned. We would like to give special thanks to Derek Osborn, who chaired most of the group meetings, and Nick Hartley who not only attended meetings most regularly but also gave us extremely useful written feedback.

We thank Anglian Water for giving us access to their SoDCon data, and particularly Amy Walters of Anglian who was immensely helpful in assisting us with the data.

Abstract

The research reported in this paper was conducted under the project 'The Social Impacts of Environmental Taxes: Removing Regressivity', funded by the Joseph Rowntree Foundation under its Programme on Environment and Social Concerns. The project is investigating the social implications of environmental taxes and charges in relation to four environmental issues – the household use of energy, water, and transport, and the generation of waste. This is a report of the component on the household use of water.

The motivation for the research was an acceptance that there is a strong environmental case for universal water metering, particularly in southern and eastern England, regions that are already making unsustainable use of their water resources and where the situation is expected to get worse because of population shifts and climate change. In these regions at least, water is now a scarce resource, which implies that it needs to be managed. A scarce resource cannot be managed unless it is measured, yet water companies presently have little knowledge about how much water different household consumers use. Since the use of water needs to be managed, that implies that its use needs to be measured by metering. A further argument involves recognition that water has a value and that people should be encouraged to use it wisely. It is not easy for that message to get across when water is a free good at the point of use, and there is no incentive to avoid even the most gratuitous waste.

There are also arguments against water metering: that it is an expensive means of encouraging water conservation, that it can lead to people cutting back on use that is essential for hygiene or medical reasons, and that its implementation can lead to disproportionate costs for low-income households (i.e. is regressive). The focus of this research is an examination of ways to design water-metering tariffs to reduce negative impacts on poor households.

At present there are two methods of paying for water in the UK. Most households pay a bill based partly on a standing charge and partly on the rateable value of the property. The system is a hangover from the days of local authority ownership of water services in England and Wales. Rateable values were last assessed in 1973 and

have a number of anomalies. For homes built since 1990 and for other households that want to, the alternative is to be metered. The households that have volunteered to be metered are on average smaller and in higher rateable value properties than those that have remained unmetered.

The UK is unusual among OECD countries in that most households here are not metered. A recent OECD study found that water charging in England is more regressive and more burdensome on the poor as a proportion of their income than in any other country examined except Mexico (OECD 2003). It is therefore not true either that metering is per se more regressive than non-metered tariffs, or that the UK's present system of water charging is equitable. The distributional impact depends on the detail of the tariff.

Universal metering could be implemented in the UK through a variety of different tariffs, each with different distributional implications. At one end of the spectrum would be an equal charge (at least from a given water company – water charges currently vary widely by region) for all households per unit volume of water used. This would increase the regressivity of water charging, and most low-income households would be made worse off. At the other end of the spectrum universal metering could be made very progressive, and most low-income households could be made better off, by having a lower tariff for those on benefits, by giving a 'free' allowance of water to some households, or by varying the tariff by an amount related to Council Tax. These are some of the options explored by the research in this paper. All the progressive options involve on average a redistribution of income from better off to less well of households.

Previous research conducted first by the Institute of Fiscal Studies and later by OXERA on the distributional implications of universal metering indicated that in England this would not be more regressive than the present system. However, these studies were severely limited by the fact that they did not have access to any data from a water consumption monitor that also provided data on the incomes of the households surveyed. They were forced to use various proxies for household income, with the consequence that the results obtained were rather unreliable assessments of the actual impact of alternative tariff designs. This project has been the first in the UK *to have information, from data supplied by Anglian Water, on both household water consumption and on household income*[i].

It was found that even Anglian Water's existing water metering tariff is less regressive than their unmeasured tariff based on rateable value, although it is more expensive than the unmeasured tariff for larger households on low incomes. The distributional effect of a number of alternative tariff designs was examined with three politically important variables in mind: the average effect on low-income households; the effect on high-water-using low-income households; and the overall redistributive effect (i.e. the transfer from richer to poorer households). The first major result of the research was that all the metered tariffs investigated (including the simple measure of extending Anglian's present metered tariff to unmetered customers) were less regressive than the present tariffs.

Table S.1 gives a summary of the various results found by the investigation of ten different tariff options, with a focus on the three politically important variables mentioned above. A full description of all the options, and other results from the analysis are reported in the paper. The various options are set out below. It should be noted that the results quoted are for both currently metered and RV Anglian customers, apart from Option 1. All results assume that there has been no demand reduction as a result of metering.

Option 1: *Metering with existing Anglian Water tariff for (RV customers only, no effect on existing metered customers)*

Option 2: *Metering with the volumetric rate varying according to current Council Tax bands*

Option 3: *Metering with the volumetric rate varying according to stretched Council Tax bands*

Option 4: *Metering with standing charge varying according to stretched Council Tax bands*

Option 5: *Metering with a lifeline allowance of 15 m^3 per capita and an increased price per litre of water*

Option 6: *Metering with a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water*

Option 7: *Metering with an allowance varying according to Council Tax band*

Option 8: *Metering with an allowance and the variable charge varying according to stretched Council Tax band ratios*

Option 9: *Metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios*

Option 10: *Metering with a lifeline allowance and the charge per litre of water varying according to current Council Tax band ratios*

Option 11: *Metering with standing charge and allowance varying according to Council Tax band*

In addition to showing, as mentioned above, that all the investigated options are progressive from the point of view of the lowest-income households, Table S.1 shows that all but one (Option 1) is also progressive for the next income group (those with incomes of £10-20,000). Moreover, this result was not a function of the structure of the Anglian Water tariff, because a similar result was obtained when one of the options was analysed using the Severn Trent tariff (which has no standing charge). The result is therefore likely to hold across all water customers, whatever their water company. There is therefore no basis for supposing for switching to metering will, on average, make low-income households worse off. All the options investigated actually make them better off on average, some quite substantially so. In view of the fact that current water charging systems are generally regressive, many would consider that a switch to such tariffs would give greater fairness of treatment of water customers.

Table S.1: Comparison of Results from Various Metering Tariff Options

	Households <£10,000		**Households £10-20,000**		**Households >£40,000**	
	Average loss or gain £ p.w.	Proportion much worse off	Average loss or gain £ p.w.	Proportion much worse off	Average loss or gain £ p.w.	Proportion much worse off
Option 1	+0.34	8%	-0.02	15%	-0.09	17%
Option 2	+0.67	9%	+0.39	10%	-0.14	21%

Option 3	+1.09	6%	+0.81	12%	+0.36	37%
Option 4	+0.59	9%	+0.24	15%	-0.50	33%
Option 5	+0.31	12%	+0.01	15%	-0.17	25%
Option 6	+0.39	11%	+0.08	15%	-0.31	26%
Option 7	+1.48	13%	+0.79	20%	-1.83	57%
Option 8	+2.20	10%	+1.49	14%	-3.11	43%
Option 9	+1.16	8%	+0.93	11%	-2.00	45%
Option 10	+0.72	12%	+0.50	13%	-1.19	47%
Option 11	+1.57	18%	+0.81	23%	-1.69	55%

Secondly, there is no tariff which does not make 6% or more of the lowest-income households worse off by more than £1 p.w. These will be the high-water-consuming households in this income group. For some of them, their high water use will reflect discretionary rather than essential use, and a cutback in that use would reduce these extra charges they would pay under metering (Options 5-11 include a lifeline allowance, to reduce the likelihood of cutbacks on essential water use). Where their high water use is essential, this is likely to be due to medical reasons, and it should be possible to make special arrangements to make rebates of some charges through the benefits system. In these two ways, it is likely that the great majority of low-income households would be able to reduce any extra charges they would face under the metering tariffs.

Thirdly, the tariffs vary considerably in the degree of redistribution from richer to poorer which they bring about (as noted above, all are redistributive in this direction to some extent). The least redistributive is Option 5, whereby the average cost to the richest households is only £0.17 p.w., and only 25% lose more than £1 p.w.

Which of these tariff options is 'best' depends on political perspective. Option 3 (volumetric rate varying according to stretched Council Tax bands) leaves fewest households in the two lowest income groups worse off by over £1 p.w. Option 9 (lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios) is very similar in this respect, but is substantially more *redistributive from richer to poorer households. Option 4 (standing charge varying according to stretched Council Tax bands) is also similar in this respect, but is less redistributive. Option 5 a lifeline allowance of 15 m^3 per capita and an increased price per litre of water) is least redistributive, but leaves more low-income households with extra bills in excess of £1 p.w. (12% as opposed to 8% for the lowest income group).*

It is hoped that, should universal metering be adopted in the UK, in some regions or as a whole, such detailed tariff design issues will get adequate consideration, so that the change does not have social effects that were not intended.

1. Introduction

1.1 The need to manage water use

England is generally thought of as a wet country, but in fact rainfall in much of the country is moderate (and East Anglia is officially semi-arid), while the population density is high, especially in the south of England. As a consequence, England has less water resources per capita than Spain or Portugal. In the Thames Water region, water resources per capita are less than in Ethiopia or Sudan (World Resources Institute 1999).

Water usage in England and Wales rose more or less continually during the twentieth century and particularly after the Second World War. Per capita consumption rose dramatically between 1961 (87 l per person per day) and 1999 (146 l per person per day). However, because industrial demand for water has been falling since the 1970s, total water usage increased more slowly. It peaked in 1996 and by 1999 had fallen around 15% to the levels of the mid-1970s (National Consumer Council 2000, National Consumer Council 2002). The main reason for the dramatic fall was that after the 1996 drought Ofwat gave the water companies strict and binding targets for leakage reduction. However, leakage reduction is a one-time gain and even by 2001/2, leakage was already increasing again, particularly in the Thames region (Environment Agency 2002).

Total future water demand in England may either rise or fall over the period until 2025 depending on the extent to which water conservation policies are followed (Environment Agency 2001). In parts of the country, particularly the South and East, population increases are expected that would be likely to place additional demands on water resources. Unfortunately, the South and the East are the two regions that already have the greatest difficulties in meeting demand. Many regions already have excessive river abstraction and the southern and eastern regions also have unsustainable groundwater abstraction. The South and the East are beyond their sustainable use of water resources. Other regions are at or near the limits. Only in the

North East is there additional water available. In other regions there is little capacity to increase the water supply (Environment Agency 2001). That means that the capacity to meet increased demand is very limited. In addition, expected climate change over the next decades causing hotter and drier weather will reduce the supply of rainwater and is likely to increase demand for water. The effect of climate change on water resources is likely to be particularly pronounced in southern and eastern England.

In this situation it is curious that the water usage of most households in the UK is not measured. Among OECD countries, only the UK and Ireland do not measure the water use of most households – in Ireland water services are provided free and paid for out of general taxation (OECD 1999). Consequently UK water companies generally have very poor data on how much water is being used by households in different areas, and what factors influence that use. Their ability to manage the household use of water, and indeed households' ability to manage such use themselves, is low. The contrast between water and other utilities (gas, electricity, telephone), the use of all of which is measured on a unit basis, is marked. The need to measure water use in order to manage it is a strong argument in favour of universal water metering, especially in those regions which have been or may be affected by water shortages.

Especially in a context of increasing household water demand, another argument in favour of metering is that it can help to conserve water – metering has been found to reduce water consumption by about 10% on average (National Metering Trials Working Group 1993). It is in fact not surprising that people tend to use less water when they pay for it on a per unit basis than when it is free at the point of use, and this difference would be likely to become more marked either as people moved towards less water-intensive equipment (which would then save them money), or water became more expensive, because of increasing scarcity.

1.2 Concerns about water metering

A popular argument against metering is that there are cheaper ways of conserving water, as shown in Table 1.1. For instance, low-flush toilets reduce total water consumption by nearly as much as metering does, but low-flush toilets cost less than metering does. Water metering costs £20-30 per household per annum. However, it is not clear how people will be persuaded to install low flush toilets, efficient appliances, and water saving taps and showerheads if they do not have any incentive to do it. Nor is it easy to establish how much water they would in fact save when the water consumption to which they relate is not measured. The point of water metering is not just to gain the 7-10% reduction in water consumption that occurs initially, but also to create a situation where people will install water saving equipment in future, and where the result of them doing so will be apparent.

