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Assessing Funding Models for Water Services Provision in Ireland

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ABSTRACT

Water services provision is a natural monopoly. This drives a propensity to market failure and economic inefficiency in the absence of robust regulatory measures. In this context I discuss the appropriate role of the regulator and the advantages and disadvantages of pricing water usage. Beyond subsidies funded from general taxation there are potentially three main sources of revenue for a water utility. These are connection fees, recurrent fixed charges and volumetric charges based on usage.

Water policy pursues multiple objectives and a wide variety of pricing structures are employed within the OECD. These objectives can be structured around four sustainability dimensions: environmental sustainability; financial sustainability; economic efficiency and social concerns including affordability. There are trade-offs between each of these policy objectives. Full cost recovery through usage based tariffs creates affordability and equity concerns, while the most efficient allocation of water may not be consistent with water saving and environmental concerns. This paper considers the main trade-offs as a set of dilemmas and discusses the advantages and disadvantages of a variety of different water charging models.

Water charges for domestic users are being introduced in Ireland in 2014. Based on the premise that water charges remain in place I consider various charging models. Water affordability and water poverty are important concerns in this context. A universal free allowance has been proposed as a means of protecting households from water poverty. However, the proposed system is highly regressive and should be abolished in its current form. A small free universal allowance will not address the affordability issue while a large free allowance undermines other policy objectives – notably economic, financial and ecological sustainability. Instead, a system of income related water credits is described as a potential alternative. Combining a volume based pricing structure with a system of income related water credits may best reconcile the four main policy objectives, would address the affordability issue at a much lower cost to the exchequer than a universal allowance, and if properly designed would ensure that a combination of water charges and low income does not become a barrier to vulnerable households accessing water and wastewater services.

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1. INTRODUCTION

There are some industries and services where competition can be destructive, for example industries characterised by decreasing costs or increasing returns to scale. Such industries are often called natural monopolies. Natural monopolies are characterised by network infrastructure, very large fixed costs, economies of scope and scale and low or zero marginal cost.[1] The market for water and wastewater services provision is a natural monopoly in the sense that a single provider of the service is the most efficient market structure. This drives a propensity to market failure and allocative and technical inefficiency in the absence of robust regulatory measures. Such market failures may have important social and economic costs.

Access to clean and affordable water is a human right. Yet there is no such thing as free water. A consistent and secure supply of clean water is expensive to provide. Water must be treated and is difficult to transport. Indeed the provision of water and waste water services requires the construction, maintenance, improvement and operation of expensive network infrastructure. On an annual basis, the provision of water and wastewater services in the Republic of Ireland costs in excess of €1 billion although the precise cost can fluctuate quite widely from year to year given the large percentage of costs attributable to capital projects. Water services cost over €1.2 billion in 2010 with operational costs amounting to €715 million and capital expenditure of over €500 million (DECLG, 2012). The question isn't 'whether' we should pay for water and wastewater services but 'how' we should pay for them. We can pay for water through taxes or tariffs or both. Until 2014 water and waste water services for domestic users were mainly paid for out of monies raised from general taxation, (e.g. VAT and income tax) which was then allocated as subsidies from central government to the various local governments. Thus households were paying for water in the same way they were paying for many other public services – through their taxes. The prior abolition of residential water charges in the 1990s was opposed by environmental groups as an abandonment of the 'user pays' principle and no economic or environmental rationale was given at the time for the abolition of charges. Funding for water became a combination of government subsidies and non-domestic rates mainly paid by businesses but also by schools, churches, sports clubs and other bodies.

From October 2014 Ireland's funding model for water and wastewater service provision will become a combined tax and tariff system with the reintroduction of water charges for all domestic users. The unlimited free allowance model subsidised by government and paid for out of general taxation will be switched for a model that combines government subsidies with usage based water charges. A portion of the cost of water will continue to be subsidised from central

[1] The marginal cost is the cost of producing one more unit of output.

government (taxes) while the remaining cost of water will be paid for through charges linked with water use (tariffs).

Water policy pursues multiple objectives. These include affordability and social concerns, environmental sustainability, financial sustainability and economic efficiency. The affordability of water and the distribution of the cost of provision are central concerns for any politically sustainable water funding model or indeed any funding model consistent with social justice. The United Nations General Assembly (United Nations, 2010) has recognized the right of every human being to have access to sufficient water for personal and domestic uses (between 50 and 100 liters of water per person per day), which must be safe, acceptable and affordable (water costs should not exceed 3% of household income). The change in funding model to one based on user charges is regressive and raises serious affordability issues for low income households. There are clear tensions between the different goals of conservation, economic efficiency and affordability. The proposed policy of using a system of universal free allowances to reduce the average tariff level over the population is costly and badly targeted, and it reduces the scope for targeted affordability measures for low income and other vulnerable groups.

In this paper I examine a number of potential funding models for water services provision on the premise that Ireland moves toward a funding model based on user charges, and with the goal of reconciling the multiple water policy objectives. I argue that the model best able to reconcile the core policy objectives is a water credit model with a zero free allowance and with tapered contributions to the water bill from a designated government department. The size of the contribution should be based on disposable household income and should be expressed as a percentage of the household's total bill. Crucially the most vulnerable cohort – the bottom twenty per cent of the income distribution - will have their entire bill paid for by the government under this model. This ensures the principle of the right to affordable water for all.[2] The proposed structure generates a much less regressive distribution of the cost of water service provision, eliminates water poverty, and enables the water utility to meet the commercial test of independence from government and stay 'off-book' for the purposes of managing the public finances.

2. THE CURRENT POSITION

Clean water is an economic good. It is not costless. Water is heavy and difficult to transport, and the provision of water and waste water services requires the construction, operation, maintenance and improvement of expensive network infrastructure. Such costs must be financed through present or future taxation, through tariffs, or through a combination of both. In

[2] Drinking water is non-substitutable and essential for life. The human right to water has been recognised in international law including human rights treaties, declarations and other standards. The United Nations General Assembly adopted a resolution in 2010 recognising access to clean water and sanitation as a human right. 122 countries voted in favour, none against, while 41 countries abstained. Ireland abstained (UN, 2010).

Ireland, the provision of water and wastewater services has mainly been funded through general taxation with an additional contribution from non-domestic rates. A government commissioned assessment of water services delivery in Ireland (PWC, 2011) reviewed the strengths and weaknesses of the delivery of water services through the then thirty four local authorities, and concluded that there was a lack of co-ordination, an aging and poor quality network, and problems in achieving economies of scale and delivering projects of national importance. The report argued that the best way to improve the efficiency and effectiveness of operations, to increase capital investment, and to access new finances for the water sector, was to combine Irish water and wastewater services into a single public utility.

On 1 January 2014, responsibility for water and wastewater services to homes and businesses was transferred from the then thirty four local authorities to a new national water services authority called Irish Water. Local authorities will continue to provide certain services on behalf of Irish Water through a Service Level Agreement that runs to 2026. Statutory responsibility for the economic regulation of the water sector and protection of the interests of customers was given to the Commission for Energy Regulation (CER) with the mandate to ensure operational efficiency is achieved across the sector. Spending by Irish Water is estimated to reach €1.425 billion in 2014 (Dáil Debates, 2014a). Operational expenditure was €502 million from January to the end of August with projected