Table 1.1 Cost-effectiveness of different demand-supply options

Demand management option	Demand management cost (p/m³)	Ratio to cost of increasing water supply		Likely water savings	
		Low-cost supply	High-cost supply	Ml/day	% of input
Leakage control target (4.05 l/p/hr)	19.7	0.5	0.3	3151	18.5
Compulsory universal metering	94	2.5	1.4	1233	7.2
Voluntary metering	113	3.0	1.7	538	3.2
Compulsory metering – sprinkler users	51	1.3	0.8	240	1.4
Metering as part of rehabilitation works	36	1.0	0.6	1233	7.2
Converting 9 litre WCs to 7.5 litre	27.2	0.7	0.4	543	3.2
Converting 9 litre WCs to dual flush	17.2	0.5	0.3	858	5.0
£100 subsidy to replace pre-1981 WCs with 6 litre WCs	74.5	2.0	1.1	268	1.6

Natural replacement of pre-1981 WCs with 6 litre WCs over 20 years	_	_	_	357	2.1

Source: OXERA 1998, p. 10

Another argument against water metering is that increased water demand can be addressed by increasing supply, as has been done in the past. In pure financial terms, as Table 1.1 shows, increasing supply is more expensive than leakage control, converting 9 litre WCs or metering as part of rehabilitation works (Clark et al 1998a, p.10). It is about as expensive as the compulsory metering of sprinkler users, but cheaper than universal metering, while voluntary metering (the current situation in the UK) is the most expensive option of all.

It should, however, be noted that these comparisons do not take into account the environmental costs of increasing supply in terms of damage to wetlands and estuaries, and consequent loss of habitat and biodiversity (ibid, pp. 6-7). The case for water metering, as opposed to increasing supply, rests on environmental arguments. Increasing abstraction of river water and groundwater are cheap, but unsustainable in the long term. Building more reservoirs is more expensive financially and involves using up land, and may be no cheaper than water metering. It clearly has a much greater environmental impact than water metering. In most of England and Wales, there is little or no capacity to increase water supply without unacceptable environmental impacts (Environment Agency 2001).

It is also argued that water metering is unfair because most of the costs of the industry are fixed. John Thackray of the Public Utilities Access Forum has estimated that they can be divided as follows:

Water supply pipe network	30%
Water resources and treatment	20%
Sewer network	10%

Sewage treatment and disposal	20%
Rainwater disposal from properties	10%
Highway drainage	10%

(Thackray 1997)

Opponents of metering argue that most of these costs are not dependent on the quantity of water used, so charging on the basis of use is irrelevant. However, the quantity of water used does have an impact on cost. The social costs of additional marginal use of water are high, particularly in regions which are short of supply and are making unsustainable use of abstraction. What is more, the rising water consumption by households in recent years is entirely accounted for by increases in non-essential uses. Not charging for use means that there is no incentive for less wasteful use. Britain is one of very few countries in the world where water metering is not standard (OECD 1999). It is important to note that when Ofwat surveyed consumers they identified water metering as the fairest way to pay for water (National Consumer Council 2000).

Another particular concern that is often expressed about water metering is that it can lead to poorer households cutting back on essential uses such as personal hygiene. There is some evidence to support this concern (DoE/OFWAT 1992, Consumers' Association 1996), but attempts to prove that this leads to higher rates of disease have failed to show a link (Clark et al 1998a). Nonetheless, the British Medical Association (BMA) has stated that water is vital to halting the chain of infection and should therefore be available to all at an affordable price (BMA 1994).

However, it is not the intention of this paper to make the case for or against metering, or seek to adjudicate between the arguments for the various options in Table 1. Rather the paper is based on an acknowledgement that there are strong arguments in favour of water metering, and that metering may therefore be introduced into the UK on a universal basis, as it has been in other countries. If this were to occur, the research in paper is addressed to the question of what charging structures relating to metering could be introduced in order to limit the financial impact of metering on low-income households. In order to consider this question it is necessary first of all to set out how the household use of water is currently paid for in the UK.

1.3 Current methods of water charging

The traditional method of charging domestic customers for water in the UK has been on the basis of rateable values (RVs), a hangover from the days of local authority ownership of the water supply. The water bill is divided into a standing charge (the same for each household) and an additional charge based on the rateable value of the home. Some water companies make the standing charge the main element of the bill; others make the rateable value the main element of the bill. RVs were last assessed in 1973, so they bear little relation to present property values. Other anomalies in the valuation system are that RVs are lower for houses than for equivalent flats and that RVs tend to be very low for rural properties and pre-1919 properties, even if they are large and valuable (Thackray 1997). The rateable value system was abolished for local government taxation in 1989 and nearly all homes built or substantially renovated since 1990 have had water meters installed. In 1989, it was legislated that RVs would be abolished for water charging purposes in 2000 and replaced with an unspecified alternative system, but the deadline was deferred into the indefinite future by the 1999 Water Industry Act.

Water metering became an option for existing properties in 1990. By 1999, 17 per cent of households were metered (National Consumer Council 2000). Since 2000, households have had the right to the free installation of a meter and the proportion metered had reached around 23 per cent by 2002 (OFWAT 2002). A complaint made against the optional metering that exists now is that the people who take it up tend to be small households in larger properties, generally richer than the average. Because variable costs are only a proportion of the costs of the water industry, what happens is that the bills of people who are not metered, generally poorer, increase (National Consumer Council 2000). Obviously this could be addressed by increasing the volumetric charge to metered customers, but this would reduce the incentive to switch to metering. Another source of contention is that, also in order to encourage people to switch to metering, the additional administrative costs of metering and billing are not borne by those being metered, but shared among all consumers, which is effectively a subsidy of the metered by the non-metered. Since those opting for voluntary metering tend to be the better off who live in high rateable value homes, and the non-metered tend to be poorer, in this respect poorer consumers are subsidising richer consumers. On the other hand, the RV system is itself an extensive system of often illogical cross-subsidies. In particular, those in rural areas are heavily subsidised by those in urban areas. They impose higher costs, yet they actually pay less. An even more illogical subsidy is of those in older houses by those in more modern properties because of the characteristics of the RV system.

Distributional effects of water metering

As noted above, most households in other OECD countries except Ireland are metered (OECD 1999), but water charging in England and Wales has a higher proportional impact on the poor than in any other of nine OECD countries surveyed except possibly Mexico (OECD 2003, p.61). Although the average proportion of disposable income spent on the water supply in England and Wales is 1.2%, which is about average, the proportion of income spent by the lowest decile is 3.75%, the second highest among the nine OECD countries compared - Mexico is just ahead at 3.84%. In no other country was it above 2.53%. The ratio of the burden on the lowest income group compared to the burden on the average is highest in England and Wales (3.1), followed closely by Mexico (3.0). This shows that the widely-repeated claim that water metering *necessarily* has a greater proportional impact on the poor than the RV system used in the UK is quite false.

The reason why water charging in England and Wales is so regressive is probably because a large proportion of unmeasured water bills is composed of a standing charge that is the same across all households in the water company's area. Only a proportion of the bill is based on rateable value. This is one of the aspects examined in the metering tariff structures explored in Section 3.

2. Past research on metering

2.1 Institute for fiscal studies work

The Institute for Fiscal Studies (IFS) examined the question of the regressivity of water metering in England and Wales in 1993 (Pearson, Rajah and Smith 1993). They used data from the Family Expenditure Survey (FES) with the Severn Trent Water Domestic Consumption Monitor (DCM) - a record of the details of the water consumption of around 1500 volunteer households plus about thirty other variables including the number of people in the household, the rateable value, location, tenure type, property type, occupation, age of occupants and information on water-using equipment. Average water consumption was about 125 litres per person per day. Regression analysis was used to derive a model that could explain nearly half the variance in water consumption. The other half of the variance was treated as random. The model was apparently able to predict the average water consumption of groups of households quite well, but it was not able to identify how an individual household would be affected by water metering. It is very important to note that the Severn Trent monitor did not provide information about household income – that was imputed from information about other household parameters using the FES.

IFS compared the distributional effects of four alternatives to the RV system: a flat-rate licence fee for all households, a charge based on the number of people in the household, a charge based on the type of property and water metering.

A switch to a licence fee would be highly regressive. The poorest households would lose substantially, while the richest households would gain substantially, particularly those in the tenth decile. In terms of household size, it would tend to substantially increase the bills of one adult households, while reducing the bills of two adult households and substantially reducing the bills of households with three or more adults. Pensioner households would on average lose slightly.

A charge based on the type of property (whether detached house, semi-detached, bungalow or terrace, or a flat) would have similar effects, although not so substantially redistributive from poor to rich. The banding according to property type was very crude, but IFS used that because there was no Council Tax banding data for the households in the FES. Because the FES stopped recording property type in 1984-5, they used the FES for that year (with all prices indexed to 1992 levels).

Charging for water according to Council Tax banding would be more regressive than according to RVs (the present system) because Council Tax bands are weighted towards lower cost homes. Extrapolating from the IFS work, it would be somewhat regressive. It would be possible to re-weight the bands to make the effect less regressive (simulations of this kind are carried out in Section 3 with the Anglian Water data).

A charge based on the number of people in the household has rather different effects. It was found to be on average broadly neutral for the bottom three deciles, negative for the middle four deciles, neutral for the eighth decile and positive for the top two deciles, especially the tenth. It redistributes income from the middle of the income range to the top. The reason for that is mostly because the households in the top quintile are on average smaller than households in the middle quintiles.

IFS analysed the distributional effects of water metering, assuming that there was a fixed charge of £30 per household irrespective of consumption (to cover the fixed costs of metering each household) and that the remainder of the cost would be based on water usage at a flat rate per cubic metre. Under these assumptions, the bottom three deciles again break even on average. The middle four deciles lose a little, the eighth decile breaks even, the ninth decile gains a little and the top decile gains a great deal. That is because the top quintile actually uses less water than the third and fourth quintiles because it tends to live in smaller households. Because of limitations to their data, IFS was not able to describe the effects on individual households (as opposed to deciles) and give a detailed breakdown of the distribution of gainers and losers in each part of the income spectrum for water metering. Although the pattern of shifts between deciles is similar to that of charging on the basis of the number in the household, it is less marked.

A few comments can be made about the IFS analysis. Firstly, they assumed that the total amount charged for water would remain the same under the water metering system, but there are in fact additional costs of £20-30 per annum per household associated with water metering. They would amount to an increase of about 5-10% in the cost of water if universal water metering was introduced at a stroke. On the other hand, water metering leads to reductions in water consumption of around 10%; that would reduce costs somewhat. However, the additional cost of metering is a significant stumbling block to the introduction of compulsory water metering. One solution might be to transfer the costs of highway drainage to the roads budget (which is how it was paid for before 1973). That would balance out the additional cost of water metering in bills.

Secondly, IFS assumed that there would be a standing charge and then a charge for each cubic metre of water consumption – in other words a regressive charging scheme. A charge related strictly to water consumption would tend to charge smaller and poorer households less and larger and richer households more. Note, however, that because the richest households tend to use less water than those in the middle of the income range (because they are smaller), simple water metering will tend to lead to gains for the richest and losses for those in the middle.

Thirdly, the fundamental disadvantage with the approach IFS used is that because of the nature of the predictive methodology which was used to link the Severn Trent DCM data and the FES samples, the information on households in which consumption was above or below average was lost. Only the average consumption for each consumer group was predicted for the FES observations. However, social concerns about water metering in the UK usually relate to the possible adverse effects of metering on vulnerable households which have above-average consumption either as a result of family size or medical conditions. It is precisely the effects of water metering on households that have above-average consumption that is the main focus of the analysis in Section 3.

2.2 OXERA and other work

A study by OXERA (Clark et al 1998a, Clark et al 1998b) for UK Water Industry Research instead used actual data from the Severn Trent DCM, which enabled them to predict what would be the effect on individual households of different water metering tariffs. The disadvantage with their approach is that because the DCM did not collect income data, they were not able to make predictions about particular income groups. The particular concern of the study was to examine the effect of different proposed water metering schemes on 'vulnerable households', defined as those with low incomes or high essential use, such as large families and households containing someone with a medical condition such as incontinence or skin disease which requires high water consumption. Unfortunately, they did not have data on household income or medical conditions. They had to rely on information about proxies for poverty such as being elderly or in generally poorer ACORN areas.[ii] It should also be noted that the average RV of the households in the DCM sample was £255, while the average RV among Severn Trent households was £192. In order to adjust for this lack of representativeness, the unmeasured bills were rescaled by 192/255. However, because the water consumption of households is known to correlate quite well with RV, this rescaling will have introduced a systematic error tending to overstate the likely water bills from a switch to universal metering. Severn Trent does not have a standing charge, but all the other water companies do, so the OXERA team recalculated the gains or losses based on an assumed tariff more typical of other water companies.

It would be useful to be able to identify households with high essential use due to large numbers of people. However, it is generally not considered practical to keep up-to-date registers of the number of individuals in each household in the UK, as is frequently said to have been demonstrated by the experience of the 'poll tax' in the early 1990s. It is the case that Flanders has introduced a water metering tariff where each individual is given a 'free' allowance of 15m^3 of water per annum (equivalent to 41.1 litres/day) to cover essential use, with metered payment for use above that amount (OECD 1999). A special register is maintained to support the scheme, but it must be remembered that in Flanders each citizen or resident already has an identity card. The introduction of such a water-metering scheme in the UK (at least for as long as the UK does not have an identity card) would be likely to be more expensive and meet with greater resistance.

Paul Herrington (Herrington 1996) instead proposed an allowance based on one adult plus the number of children in the household. The information for that would be obtained from child allowance records (in practice this would require data protection issues to be addressed). An allowance of 60 litres per person per day (equivalent to 21.9 m^3 per person per annum) would be made at a special low price. It would avoid the risks to public health that could otherwise be posed by water metering. The scheme would involve some cross-subsidisation of households with children and single person households by larger adult households. This approach is based on the use of a universal benefit to determine eligibility for concessions. A more targeted approach that Herrington suggests as an alternative would instead use means-tested benefits to provide eligibility for rebates. Such a system is used in Melbourne, Australia. The effects of some such schemes are analysed in Section 3.

OXERA considered two basic policy instruments for minimising the effects of metered bills on low-income households: direct subsidies by social security payments; and cross-subsidies by making metered tariffs sensitive to the socio-economic status of the household. Direct subsidies could take two forms. There could be an additional payment within existing benefits, or there could be a tailor-made water charges benefit. About 70% of households receive a state benefit, including many wealthy households because of universal benefits, while 30% of households receive income-related benefits. The proportion of households receiving income-related benefits is over 60% in the lowest three deciles, but it falls sharply to only a few percent in the highest deciles. OXERA suggested the idea of incorporating an extra payment into Council Tax Benefit or using it as a prototype for a separate 'Water Charges Benefit'.

The alternative to direct subsidies to consumers is cross-subsidies through water tariffs. OXERA examined the effect of five different tariff schemes using the Severn Trent DCM data:

- Universal metering, with a standard two-part tariff that consists of a standing charge of £34 and a single unit price of £1.54/m^3 applicable all year round.

- Universal metering, with a rising-block tariff that consists of a fixed charge of £67 that entitles all consumers to a 'free' block of lifeline consumption set at 60 m^3 per property per year, with consumption beyond this level attracting a year-round price of £2.37/m^3.

- Universal metering, with a rising-block tariff very similar to that above, except that households whose monthly summer (June-August) consumption is at least 10% greater than their monthly winter consumption pay a 40% surcharge on this excess.

- Universal metering, with a rising-block tariff with a summer surcharge similar to that described above, except that the fixed charge and 'free' allowance vary according to the Council Tax band. The unit charge was £2.33/m^3. The tariff was structured as in Table 2.1.

Table 2.1 Tariff parameters based on Council Tax bands used in the OXERA model

Council tax band	Fixed charge (£/year)		Free allowance (m^3/year)
	Water only	Combined water and sewerage	
A	44	66	120
B	44	66	120
C	44	66	80
D	64	96	60
E	64	96	0
F	84	126	0
G	84	126	0

Source: Clark et al 1998a, p.65

- Selective metering of households in Council Tax bands C-H, with a standard two-part tariff as in the first option, except that a summer surcharge is also incorporated.

OXERA first attempted to assess the environmental benefits in terms of demand reduction from the different tariffs, based on the ranges identified in a review of the literature.

Table 2.2 Summary of effects of different measured tariff structures on demand

Tariff type	Year-long demand		Summer demand	
	Low demand reaction[a]	High demand reaction[b]	Low demand reaction[a]	High demand reaction[b]
Standard	-10	-20	-10	-20
Rising block	-18	-27	-22	-33
Rising block with summer surcharge	-18	-28	-26	-36
Rising block varied by Council Tax band	-15	-22	-22	-29
Selective metering with summer surcharge	-8	-15	-11	-18

[a] The low demand reaction scenario is based on the assumptions that demand falls by 10% as a result of metering and that increases in the volumetric tariff above the current level are associated with price elasticities of –0.2 in winter and –0.4 in summer. [b] The high demand reaction scenario is based on the assumptions that demand falls by 20% as a result of metering and that increases in the volumetric tariff above the current level are associated with price elasticities of –0.2 in winter and –0.4 in summer.

Source: Clark et al 1998b, p.23

Table 2.2 shows that the standard tariff leads to a reduction in demand of 10-20%, depending on the assumptions, but it is no higher in summer when the environmental stresses tend to be greater. A rising block tariff (with or without a summer surcharge) leads to a further reduction of around 7.5%. The reduction is greater in summer (12-

16%), and particularly when there is a summer surcharge. The rising-block tariff that varies by Council Tax band does not give such large demand reductions as the other rising-block tariffs because of the large amounts of 'free' water provided to households in the lower Council Tax bands. However, it still gives a greater reduction in consumption than the standard tariff, particularly in the summer. Selective metering (assuming 60% of the population is metered) has the least effect. The demand reductions projected from universal metering are substantial.

OXERA then attempted to assess the distributional impact of the different tariffs on water and sewerage bills. It was initially assumed that no demand reductions would take place. As well as looking at the effect on all households, they also examined the effect on 'vulnerable' households. Due to the lack of income data, these were taken to be households with ACORN codes placing them in most deprived 15% of postcodes.

Regression analysis carried out in the present project using the Family Expenditure Survey 2000-01 shows that ACORN actually correlates less well than Council Tax band with income. The coefficient of income and ACORN number is –0.253 (sig. 0.000), while the coefficient of income and Council Tax band is 0.396 (sig. 0.000). Might it be that 'vulnerable' ACORNs do correlate better with income than Council Tax band A? ACORN has recently been reclassified to create a larger number of subtypes (55 instead of 38) and make their ordering more logical. Under the new classification, 22% of households are in the poorest ACORN group (G), while 24% of households are in the lowest-value Council Tax band A. However, the coefficient of income and Council Tax band A is –0.239 (sig. 0.000), while the coefficient of income and ACORN group G is only –0.159 (sig. 0.000). In other words, what the OXERA study used as a test of the reliability of Council Tax band as a means of finding low-income households was actually less reliable than Council Tax band is.

Table 2.3 Summary of effects (%) of metering on water and sewerage bills for different groups of households assuming no demand reduction scenario

Tariff type	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households					
Standard	35.6	21.0	20.4	23.0	1052
Rising block	35.6	12.7	17.0	34.7	1052
Rising block with summer surcharge	34.9	13.2	17.6	34.3	1052
Rising block by Council Tax band	32.3	9.1	15.1	43.5	860
Selective metering with summer surcharge[a]	24.2	10.0	13.0	16.5	860
'Vulnerable' households					
Standard	43.9	21.6	21.6	12.8	148
Rising block	41.9	10.1	20.3	27.7	148
Rising block with summer surcharge	41.9	10.8	18.2	29.1	148
Rising block by Council Tax band	17.6	7.6	21.0	53.8	119
Selective metering with summer surcharge[a]	9.2	1.7	3.4	3.4	119

[a] Does not sum to 100 because a significant proportion of households do not experience a change in their bills.

Source: Clark et al 1998b, p.26

The results in Table 2.3 above were based on very pessimistic assumptions about cost reductions from a switch to metering and should be regarded as a worst-case scenario. The first three tariffs – the standard tariff, the rising block tariff and the summer surcharge tariff – make about half of households better off, and half of households worse off. Most of the gains and losses are greater than £1 per week, so they represent significant changes to customers' bills. Losses are disproportionately concentrated among 'vulnerable' households. About 40% of them lose more than £1 per week. However, only about 40% of all households lose under the tariff varied by Council Tax band, and only about 25% of 'vulnerable' households lose (meaning that 75% of these households are net gainers), about 18% by more than £1 per week. This makes this option very progressive overall. Selective metering has a smaller impact because only some households are included. It largely passes 'vulnerable' households by. About 10% lose, mostly by more than £1 per week.

The OXERA report also considered the impact of the proposed tariffs on two typical households with high essential water use due to medical conditions, based on consultation with the BMA about likely water use. In both cases, the households were assumed to live in Council Tax Band A or B properties.

Table 2.4 Weekly changes in water only bill under different tariffs (£) – Council Tax bands A and B

	Stan-dard tariff	Rising block tariff	Rising block with summer surcharge	Rising block varied by Council Tax band	Selective metering with summer surcharge
Family with two children with severe eczema	+2.09	+2.79	+3.58	+1.43	0
Pensioner household with one severely incontinent member	+0.94	+1.27	+1.75	+0.04	0

It can be seen from Table 2.4 that the tariff varying by Council Tax band has less impact on these households than the other universal metering tariffs. However, it should be noted that for such households living in higher band properties the additional costs could be quite substantial. The thinking in the report seemed to be that households in higher band properties would be able to afford it without hardship.

3. Present research using anglian water data

3.1 Analysis of the data

The research undertaken by PSI in the present project has used data kindly provided Anglian Water from their SoDCon water consumption monitor. The crucial difference between this data and the Severn Trent data used in the earlier studies is that it provides information about household incomes. For the first time in the UK, it is possible to directly examine how water consumption varies in relation to income. That means it is also possible to directly examine the distributional impact of different universal water metering tariffs.

The SoDCon sample is taken from Anglian Water customers, stratified by county and by ACORN. There are 1320 households in the sample, of which 678 (51%) pay according to rateable value and 642 (49%) are metered. The proportions match the proportions among Anglian water customers as a whole. The average rateable value of the unmeasured households in the sample is £199, while the average rateable value of all Anglian's water customers is £178. The difference is relatively small and it was not felt necessary to rescale. As well as providing data on water consumption, SoDCon provides data on ACORN, payment method, RV (if applicable), numbers of adults and children, the occupational status of the adults and the educational level of children, shift work, use of appliances at night, kind of property, number of bedrooms, gardens, washing machines, dishwashers, water softeners, showers and power showers, sprinklers, hosepipes, jet pressure washers, watering cans, water butts, garden ponds, frequency of gardening, frequency of car washing, and household income. Data relating these variables to Council Tax band became available later in the project, and was used for the simulations .

The income data provided by Anglian Water places households in six bands: £0-£10,000 per year, £10,001-£20,000, £20,001-£30,000, £30,001-£40,000, £40,001-£80,000 and over £80,000. The bottom band roughly corresponds to the lowest three deciles, which are the ones generally regarded as having low incomes.

For the income question, there were also boxes for "don't know" and "refuse". Out of 1315 households taking part, 5.7% ticked "don't know" and 11.5% ticked "refuse", giving a total non-response rate for income of 17.2%. A regression analysis was run to see whether membership of these groups correlated with ACORN, the best available proxy for income. There was a coefficient of 0.103 (sig. 0.000) between don't knows and ACORN, in the direction that those from poorer ACORN groups were more likely to not know their household income. There was no correlation between ACORN and refusal to answer the income question. The relationship between membership of these groups and water consumption was also tested. There was a coefficient of 0.061 (sig. 0.028) between the don't knows and water consumption, in the direction that don’t knows were more likely to have lower water consumption. There was no correlation between water consumption and refusal to answer the income question. It can be concluded that the systematic bias introduced by the non-response rate to the income question was small in relation to the sampling error and probably due to poorer households being slightly more likely to answer “don’t know”.

How well does the sample reflect the actual income distribution in East Anglia? Table 3.1 gives a comparison of the incomes reported by the households in the sample (n=1094) with the reported gross incomes for households in East Anglia in the Family Expenditure Survey 2000-2001 (n=261):

Table 3.1 Comparison of incomes reported in the Anglian Water SoDCon sample and the FES East Anglian sub-sample

Income	Anglian Water	FES
£0-10,000	19%	23%
£10,001-£20,000	26%	29%
£20,001-£30,000	24%	20%
£30,001-£40,000	15%	14%
£40,001-£80,000	11%	11%
> £80,000	2%	1%

The totals do not sum to 100% due to rounding. Table 3.1 shows that the incomes reported by the Anglian Water sample in 2002 are slightly higher than the incomes reported by the FES sample for 2000-2001, but not significantly so. Both the effects of wage inflation and random sampling errors could account for the difference. Another factor could be that those on lower incomes may have been slightly more likely to answer “don’t know” to the household income question. However, the distribution of incomes reported by the Anglian Water sample appears to be fairly representative.

Average household size in the Anglian Water sample was 2.64 people. That is slightly larger than the national average of 2.33 in 2001 (National Statistics, 2002). The average household size in the larger East of England region was 2.40 in 1999 (National Statistics 2001). The fact that the households appear to be slightly larger than average will tend to slightly overstate the use of water to be expected.

A simple regression analysis found that household income does correlate with household water consumption. The coefficient was 0.178 (sig. 0.000), and was very similar for both metered and RV households examined separately. An analysis among only the RV households found a coefficient between RV and household water consumption of 0.251 (sig. 0.000), showing that RV is a better predictor of water consumption than income is. The coefficient between Council Tax band and household water consumption is 0.247 (sig. 0.000), almost exactly the same as RV.

A multiple regression analysis was run to see how all the different possible explanatory factors correlated with household water consumption. A rather surprising result was revealed: income is not an explanatory variable in such a multiple regression. In other words, it is not a higher income itself that makes households use more water, but other factors that tend to correlate with income. The factors (with a negative coefficient meaning the factor tended to reduce water use) that were statistically significant (sig. 0.050 or better) were: number of adults (coefficient 0.464, sig. 0.000), number of children (0.172, sig. 0.013), having a garden (0.207, sig. 0.017), having a shared garden (0.160, sig. 0.007), having a courtyard (0.157, sig. 0.000), having a jet washer (-0.052, sig. 0.043) and having a sprinkler (0.046, sig. 0.036). There is one coefficient which just misses statistical significance: having a washing machine (-0.068, sig. 0.058).

These results are for the sample as a whole. It is interesting to compare the two sub-groups, the RV and the metered households. For RV households, the statistically significant factors were: number of adults (0.406, sig. 0.000), number of children (0.222, sig. 0.043), having a courtyard (0.255, sig. 0.000), having a shared garden (0.216, sig. 0.002), having a garden (0.204, sig. 0.011), presence of a housewife (0.117, sig. 0.045), number of bedrooms (0.090, sig. 0.022), rateable value (0.088, sig. 0.038) and having a sprinkler (0.083, sig. 0.012).

For metered households, the statistically significant factors were: number of adults (0.460, sig. 0.000), ownership of a washing machine (-0.142, sig. 0.002) and number of bedrooms (0.120, sig. 0.005). Frequent gardening just misses statistical significance (0.075, sig. 0.051). Interestingly, the correlation with the number of children is not statistically significant (0.138, sig. 0.174), while the different types of gardens and courtyards or ownership of a sprinkler no longer produce any correlations.

A number of interesting conclusions about the effect of metering can be deduced from comparison of the two sets of results. It appears that metering makes people with washing machines use less water, to the extent that they actually end up using significantly less water than people who do not have a washing machine! Metering also appears to dramatically reduce their use of water for gardening, although people who do more gardening may possibly cut back less. Metered users also appear not to use their sprinklers as RV households do.

It is very difficult to explain why the presence of a housewife should increase water consumption in RV households, but not in metered ones. It is a particularly strange result given that the presence of retired or unemployed people does not appear to increase the use of water. However, these results are only barely statistically significant, so they may well be flukes.

In terms of quantity of water use, examination of water usage by households in the Anglian Water sample with different numbers of adults and children shows that the first adult in a household on average uses around 140 litres/day (50m^3/year). A second or additional adult uses around 100 litres/day (35m^3/year). A child uses around 60 litres/day (20m^3/year). The figures for unmetered households are somewhat higher and the figures for metered households are somewhat lower.

The range of usage even by households with the same number of adults and children paying on the same basis is quite wide. Households at the 90th percentile use between two and three times as much water as equivalent households at the 10th percentile. Households at the 80th percentile use nearly twice as much water as equivalent households at the 20th percentile. It is not clear that this extra use by such a large number of households, compared to similar households, can be justified on the basis of medical conditions or similar needs.

However, it is clear, as recognised in Section 1, that a certain amount water use is vital for both health and hygiene. For this reason, a popular idea in the design of socially-conscious water tariffs is the idea of a 'lifeline' tranche of free or fixed cost water to cover essential uses. The intention is to prevent water metering resulting in poor households sacrificing hygiene in order to save money. The OXERA research reported above included a free water allowance as one of its options, and it was noted that this option (which also varied charges according to the Council Tax band) was progressive overall and affected fewer 'vulnerable' households negatively that the other options analysed.

In the simulations of metering that follow using the Anglian data, a number of approaches have been taken to designing metering tariffs, in order to study the distributional effects and, particularly, the effects on low-income households. It has already been noted that the current system of water charging (still predominantly based on rateable values) is more regressive than in other industrial countries which have universal or nearly universal metering of household water use. It is most unlikely that universal metering will be regarded as politically acceptable in the UK if it makes this existing regressivity worse. At the same time, given the range of water usage even between similar households revealed by the Anglian data, it is also most unlikely that any switch to metering will leave *no* low-income household worse off, unless it involves a degree of cross-subsidy of poorer households by richer households that is also likely to be politically problematic. The politics of water metering needs therefore to take account of three factors: factor one, the overall regressivity of the system; factor two, the negative impacts on individual, high-water-using low-income households; and factor three, the degree of redistribution (from richer to poorer households) that is required to reduce factors one and two. The results that are reported from the simulations therefore focus on these factors.

The simulations that have been modelled are of five types:

- A simple switch to water metering on the basis of the Anglian tariff

- A switch to water metering using tariffs that vary by Council Tax band
- A switch to water metering which incorporates a lifeline allowance that may also vary with Council Tax band
- A switch which involves a combination of tariffs and a lifeline allowance that may also vary with Council Tax band
- A switch using the Severn Trent tariff

In all the simulations it has been assumed that there were no demand reductions induced by the switch to metering. This is unrealistic. To the extent that metering induces demand reductions (which, in line with the data in Section 1 and the OXERA modelling reported in Section 2, could be from 7-28%, assuming no summer surcharge), and especially if these reductions are concentrated in high-water-using households, the negative financial effects of the switch on high-water-using households will be reduced.

For most of the simulations studied the results for the whole Anglian data sample, and then given separately for the households who are currently metered or charged according to rateable value (RV). To avoid breaking up the text excessively, many of the tables have been moved to the end of paper, and are in Annex 1, though they are referred to in the main text where they generate useful insights.

3.2 Simulations of metering

3.2.1 The Anglian tariff

The next stage of the analysis is to examine the effects of a switch to universal metering, assuming no demand reduction. The first option to be explored (Option 1) was the effect of a switch to metering using the Anglian Water tariff for 2002-03, shown in Table 3.2. It turns out that the average annual loss of such a switch for RV households in the sample would be £0.73, so such a switch can be treated as revenue-neutral overall.

According to OFWAT, the tariff differential for Anglian Water customers in 2002-3 was £20. That is to say that if a household with average rateable value switched from the unmeasured to the metered tariff and had water consumption equal to the average unmeasured household, they would pay £20 more, calculated as a contribution towards the cost of metering. Of course, households that actually switch to metering tend to have higher RVs and use less water than the average, so that the switch is financially advantageous to them.

Table 3.2 Anglian Water tariffs (£) for April 2002 – March 2003

	Water	Sewerage
Unmeasured		
Standing charge	69.12	91.89
RV multiplier	0.3678	0.4807
Measured		
Standing charge	20	44
Volumetric charge/m3	0.8144	0.9688

Table 3.3a Summary of effects of metering with existing Anglian Water tariff on water and sewerage bills of RV and metered customers for different groups of households assuming no demand reduction (Option 1)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households unchanged	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.01**	**14%**	**9%**	**47%**	**13%**	**17%**	**1307**
£0-£10,000	+0.34	8%	10%	50%	8%	23%	200
£10,001-£20,000	-0.02	15%	8%	49%	12%	16%	281
£20,001-£30,000	-0.01	15%	13%	38%	15%	19%	264
£30,001-£40,000	-0.34	21%	8%	48%	10%	13%	161
£40,001-£80,000	-0.19	18%	9%	50%	13%	10%	119
> £80,000	+0.38	10%	18%	44%	3%	25%	24

The bills of a large proportion of customers are unchanged because Table 3.3a shows the effect on both RV and metered customers of compulsory metering at the existing Anglian metered tariff. Compulsory metering with this tariff would lead to gains on average for households with incomes up to £10,000 a year and only 8% of such households would lose. The effect on households with incomes between £10,000 and £30,000 is neutral, while households with incomes between £30,000 and £80,000 lose on average, although the small number of households with incomes over £80,000 gain on average. Compulsory metering, even with this tariff, would not appear to have the regressive effects feared.

Table 3.3b: Summary of effects of metering with existing Anglian Water tariff on water and sewerage bills of RV customers for different groups of households assuming no demand reduction (Option 1)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.01**	**28%**	**17%**	**23%**	**32%**	**678**
£0-£10,000	+0.69	16%	20%	16%	48%	97
£10,001-£20,000	-0.03	30%	14%	23%	33%	139
£20,001-£30,000	-0.01	25%	20%	23%	32%	158
£30,001-£40,000	-0.67	41%	15%	19%	25%	81
£40,001-£80,000	-0.41	37%	18%	24%	21%	57
> £80,000	+0.77	20%	28%	5%	47%	12

There is of course no purpose in presenting a table 3.3c of the effects on already-metered customers as they will all pay exactly the same as they do at present.

It can be seen from Table 3.3b that RV households with incomes up to £10,000 on average gain quite substantially from a switch to metering, with nearly half gaining more than £1 per week. However, 16% lose more than £1 per week. It should be realised that this 16% includes many of the most vulnerable households. Households with incomes up to £10,000 tend to be smaller (average size 2.05 people) than the average in the sample (2.95 people). Only 20% of the households with an income up to £10,000 have more than two people in them. Among the households in this income band, losers amount to only 8% of one person households (sample size 23), but 33% of two person households (sample size 54), 86% of three person households (sample size 14), and 50% of four person households (sample size 4). It is larger households that tend to lose out substantially. The average annual loss for households with incomes below £10,000 and more than two people is £77. By comparison, 46% of the households with an income of £10,001-£20,000 have more than two people. It is therefore not surprising that there are more losers in this income band, although they are balanced out by the gainers. A similar pattern is found in the £20,001-£30,000 band. Households with incomes between £30,001-£40,000 and £40,001-£80,000 tend to lose out because they use more water. The very small number of households with incomes over £80,000 tend to gain as their water consumption is not as high as their very high rateable values. The number of such households in the sample is too small to draw any meaningful conclusions.

The results in Tables 3.3a and 3.3b suggest that universal metering using a tariff designed like the one presently used by Anglian Water would be progressive overall. Not surprisingly, households that use more water would tend to pay more than they do at the moment. However, gainers and losers in all income groups are fairly evenly balanced, and in none of the income groups is the average change more than £1 per week, so that the overall redistributive effect between groups is not large. While the change would have a significant negative effect on some low-income households, overall low-income households would be better off by around £18 per year, and the charging regime would be less regressive than it is at the moment. Of course, if the metering led to reduced water use by the households consuming more water, this would be reflected in their bills and would reduce and perhaps eliminate their increased costs from the switch. The conclusion from this simulation is that such a switch would overall be strongly in the social and environmental interest.

The rather surprisingly progressive result is partly explained by the fact that Anglian's unmeasured tariff has quite a high standing charge. The combined water and sewerage bill of a customer with an RV of £300 is only 1.7 times the bill of a customer with an RV of £100 (OFWAT 2002). By contrast, the ratio for equivalent Severn Trent customers is 3. However, Severn Trent is unique in that it does not have a standing charge. The other companies do have a standing charge, but Anglian's is one of the highest. A simulation later in this section examines the effect of the standing charge by switching on the basis of the Severn Trent tariff.

3.2.2 Tariffs varied by council tax band

Initially, the project did not have available data that included Council Tax bands and had to rely on ACORN group data that, as noted above in connection with the OXERA research, is significantly less well correlated with income than Council Tax bands.

Modelling of a wide range of different metering tariffs that varied both the fixed charge and a free allowance of water according to ACORN group did not find distribution with significantly fewer low-income losers than the standard Anglian Water tariff. The percentages of households in the income bands £0-£10,000 and £10,001-£20,000 that lost by more than £1 per week were found to be impossible to reduce by any significant amount. The reason is that there are many low-income households even in wealthier ACORN groups. ACORN does not identify poorer households with sufficient accuracy.

A substantial amount of work was done for the project on the effects of varying tariffs according to rateable value, before Council Tax band data for the sample became available towards the end of this project. In fact, metered tariffs that vary according to rateable value would not be very practical to introduce because homes built or substantially modified since 1990 do not have rateable values. In any case, the work with RVs produced similar results to the work using tariffs that vary according to Council Tax bands described below.

The eight Council Tax bands are shown in Table 3.4a:

Table 3.4a Council Tax Bands and the Values on which they are Based

Valuation Band	Value at 1st of April 1991	Ratio to Band D
A	Up to £40,000	6/9ths
B	Over £40,000 and up to £52,000	7/9ths
C	Over £52,000 and up to £68,000	8/9ths
D	Over £68,000 and up to £88,000	1
E	Over £88,000 and up to £120,000	11/9ths
F	Over £120,000 and up to £160,000	13/9ths
G	Over £160,000 and up to £320,000	15/9ths
H	Over £320,000	18/9ths

Table 3.4a shows that Council Tax is regressive. A Band H property is worth at least 8 times as much a Band A property (and incomes between the top and bottom deciles vary by much more than this), but the Council Tax paid, which is calculated on the basis of the ratio of the band in question to Band D, as shown in Table 3.4a, is only 3 times as much. In some of the simulations which follow it was therefore decided to use Council Tax bands, but 'stretch' them so that the amount paid was roughly proportional to the value of the property in 1991, in the manner of rateable values. The 'stretched' ratios of the bands to Band D are shown in Table 3.4b:

Table 3.4b Council Tax Bands and the 'Stretched' Ratios Used in Some Simulations

Valuation Band	Value at 1st of April 1991	'Stretched' Ratio to Band D
A	Up to £40,000	30/78
B	Over £40,000 and up to £52,000	46/78
C	Over £52,000 and up to £68,000	60/78
D	Over £68,000 and up to £88,000	78/78
E	Over £88,000 and up to £120,000	104/78
F	Over £120,000 and up to £160,000	140/78
G	Over £160,000 and up to £320,000	240/78
H	Over £320,000	400/78

The standard Anglian tariff can be expressed by the formula:

64 + 0.8144 x volume + 0.9688 x volume (see Table 3.2)
(for water) (for sewerage)

There are two simple ways of varying the tariff according to Council Tax band: varying the volumetric rate or varying the standing charge. These are now examined in turn.

3.2.2.1 Tariff varying volumetric charge by Council Tax band (Option 2)

The first way of varying the metering charge analysed here is to keep the standing charge constant and vary the volumetric charge for water according to the formula:

64+(Council Tax band ratio/average Council Tax band ratio
x (0.8144 x volume + 0.9688 x volume))
(for water) (for sewerage)

Table 3.5a Summary of effects of metering with the volumetric rate varying according to current Council Tax bands for different groups of households assuming no demand reduction (Option 2)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**20%**	**25%**	**30%**	**25%**	**1003**
£0-£10,000	+0.67	9%	18%	43%	30%	142
£10,001-£20,000	+0.39	10%	14%	40%	26%	233
£20,001-£30,000	+0.14	21%	21%	29%	29%	207
£30,001-£40,000	-0.40	27%	31%	22%	20%	123
£40,001-£80,000	-0.84	38%	29%	20%	13%	92
> £80,000	-1.33	46%	23%	9%	22%	18

A large proportion of households appear to lose out with this tariff, but the losses of about half of the households losing less than £1 per week are trivial even for those on the lowest incomes – a few pence a week or a couple of pounds year. Only about 17% of low-income households lose more than a few pence a week. Households with incomes up to £30,000 a year are gainers on average, while households with incomes above this level are losers on average.

Table 3.5 Summary of effects of metering with the volumetric rate varying according to current Council Tax bands for different groups of RV customer households assuming no demand reduction (Option 2)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.30**	**23%**	**12%**	**20%**	**45%**	**505**
£0-£10,000	+1.14	17%	6%	19%	58%	69
£10,001-£20,000	+0.71	14%	16%	20%	50%	110
£20,001-£30,000	+0.51	21%	12%	21%	45%	118
£30,001-£40,000	-0.45	34%	14%	17%	35%	62
£40,001-£80,000	-0.94	45%	8%	19%	28%	41
> £80,000	-0.37	32%	14%	9%	45%	8

A higher proportion of low-income households lose non-trivial sums (21%) than in the whole sample (17%), but the average weekly gain is +£1.14 rather than +£0.67 in the whole sample. The average annual loss for households with more than two people and an income of less than £10,000 a year is £35.

Table 3.5c Summary of effects of metering with the volumetric rate varying according to current Council Tax bands for different groups of metered customer households assuming no demand reduction (Option 2)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households

All households	**-0.29**	**17%**	**37%**	**42%**	**4%**	**498**
£0-£10,000	+0.23	2%	30%	63%	5%	73
£10,001-£20,000	+0.09	8%	31%	56%	5%	123
£20,001-£30,000	-0.35	21%	34%	38%	7%	89
£30,001-£40,000	-0.35	19%	48%	28%	5%	61
£40,001-£80,000	-0.75	34%	45%	21%	0%	41
> £80,000	-2.09	59%	24%	17%	0%	8

The average annual *gain* for households with more than two people and an income of less than £10,000 a year is £32.

3.2.2.2 Tariff varying volumetric charge by Council Tax band (Option 3)

Table 3.6a Summary of effects of metering with the volumetric rate varying according to stretched Council Tax bands for different groups of households assuming no demand reduction (Option 3)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**20%**	**20%**	**21%**	**39%**	**1003**
£0-£10,000	+1.09	6%	18%	29%	47%	142
£10,001-£20,000	+0.81	12%	15%	27%	46%	233
£20,001-£30,000	+0.36	20%	14%	22%	44%	207
£30,001-£40,000	-0.62	27%	27%	14%	32%	123
£40,001-£80,000	-1.40	39%	28%	11%	22%	92
> £80,000	-3.66	46%	12%	20%	22%	18

Table 3.6a shows that 24% of low-income households lose out from this tariff. However, only about 12% lose more than a few pence a week. Households with incomes up to £30,000 are gainers on average. The result is that more households with incomes above this level lose on average. Those with incomes above £80,000 lose on average more than £1 per week.

From Table 3.6b it can be seen that a higher proportion (10%) of low-income households lose more than £1 p.w. than in the whole sample (6%), but that as a group their average weekly gain is £1.76 p.w., compared with £1.09 p.w. for the whole sample. In addition, the average annual loss for RV households with more than two people and incomes below £10,000 is reduced to £3 (compared with a £63 loss for this group when the standing charge is varied by Council Tax band).

For the metered households the effects are reversed, with low-income households as a whole gaining less (only £0.46 p.w.) but only 4% now lose more £1 p.w. The big losers are now the richest households, 47% of which lose more than £2 p.w. The average *gain* for already metered households with more than two people and incomes below £10,000 is £56.

Table 3.6b Summary of effects of metering with the volumetric rate varying according to stretched Council Tax bands for different groups of RV customer households assuming no demand reduction (Option 3)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.64**	**16%**	**10%**	**15%**	**59%**	**505**
£0-£10,000	+1.76	10%	6%	10%	74%	69
£10,001-£20,000	+1.46	7%	7%	18%	68%	110
£20,001-£30,000	+1.13	12%	8%	18%	62%	118
£30,001-£40,000	-0.52	25%	17%	10%	48%	62
£40,001-£80,000	-1.46	40%	13%	8%	39%	41
> £80,000	-1.61	30%	2%	21%	47%	8

Table 3.6c Summary of effects of metering with the volumetric rate varying according to stretched Council Tax bands for different groups of metered customer households assuming no demand reduction (Option 3)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.65**	**24%**	**30%**	**28%**	**18%**	**498**
£0-£10,000	+0.46	4%	28%	47%	21%	73
£10,001-£20,000	+0.23	16%	22%	45%	27%	123
£20,001-£30,000	-0.65	30%	25%	25%	20%	89
£30,001-£40,000	-0.73	30%	37%	16%	17%	61
£40,001-£80,000	-1.35	38%	40%	12%	10%	41
> £80,000	-5.30	61%	21%	18%	0%	8

Comparing Option 3 (Table 3.6b) with Option 1 (Table 3.3) it can be seen that charging per litre of water with the rate varying according to Council Tax band is both more progressive overall (low-income households gain an average of £1.12 p.w. instead of £0.69), and results in fewer losing low-income households (25% as against 36%), than metering according to the standard Anglian Water tariff (Option 1). Changing from the Anglian tariff to this variable tariff is also mildly beneficial for already metered low-income households, though it has a large negative effect on the richest households in this category. One of the implications of the variable tariff is that different households receive different marginal incentives for water conservation. That may not be a problem if the different marginal incentive is roughly proportional to income. If that is so it will mean that both rich and poor households feel an equivalent incentive to conserve water.

However, there is a limit to how low the marginal price of water can be driven before any incentive effect is lost. Theoretically, the aim should be to make the marginal cost of water a similar proportion for each income group. In England as a whole, mean incomes of households in Council Tax band H (£59257) are about five times those of households in Council Tax band A (£12673). The ratio between mean incomes in Council Tax band G (£45520) and band A is about 3.5 times. However, such a comparison is not very meaningful because of the large variation in house prices across the country. Unfortunately, the sample size in the Family Expenditure Survey is not large enough to give meaningful results just for East Anglia or even the East of England for the higher Council Tax bands, but the incomes for the lower bands are very similar to national averages, so it may be presumed that there is a similar ratio.

A possibility that has not been investigated here is that the ratio charged to different Council Tax bands could be varied to match the ratio of average incomes in each Council Tax band in a particular region. This would result in water charges in each region reflecting household income more closely, although the current substantial differences between water charges in different regions would remain.

It may therefore be concluded from this analysis that metered tariffs that varied according to Council Tax bands (Options 2 and 3) would have greater benefits for low-income households than extending the existing Anglian Water metered tariff to unmetered households (Option 1), with the change in the volumetric charge being slightly more beneficial for these households than changing the standing charge. However, changing the standing charge rather than the volumetric charge lowers the losses for the upper income groups.

3.2.2.3 Tariff varying standing charge by Council Tax band (Option 4)

The first option examined under this heading is to keep the volumetric charge constant and vary the combined standing charge (normally £64 per annum) according to the formula:

(66.50 xCouncil Tax band ratio/average Council Tax band ratio) +
(0.8144 x volume + 0.9688 x volume))
(for water) (for sewerage)

The slight increase in the standing charge is necessary in order to ensure revenue neutrality as the average value of a property is slightly below Band D.

Table 3.7a Summary of effects of metering with standing charge varying according to stretched Council Tax bands for different groups of metered and RV households assuming no demand reduction (Option 4)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**19%**	**29%**	**32%**	**20%**	**1003**
£0-£10,000	+0.59	9%	21%	43%	27%	142
£10,001-£20,000	+0.24	15%	24%	42%	19%	233
£20,001-£30,000	+0.07	19%	28%	30%	23%	207
£30,001-£40,000	-0.36	27%	35%	22%	16%	123
£40,001-£80,000	-0.49	30%	40%	17%	13%	92
> £80,000	-0.55	48%	21%	18%	23%	18

From Table 3.7a it can be seen that the distributional effect is similar to that for the standard tariff (Option 1, see Table 3.3) and is clearly progressive. 70% of low-income households are better off from the switch, and only 9% are losers by more than £1 p.w. (compared with 16% in the Anglian tariff case). The stretched Council

Tax bands have also removed the small gains for the richest households shown in Table 3.3. Moreover, households in the £10,001-£30,000 income range are also net gainers (unlike in Table 3.3), and in all income bands except the richest there are fewer households that lose more than £1 p.w.

Table 3.7b shows that the main impact of the tariff is on previously unmetered households. For them on average the tariff is progressive. Most low-income households gain and more gain by more than £1 p.w., but 18% lose by more than £1 p.w. Moreover, as noted above, most low-income households are small. The average loss for unmetered households with more than two people and incomes below £10,000 is £63, compared to £77 under the standard Anglian tariff.

Table 3.7c shows that this tariff is also progressive among metered customers, with a small gain for 68% of poor households, while very few poor households (only 3%) lose out by more than £1 p.w. Moreover, in contrast to the RV households, already metered households with more than two people and incomes below £10,000 experience an average *gain* of £15.

Table 3.7b Summary of effects of metering with standing charge varying according to stretched Council Tax bands for different groups of RV customer households assuming no demand reduction (Option 4)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.13**	**26%**	**16%**	**19%**	**39%**	**505**
£0-£10,000	+0.93	18%	9%	18%	55%	69
£10,001-£20,000	+0.37	23%	17%	20%	40%	110
£20,001-£30,000	+0.22	23%	17%	20%	40%	118
£30,001-£40,000	-0.54	43%	13%	12%	32%	62
£40,001-£80,000	-0.60	40%	17%	14%	29%	41
> £80,000	+0.10	36%	11%	17%	46%	8

Table 3.7c Summary of effects of metering with standing charge varying according to stretched Council Tax bands for different groups of metered customer households assuming no demand reduction (Option 4)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.13**	**12%**	**42%**	**46%**	**0%**	**498**
£0-£10,000	+0.26	3%	29%	68%	0%	73
£10,001-£20,000	+0.12	8%	30%	62%	0%	123
£20,001-£30,000	-0.14	13%	41%	46%	0%	89
£30,001-£40,000	-0.18	11%	57%	32%	0%	61
£40,001-£80,000	-0.40	23%	56%	21%	0%	41
> £80,000	-1.07	55%	17%	18%	0%	8

3.2.3 Per capita lifeline allowance

3.2.3.1 Lifeline allowance per capita with increased volumetric charge (Option 5)

A way that has been proposed to avoid negative impacts on larger households would be to have a per capita (or per adult and per child) lifeline allowance of water available at a fixed rate. The research then modelled the distributional impact of introducing the Flemish tariff, which provides a lifeline allowance of 15 m^3 per capita. A tariff was tested that achieved revenue neutrality by increasing the standing charge compared to that currently applying to metered customers, although less than the current standing charge for RV customers, but it was found to lead to most low-income customers losing. A more progressive result was obtained if the price of each litre of water above the allowance was increased and the standing charge for metered customers was kept at the existing level of £64.

Table 3.8a Summary of effects of metering with a lifeline allowance of 15 m^3 per capita and an increased price per litre of water for different groups of households assuming no demand reduction (Option 5)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**17%**	**24%**	**36%**	**23%**	**1307**
£0-£10,000	+0.31	12%	23%	42%	23%	200
£10,001-£20,000	+0.01	15%	28%	36%	21%	281
£20,001-£30,000	+0.07	19%	22%	30%	29%	264
£30,001-£40,000	-0.26	22%	23%	32%	23%	161
£40,001-£80,000	-0.28	25%	22%	34%	19%	119
> £80,000	+0.36	24%	14%	36%	26%	24

Table 3.8a shows that this tariff is positive overall for all households with incomes below £30,000. A minority of low-income households lose out under this tariff (35%), but this is significantly more than under the options where the volumetric rate varies according to Council Tax bands (see Tables 3.5a and 3.6a). On the other hand the tariff benefits a majority of households in all income groups except the very highest. Moreover, fewer households lose more than £1 p.w., and in no income group do more than 25% of households lose this amount, much lower than in the worst affected income groups in the previous options. This option is therefore less redistributive between income groups, with the maximum average gain or loss being £0.36 p.w., compared to £1.33 p.w., £3.66 p.w. and £0.55 p.w. in the previous options. This tariff

might therefore attract less political opposition from higher income groups than the previous options.

The tariff is, however, considerably worse than the tariffs that varied the volumetric charge according to Council Tax band for low-income RV households. 41% of all RV households with income below £10,000 lose out (see Table 3.8b in Annex 1), and the average loss of those with more than two people and incomes below £10,000 is £57. On the other hand, with this tariff all income groups in already metered households gain on average (see Table 3.8c in Annex 1), and the average gain for those with more than two people and incomes below £10,000 is £20.

This tariff is therefore not as progressive as those that vary either the standing charge or the volumetric rate according to Council Tax (Options 2, 3 and 4), but it also produces far fewer significant losers in higher income groups.

3.2.3.2 Lifeline allowance for one adult and each child with increased volumetric charge (Option 6)

There would be practical difficulties in introducing a per capita tariff in the absence of a UK population register (there is already a national identity card in Belgium). The research next explored the distributional impact of Paul Herrington's proposal for an allowance of 20 m^3 per capita for the first adult and each child (administered using the child benefit register). Note that 20 m^3 is the average amount of water used by a child in the sample.

Table 3.9a Summary of effects of metering with a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water for different groups of households assuming no demand reduction (Option 6)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**0.00**	**19%**	**24%**	**32%**	**25%**	**1307**
£0-£10,000	+0.39	11%	18%	45%	26%	200
£10,001-£20,000	+0.08	15%	26%	37%	22%	281
£20,001-£30,000	+0.05	23%	21%	29%	31%	264
£30,001-£40,000	-0.33	22%	26%	30%	22%	161
£40,001-£80,000	-0.44	26%	32%	22%	20%	119
> £80,000	+0.32	25%	17%	26%	32%	24

Table 3.9a shows that that the distributional impact of Option 5 is progressive overall and is similar in this respect to the preceding option (Table 3.8a), although 39% of low-income households now lose out (compared to 35%) and the maximum loss or gain is now £0.55 (compared to £0.36) p.w. The impact on low-income RV households (Table 3.9b in Annex 1) is also similar to that of the standard Anglian tariff (Option 1, Table 3.3). It is less progressive than the three options that vary a metered tariff according to Council Tax band (Options 2, 3 and 4; Tables 3.5a, 3.6a and 3.7a), though the maximum losses and gains of these options are greater, so that the the same considerations apply as discussed for the previous option.

The average loss for RV households with more than two people and incomes below £10,000 is £57, the same as for the preceding option. The average *gain* for households with more than two people and incomes below £10,000 is £26.

It therefore makes little difference whether there is an allowance of 15 m^3 per individual (Option 5) or an allowance of 20 m^3 for the first adult and each child (Option 6), although Option 6 would currently be easier technically to implement in the UK. Both options are progressive overall and lead to limited redistributive effects. The options which vary the charge by Council Tax band (Options 2, 3 and 4) are better for low-income households but are more redistributive. The two kinds of metering tariff therefore have different political implications and offer different political options.

3.2.3.3 Tariff varying water allowance by Council Tax band (Option 7)

A third way of implementing the lifeline allowance idea would be to provide a free allowance of water (say 120m^3 per annum) that tapers off as the Council Tax band increases. There are two ways to make the measure revenue neutral, either by increasing the standing charge or by increasing the volumetric charge. It was found that increasing the standing charge inevitably led to losses for a large proportion of low-income customers. It was found that such a result could be avoided if the volumetric charge was increased according to the following formula:

$$64 + 1.61 \text{ x } (0.8144 \text{ x } (\text{volume} - \text{allowance}) + 0.9688 \text{ x } (\text{volume} - \text{allowance}))$$

where the allowance varied according to the schedule set out in Table 3.9.

Table 3.10 Varying the Water Allowance by Council Tax Band

Council Tax band	Allowance (m^3)
A	120
B	90
C	60
D	30
E	0
F	0
G	0
H	0

The allowance tapers off up to Band D. Trial and error showed that a long taper is better for low-income households than a shorter taper, but that, as would be expected, this effect wears off as the taper reaches into the most valuable homes.

Table 3.11a Summary of effects of metering with an allowance varying according to Council Tax band for different groups of households assuming no demand reduction (Option 7)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**33%**	**12%**	**14%**	**41%**	**1003**
£0-£10,000	+1.48	13%	4%	20%	63%	142
£10,001-£20,000	+0.79	20%	14%	16%	50%	233
£20,001-£30,000	+0.06	33%	12%	12%	43%	207
£30,001-£40,000	-0.74	46%	11%	11%	32%	123
£40,001-£80,000	-1.89	58%	13%	14%	15%	92
> £80,000	-1.55	50%	15%	19%	16%	18

Table 3.11a shows that under Option 7 only 17% of low-income households lose out. 63% of low-income households gain more than £1 p.w., meaning that on average overall low-income households gain quite substantially. On the other hand, 50% or more households with incomes higher than £40,000 lose more than £1 p.w.

The *average* outcomes for low-income households are good, but because extreme gains and losses tend to be of a higher magnitude the average loss for RV households with more than two people and incomes below £10,000 is £76, which is almost exactly the same as for the standard Anglian tariff. On the other hand, this tariff is good for 88% of low-income metered households (see Table 3.11c). The average *gain* for metered households with more than two people and incomes below £10,000 is £20.

Thus this tariff is progressive overall, and many low-income households gain substantially, but it is costly for larger low-income RV households. Also, because of the tendency of the tariff to exaggerate gains and losses, some higher income households have very large losses.

3.2.4 Lifeline allowance and volumetric charge varying by council tax band ratio

Looking at all the options so far, two options stand out as having a better effect on low-income households than the others: varying the volumetric charge according to stretched Council Tax band (Option 3) or an allowance of water included in the standing charge according to Council Tax band (Option 7). The next simulation looks at the effect of combining these options.

3.2.4.1 Tariff with both lifeline allowance and volumetric charge varying by 'stretched' Council Tax band ratio (Option 8)

This simulation varies both the lifeline allowance and the volumetric charge according to the Council Tax band ratio.

Table 3.12a Summary of effects of metering with an allowance and the variable charge varying according to stretched Council Tax band ratios for different groups of households assuming no demand reduction (Option 8)

Income group	**Average weekly gain (+) or loss (-)**	**Households losing >£1/week**	**Households losing <£1/week**	**Households gaining <£1/week**	**Households gaining >£1/week**	**Total number of households**
All households	**+0.00**	**24%**	**10%**	**12%**	**54%**	**941**
£0-£10,000	+2.20	10%	4%	9%	77%	121
£10,001-£20,000	+1.49	14%	9%	11%	66%	209
£20,001-£30,000	+0.54	21%	10%	9%	60%	202
£30,001-£40,000	-0.90	31%	15%	13%	41%	119
£40,001-£80,000	-2.55	42%	18%	10%	30%	91
> £80,000	-6.12	49%	6%	12%	33%	17

Table 3.12a shows that Option 8 is the most progressive of those so far explored, with 77% of low-income households gaining more than £1 p.w., and the average for this group being more that £2 p.w. However, the highest income group loses on average over £6 p.w., and the losses for the greatest losers are well over £1000. The greatest losses among households on low incomes are also large – up to £350.

The average *gain* for RV households with more than two people and an income below £10,000 is £20. However, because of the exaggeration of gains and losses with this tariff, some households lose a great deal, including some low-income households. The average *gain* for metered households with more than two people and an income below £10,000 is £91, but the losses among some households, even ones with quite low incomes, are enormous, while the average loss of the richest income group is over £9 p.w. (see Table 3.12c in Annex 1).

The gains and losses are exaggerated because stretched Council Tax band ratios are being used for both factors in the tariff. The next simulation looks at the effects of just varying the volumetric charge

3.2.4.2 Tariff with lifeline allowance and only volumetric charge varying by 'stretched' Council Tax band ratio (Option 9)

This simulation combines the ideas of variable charging according to Council Tax band and an allowance of 20 m^3 for the first adult and each child.

Table 3.13a Summary of effects of metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios for different groups of households assuming no demand reduction (Option 9)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**21%**	**12%**	**24%**	**43%**	**1002**
£0-£10,000	+1.16	8%	6%	35%	51%	142
£10,001-£20,000	+0.93	11%	13%	27%	49%	233
£20,001-£30,000	+0.41	19%	12%	19%	50%	207
£30,001-£40,000	-0.66	28%	11%	23%	38%	123
£40,001-£80,000	-1.62	45%	15%	18%	22%	91
> £80,000	-3.91	46%	8%	25%	21%	18

Table 3.13a shows that on average households with incomes up to £30,000 gain from Option 9. Moreover, fewer households in these income groups than under any other option end up as losers (only 14% of the poorest households). However, the option also leads to very large losses for some households that use a great deal of water. One per cent of low-income households lose around £200 a year.

The average loss for RV households with more than two people and an income below £10,000 is only £8. But losses under this tariff are up to £1000 per year for some households, both metered and RV (average losses for the richest metered households is £6 p.w. – See Table 3.13c in Annex 1). The average *gain* for metered households with more than two people and incomes of less than £10,000 a year is £69.

A similar tariff (not showm) that in addition varied the standing charge by Council Tax band was modelled. It gave a very similar distributional effect, but the extreme gains and losses were slightly amplified.

3.2.4.3 Tariff with lifeline allowance and only volumetric charge varying by current Council Tax band ratio (Option 10)

One way to reduce the magnitude of the gains and losses would be not to stretch the Council Tax band ratios, but use the current ratios. Option 10 examines the effects of this tariff.

Table 3.14a Summary of effects of metering with a lifeline allowance and the charge per litre of water varying according to current Council Tax band ratios for different groups of households assuming no demand reduction (Option 10)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.00**	**24%**	**15%**	**32%**	**29%**	**1002**
£0-£10,000	+0.72	12%	7%	49%	32%	142
£10,001-£20,000	+0.50	13%	20%	37%	30%	233
£20,001-£30,000	+0.17	23%	16%	24%	37%	207
£30,001-£40,000	-0.40	32%	14%	25%	29%	123
£40,001-£80,000	-1.11	47%	17%	17%	19%	91
> £80,000	-1.59	49%	12%	19%	20%	18

Table 3.14a shows that under Option 10 the percentages of gainers and losers are similar to Option 9 (the tariff with stretched Council Tax band ratios). Rather more low-income households lose more than £1 p.w. (12% as against 8%), and overall it is less progressive (low-income households gain £0.72 p.w. on average, as against £1.16 p.w. The richest income group now loses £1.59 on average (as against £3.91). The largest losses are reduced from around £1000 to around £500, but it makes very little difference to the magnitude of the biggest losses among low-income households, which remain at about £200. The average loss for RV households with more than two people and an income below £10,000 rises to £58. Attempting to reduce the maximum losses has increased the average amount that larger low-income households have to pay. The average *gain* for metered households with more than two people and an income below £10,000 is £45.

A final simulation (Option 11) modelled OXERA's idea of combining a standing charge varying according to Council Tax band and an allowance varying according to Council Tax band. It was found that the tariff of Option 11 is progressive, but creates more low-income losers than the comparable one varying the charge per unit of water by Council Tax band (Option 9) and far more lose more than £1 per week (18% as opposed to 8% - see Table 3.15a in Annex 1, and Table 3.13a). The average losses of the richest households are lower (£1.86 as against £3.91 p.w.), as are their greatest losses, at about £600. The average loss for RV households with more than two people and an income below £10,000 is £35. The average *gain* for households with more than two people and an income below £10 is £42. Because this option offers little new, all the tables relating to it (Tables 3.15a,b,c) have been placed in Annex 1.

3.2.5 Severn Trent Tariff

The high existing standing charges under the present Anglian Water tariffs seem to make it easier to find a way to adjust proposed metered tariffs to avoid costing those on lower incomes more. Other water companies have lower standing charges than Anglian, while Severn Trent actually has no standing charge for unmeasured customers, although there are standing charges for metered customers. The next simulation examines the effect of metering if the customers in the Anglian Water SoDCon monitor were instead Severn Trent customers. Conveniently for comparison, the average rateable value of SoDCon customers (£199) is very close to the average rateable value of Severn Trent customers (£192). Severn Trent has eight tariff zones. The calculations below are based on Zone 4, which has a tariff which gives charges very close to the average charge across the entire Severn Trent region.

The tariff is structured as in Table 3.16.

Table 3.16 Severn Trent Water Zone 4 tariffs (£) for April 2002 – March 2003

	Water	Sewerage
Unmeasured		
Standing charge	0	0
RV multiplier	0.5863	0.5290
Measured		
Standing charge	16.68	8.40
Volumetric charge/m3	0.7077	0.4820

In addition, metered customers (but not unmeasured ones) pay a property-based fixed charge for surface water drainage of £15.72 for a flat or terrace, £31.44 for a semi-detached and £47.16 for a detached house.

Table 3.17 Summary of effects of metering with existing Severn Trent Zone 4 tariff on water and sewerage bills for different groups of RV households assuming no demand reduction

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.33**	**32%**	**26%**	**22%**	**20%**	**678**
£0-£10,000	-0.07	26%	22%	32%	20%	97
£10,001-£20,000	-0.52	36%	27%	21%	16%	139
£20,001-£30,000	-0.32	29%	27%	24%	20%	158
£30,001-£40,000	-0.71	40%	27%	13%	20%	81
£40,001-£80,000	-0.20	36%	20%	21%	23%	57
> £80,000	+0.90	25%	5%	25%	45%	12

All classes of customers lose out on average, except for those with incomes over £80k per year. For households with an income below £10,000 the average loss is very small (£0.07 p.w.), but the average loss for these households with more than two people is £76 per year. This means that moves to metering in regions that have low standing charges will need to involve some of the progressive tariff options modelled above, if the tariff structure in those regions is not to be made more regressive.

The final simulation looks at the effect of implementing on Severn Trent customers a tariff with a lifeline allowance of 20 m^3 for the first adult and each child and the charge per litre of water varying according to stretched Council Tax band ratios (Option 9 in the simulations above).

Table 3.18a shows that the outcome is almost as progressive as the equivalent Anglian Water tariff (Option 9, Table 3.13a), with an average gain in low-income households of £0.98 (compared to £1.16), and a similarly low proportion of low-income losers (16% compared with 14%). The average loss for households with an income under £10,000 per year and more than two people is £8, which is also the same as in Option 9. The average *gain* for households with an income under £10,000 per year and more than two people is £43 (compared to £69 under Option 9). These results show that the results obtained based on changes to the Anglian Water tariff are not simply an artefact of Anglian's high standing charges. Similar results are obtained when Severn Trent's tariff is used instead. This suggests that it should be possible to design a metering tariff in other regions which is progressive overall and results in a low proportion of low-income households being left worse off.

Table 3.18a Summary of effects of change from existing Severn Trent tariff to metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios for different groups of households assuming no demand reduction

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.00**	**20%**	**14%**	**27%**	**39%**	**972**
£0-£10,000	+0.98	8%	8%	34%	50%	135
£10,001-£20,000	+0.70	10%	16%	29%	45%	225
£20,001-£30,000	+0.32	17%	15%	36%	42%	202
£30,001-£40,000	-0.45	24%	15%	25%	36%	121
£40,001-£80,000	-1.20	44%	16%	16%	24%	88
> £80,000	-3.05	47%	13%	15%	25%	18

4. Conclusion

Section 3.1 identified the three factors that, from a political point of view, need to be taken into account in designing a tariff based on universal metering as the overall regressivity of the charging system (factor 1); the negative impacts on individual, high-water-using low-income households (factor 2); and the degree of redistribution (from richer to poorer households) that is required to reduce the first two factors (factor 3). Table 4.1 sets out a number of the results that reflect these factors from the different options that have been investigated in respect of the Anglian Water customers. The key results that have been chosen for this comparison are:

- Whether on average low-income (<£10,000 p.a.) households are better or worse off with the relevant charging option than with the present Anglian

Water charging system (if on average they are better off then the new tariff is less regressive overall for these households than the present system)

- Whether on average medium low-income (£20,000>income>£10,000 p.a.) households are better or worse off with the relevant charging option than with the present Anglian Water charging system (this result is also relevant to the overall regressivity of the present system)
- The proportion of low-income households that is worse off by more than £1 p.w. (this may be taken to reflect the impact of the new system on high-water-using low-income households)
- The proportion of medium low-income households that is worse off by more than £1 p.w. (this may be taken to reflect the impact of the new system on high-water-using medium low-income households)
- The extent to which on average higher income (>£40,000 p.a.) households are made worse off by the relevant charging option (this is a measure of the redistribution from richer to poorer households that has taken place)
- The proportion of higher income (>£40,000 p.a.) households that is worse off by more than £1 p.w. (this results shows the level of the impact of the relevant charging option on the higher-water-using richer households)

The various options are set out again below for convenience. It should be noted that the results quoted are for both currently metered and RV Anglian customers, apart from Option 1. All results assume that there has been no demand reduction as a result of metering.

Option 1: Metering with existing Anglian Water tariff for (RV customers only, no effect on existing metered customers)

Option 2: Metering with the volumetric rate varying according to current Council Tax bands

Option 3: Metering with the volumetric rate varying according to stretched Council Tax bands

Option 4: Metering with standing charge varying according to stretched Council Tax bands

Option 5: Metering with a lifeline allowance of 15 m^3 per capita and an increased price per litre of water

Option 6: Metering with a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water

Option 7: Metering with an allowance varying according to Council Tax band

Option 8: Metering with an allowance and the variable charge varying according to stretched Council Tax band ratios

Option 9: Metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios

Option 10: Metering with a lifeline allowance and the charge per litre of water varying according to current Council Tax band ratios

Option 11: Metering with standing charge and allowance varying according to Council Tax band

Firstly, from Table 4.1 it can be seen that all the investigated options are progressive from the point of view of the lowest-income households, and all but one (Option 1) is also progressive for the next income group (those with incomes of £10-20,000). Moreover, the fact that this result was replicated in the option that used the Severn Trent rather than the Anglian Water tariff shows that the result was not a function of the structure of the Anglian tariff. It is likely to hold across all water customers, whatever their water company. There is therefore no basis for supposing for switching to metering will, on average, make low-income households worse off. All the options investigated actually make them better off on average, some quite substantially so. In view of the fact that current water charging systems are generally regressive, many would consider that a switch to such tariffs entailed a fairer treatment of water customers.

Table 4.1 Comparison of Results from Various Metering Tariff Options

	Households <£10,000		Households £10-20,000		Households >£40,000	
	Average loss or gain £ p.w.	Proportion much worse off	Average loss or gain £ p.w.	Proportion much worse off	Average loss or gain £ p.w.	Proportion much worse off
Option 1	+0.34	8%	-0.02	15%	-0.09	17%
Option 2	+0.67	9%	+0.39	10%	-0.14	21%
Option 3	+1.09	6%	+0.81	12%	+0.36	37%
Option 4	+0.59	9%	+0.24	15%	-0.50	33%
Option 5	+0.31	12%	+0.01	15%	-0.17	25%
Option 6	+0.39	11%	+0.08	15%	-0.31	26%
Option 7	+1.48	13%	+0.79	20%	-1.83	57%
Option 8	+2.20	10%	+1.49	14%	-3.11	43%
Option 9	+1.16	8%	+0.93	11%	-2.00	45%
Option 10	+0.72	12%	+0.50	13%	-1.19	47%
Option 11	+1.57	18%	+0.81	23%	-1.69	55%

Secondly, there is no tariff which does not make 6% or more of the lowest-income households worse off by more than £1 p.w. These will tend to be the highest water-consuming households in this income group. For some of them, their high water use will reflect discretionary rather than essential use, and a cutback in that use would reduce these extra charges they would pay under metering (Options 5-11 include a lifeline allowance, to reduce the likelihood of cutbacks on essential water use). Where their high water use is essential, this is likely to be due to medical reasons, and it should be possible to make special arrangements. This already happens to some extent with the Government's vulnerable groups scheme (DEFRA 2003) which caps the bills of those identified as having high essential water use, and efforts could be made to boost the take up of the scheme by those who are entitled to its benefits. In these two ways, it is likely that the great majority of low-income households would be able to reduce any extra charges they would face under the metering tariffs.

Thirdly, the tariffs vary considerably in the degree of redistribution from richer to poorer which they bring about (as noted above, all are redistributive in this direction to some extent). The least redistributive is Option 5, whereby the average cost to the richest households is only £0.17 p.w., and only 25% lose more than £1 p.w.

Which of these tariff options is 'best' depends on political perspective. Option 3 (volumetric rate varying according to stretched Council Tax bands) leaves fewest households in the two lowest income groups worse off by over £1 p.w. Option 8 (lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios) is very similar in this respect, but is substantially more redistributive from richer to poorer households. Option 4 (standing charge varying according to stretched Council Tax bands) is also similar in this respect, but is less redistributive. Option 5 (a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water) is least redistributive, as noted above, but leaves more low-income households with extra bills in excess of £1 p.w. (12% as opposed to 8% for the lowest income group).

Finally it should be noted that the whole sample comparisons above conceal systematic differences between the impacts of the tariffs on RV and on already-metered water customers. In general the impacts on low-income RV customers are less positive (or more negative), and those on already-metered customers are more positive (or less negative), than the whole sample average. This is because already-metered customers are less affected by the changes to the metering tariff, but still get the full benefit of any compensatory measures (e.g. lifeline allowance or 'stretched' Council Tax band ratios) that may be introduced as part of the tariff.

It is hoped that, should universal metering be adopted in the UK, in some regions or as a whole, such detailed tariff design issues will get adequate consideration, so that the change does not have social effects which were not intended.

Finally, it may be noted that it would be possible to introduce a tariff with a surcharge for significantly greater water use in summer, when water is most scarce and when some people use large quantities of water for their gardens, which may be classed a discretionary rather than an essential use. The OXERA study suggested that such a modification of a tariff would have both environmental and distributional merits. Unfortunately, it was too difficult to model here. However, it may be worth consideration if summer water conservation becomes an increasingly important consideration.

Annex 1

Supplementary tables

Table 3.8b Summary of effects of metering with a lifeline allowance of 15 m^3 per capita and an increased price per litre of water for different groups of RV customer households assuming no demand reduction (Option 5)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.13**	**30%**	**16%**	**18%**	**36%**	**678**
£0-£10,000	+0.44	23%	18%	14%	45%	97
£10,001-£20,000	-0.16	28%	20%	18%	34%	139
£20,001-£30,000	+0.08	27%	13%	17%	43%	158
£30,001-£40,000	-0.80	38%	19%	24%	29%	81
£40,001-£80,000	-0.67	43%	8%	18%	31%	57
> £80,000	+0.71	31%	6%	20%	43%	12

Table 3.8c Summary of effects of metering with a lifeline allowance of 15 m^3 per capita and an increased price per litre of water for different groups of metered households assuming no demand reduction (Option 5)

Income group	**Average weekly gain (+) or loss (-)**	**Households losing >£1/week**	**Households losing <£1/week**	**Households gaining <£1/week**	**Households gaining >£1/week**	**Total number of households**
All households	**+0.16**	**4%**	**22%**	**55%**	**9%**	**629**
£0-£10,000	+0.18	2%	27%	69%	2%	103
£10,001-£20,000	+0.17	2%	37%	52%	9%	142
£20,001-£30,000	+0.06	7%	34%	50%	9%	106
£30,001-£40,000	+0.28	4%	30%	48%	18%	80
£40,001-£80,000	+0.07	7%	36%	48%	9%	62
> £80,000	+0.02	17%	26%	46%	11%	12

Table 3.9b Summary of effects of metering with a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water for different groups of RV customer households assuming no demand reduction (Option 6)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.18**	**33%**	**14%**	**18%**	**35%**	**678**
£0-£10,000	+0.51	21%	18%	14%	47%	97
£10,001-£20,000	-0.07	30%	17%	19%	34%	139
£20,001-£30,000	+0.03	33%	11%	14%	42%	158
£30,001-£40,000	-0.92	41%	15%	16%	28%	81
£40,001-£80,000	-1.00	47%	14%	15%	24%	57
> £80,000	+0.55	31%	5%	14%	50%	12

Table 3.9c: Summary of effects of metering with a lifeline allowance of 20 m^3 per capita for the first adult and each child and an increased price per litre of water for different groups of metered households assuming no demand reduction (Option 6)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.19**	**5%**	**34%**	**48%**	**13%**	**629**
£0-£10,000	+0.28	2%	18%	73%	7%	103
£10,001-£20,000	+0.22	2%	34%	52%	12%	142
£20,001-£30,000	+0.09	8%	36%	42%	14%	106
£30,001-£40,000	+0.26	4%	36%	43%	17%	80
£40,001-£80,000	+0.07	9%	47%	27%	17%	62
> £80,000	+0.08	18%	31%	36%	15%	12

Table 3.11b Summary of effects of metering with an allowance varying according to Council Tax band for different groups of RV customer households assuming no demand reduction (Option 7)

Income group	**Average weekly gain (+) or loss (-)**	**Households losing >£1/week**	**Households losing <£1/week**	**Households gaining <£1/week**	**Households gaining >£1/week**	**Total number of households**
All households	**+0.16**	**31%**	**11%**	**11%**	**47%**	**505**
£0-£10,000	+1.88	17%	6%	7%	70%	69
£10,001-£20,000	+1.01	20%	14%	14%	52%	110
£20,001-£30,000	+0.31	28%	13%	10%	49%	118
£30,001-£40,000	-0.94	49%	6%	8%	37%	62
£40,001-£80,000	-2.39	57%	9%	10%	24%	41
> £80,000	-0.73	32%	18%	18%	32%	8

Table 3.11c Summary of effects of metering with an allowance varying according to Council Tax band for different groups of metered customer households assuming no demand reduction (Option 7)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.15**	**34%**	**13%**	**17%**	**36%**	**498**
£0-£10,000	+1.10	10%	2%	32%	56%	73
£10,001-£20,000	+0.60	20%	14%	17%	49%	123
£20,001-£30,000	-0.27	40%	11%	12%	37%	89
£30,001-£40,000	-0.53	43%	16%	15%	26%	61
£40,001-£80,000	-1.48	60%	14%	18%	8%	41
> £80,000	-2.21	69%	8%	23%	0%	8

Table 3.12b Summary of effects of metering with an allowance and the variable charge varying according to stretched Council Tax band ratios for different groups of RV households assuming no demand reduction (Option 8)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.90**	**18%**	**8%**	**9%**	**65%**	**491**
£0-£10,000	+2.76	11%	2%	5%	82%	66
£10,001-£20,000	+2.23	9%	10%	5%	76%	104
£20,001-£30,000	+1.64	11%	9%	10%	70%	116
£30,001-£40,000	-0.63	28%	12%	8%	52%	62
£40,001-£80,000	-2.72	44%	10%	8%	38%	41
> £80,000	-2.68	31%	2%	5%	62%	8

Table 3.12c Summary of effects of metering with an allowance and the variable charge varying according to stretched Council Tax band ratios for different groups of metered households assuming no demand reduction (Option 8)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.96**	**31%**	**11%**	**15%**	**43%**	**450**
£0-£10,000	+1.54	11%	4%	16%	69%	55
£10,001-£20,000	+0.76	20%	7%	17%	56%	105
£20,001-£30,000	-0.93	35%	10%	10%	45%	86
£30,001-£40,000	-1.19	36%	16%	18%	30%	57
£40,001-£80,000	-2.41	41%	24%	13%	22%	50
> £80,000	-9.18	69%	9%	22%	0%	9

Table 3.13b Summary of effects of metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios for different groups of RV households assuming no demand reduction (Option 9)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.54**	**20%**	**8%**	**15%**	**57%**	**505**
£0-£10,000	+1.62	13%	7%	9%	71%	69
£10,001-£20,000	+1.46	8%	10%	18%	64%	110
£20,001-£30,000	+1.21	13%	10%	12%	65%	118
£30,001-£40,000	-0.85	31%	9%	14%	46%	62
£40,001-£80,000	-1.94	53%	5%	12%	30%	41
> £80,000	-1.28	32%	4%	26%	38%	8

Table 3.13c Summary of effects of metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band for different groups of metered households assuming no demand reduction (Option 9)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.53**	**23%**	**14%**	**35%**	**28%**	**497**
£0-£10,000	+0.73	5%	5%	59%	31%	73
£10,001-£20,000	+0.45	14%	16%	34%	36%	123
£20,001-£30,000	-0.65	27%	15%	27%	31%	89
£30,001-£40,000	-0.48	27%	11%	32%	30%	61
£40,001-£80,000	-1.36	39%	22%	22%	17%	50
> £80,000	-6.01	62%	5%	33%	0%	10

Table 3.14b Summary of effects of metering with a lifeline allowance and the charge per litre of water varying according to current Council Tax band ratios for different groups of RV households assuming no demand reduction (Option 10)

Income group	**Average weekly gain (+) or loss (-)**	**Households losing >£1/week**	**Households losing <£1/week**	**Households gaining <£1/week**	**Households gaining >£1/week**	**Total number of households**
All households	**+0.14**	**27%**	**13%**	**17%**	**43%**	**505**
£0-£10,000	+0.92	21%	7%	14%	58%	69
£10,001-£20,000	+0.69	17%	16%	23%	44%	110
£20,001-£30,000	+0.54	23%	12%	17%	48%	118
£30,001-£40,000	-0.69	38%	13%	11%	38%	62
£40,001-£80,000	-1.52	53%	12%	12%	23%	41
> £80,000	-0.50	38%	14%	11%	37%	8

Table 3.14c Summary of effects of metering with an a lifeline allowance and the charge per litre of water varying according to Council Tax band for different groups of metered households assuming no demand reduction (Option 10)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.16**	**21%**	**18%**	**46%**	**15%**	**497**
£0-£10,000	+0.53	4%	7%	82%	7%	73
£10,001-£20,000	+0.32	10%	23%	51%	16%	123
£20,001-£30,000	-0.32	24%	20%	34%	22%	89
£30,001-£40,000	-0.11	25%	15%	40%	20%	61
£40,001-£80,000	-0.78	41%	21%	22%	16%	50
> £80,000	-2.47	60%	7%	33%	0%	10

Table 3.15a Summary of effects of metering with a standing charge and allowance varying according to stretched Council Tax band ratios for different groups of households assuming no demand reduction (Option 11)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.00**	**34%**	**12%**	**13%**	**41%**	**859**
£0-£10,000	+1.57	18%	4%	13%	65%	96
£10,001-£20,000	+0.81	23%	12%	17%	48%	180
£20,001-£30,000	+0.26	30%	13%	10%	47%	189
£30,001-£40,000	-0.66	46%	11%	11%	32%	112
£40,001-£80,000	-1.66	56%	12%	14%	18%	90
> £80,000	-1.86	51%	8%	19%	22%	17

Table 3.15b Summary of effects of metering with standing charge and allowance varying according to Council Tax band for different groups of RV households assuming no demand reduction (Option 11)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.32**	**30%**	**9%**	**13%**	**48%**	**454**
£0-£10,000	+1.80	21%	5%	6%	68%	52
£10,001-£20,000	+1.17	17%	10%	19%	54%	94
£20,001-£30,000	+0.72	22%	13%	11%	54%	112
£30,001-£40,000	-0.72	47%	6%	8%	39%	58
£40,001-£80,000	-1.91	55%	7%	12%	26%	41
> £80,000	-0.39	32%	1%	28%	39%	8

Table 3.15c Summary of effects of metering with standing charge and allowance varying according to Council Tax band for different groups of metered households assuming no demand reduction (Option 11)

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.37**	**39%**	**15%**	**13%**	**33%**	**405**
£0-£10,000	+1.29	15%	4%	20%	61%	44
£10,001-£20,000	+0.42	28%	16%	14%	42%	86
£20,001-£30,000	-0.41	41%	14%	10%	35%	77
£30,001-£40,000	-0.59	45%	16%	15%	24%	54
£40,001-£80,000	-1.45	56%	17%	15%	12%	49
> £80,000	-3.16	71%	11%	18%	0%	9

Table 3.18b Summary of effects of change from existing Severn Trent tariff to metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios for different groups of RV households assuming no demand reduction

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**+0.51**	**17%**	**12%**	**29%**	**52%**	**498**
£0-£10,000	+1.21	12%	9%	15%	64%	69
£10,001-£20,000	+1.03	8%	13%	23%	56%	107
£20,001-£30,000	+1.04	11%	13%	22%	54%	115
£30,001-£40,000	-0.42	22%	16%	17%	45%	62
£40,001-£80,000	-0.96	44%	10%	11%	35%	41
> £80,000	-0.56	32%	16%	6%	46%	8

Table 3.18c Summary of effects of change from existing Severn Trent unmeasured tariff to metering with a lifeline allowance and the charge per litre of water varying according to stretched Council Tax band ratios for different groups of metered households assuming no demand reduction

Income group	Average weekly gain (+) or loss (-)	Households losing >£1/week	Households losing <£1/week	Households gaining <£1/week	Households gaining >£1/week	Total number of households
All households	**-0.52**	**23%**	**16%**	**35%**	**26%**	**474**
£0-£10,000	+0.74	5%	7%	52%	36%	66
£10,001-£20,000	+0.39	12%	18%	34%	36%	118
£20,001-£30,000	-0.62	26%	17%	32%	25%	87
£30,001-£40,000	-0.48	26%	14%	34%	26%	59
£40,001-£80,000	-1.41	44%	21%	20%	15%	47
> £80,000	-5.05	61%	6%	33%	0%	10

References

BMA (1994) Water: A Vital Resource, British Medical Association

Clark, Emily, Vivien Foster, Andres Gomez-Lobo and Mike Ingham (1998a) Towards an Environmentally Effective and Socially Acceptable Strategy for Water Metering in the UK: Technical Report, UK Water Industry Research

Clark, Emily, Vivien Foster, Andres Gomez-Lobo and Mike Ingham (1998b) Towards an Environmentally Effective and Socially Acceptable Strategy for Water Metering in the UK: Summary Paper, UK Water Industry Research

Consumers' Association (1996) Water Consumption and Charges: Policy Report, Consumers' Association

DEFRA (2003) Reductions for Vulnerable Groups, DEFRA

DoE/OFWAT (1992) The Social Effect of Metering, Department of the Environment and OFWAT

Environment Agency (2001) Water resources for the future: A strategy for England and Wales, Environment Agency

Environment Agency (2002) Demand Management Bulletin, Issue 54, Environment Agency

Herrington, Paul (1996) Pricing Water Properly, Discussion Papers in Public Sector Economics No 96/6, University of Leicester

National Consumer Council (2000) Charging for Water: the implications for consumers, the environment and future supplies, National Consumer Council

National Consumer Council (2002) Towards a sustainable water charging policy, National Consumer Council

National Metering Trials Working Group (1993) National Metering Trials Final Report, UK Water Services Association

National Statistics (2001) Regional Trends, The Stationery Office

National Statistics (2002) Living in Britain: Results from the 2001 General Household Survey, The Stationery Office

OFWAT (2002) Tariff structure and charges: 2002-03 report, Office of Water Services

Pearson, Mark, Najma Rajah and Stephen Smith (1993) The Distributional Effects of Different Methods of Charging Households for Water and Sewerage Services, Institute for Fiscal Studies

OECD (1999) Household Water Pricing in OECD Countries, Organisation for Economic Co-operation and Development

OECD (2003) Improving Water Management: Recent OECD Experience, Organisation for Economic Co-operation and Development

OFWAT (2002) Tariff Structure and Charges 2002-2003 Report, Office of Water Services

Thackray, John (1988) Public Utility Charging Policy: The Impact of Water Taxes and Tariffs on Individual Consumers, Chartered Institute of Public Finance and Accounting

World Resources Institute (1999) Freshwater Resources and Withdrawals 1970-98, World Resources Institute

Endnotes

[i] The authors wish to thank Anglian Water for making the data available, and particularly Amy Walters for her assistance with the data.

[ii] ACORN stands for 'A Classification of Residential Neighbourhoods'. The marketing data firm CACI has produced this classification to include every street in the country, fitting them into 17 distinct Groups, which, in turn, contain 54 'typical' ACORN neighbourhood categories. The basic idea is that streets of broadly similar people are grouped together. A postcode is assigned to the type which is the best match with the unique characteristics of the street, based on Census data. The descriptions of the types are based on averages across all streets in the type. The match is not necessarily particularly close.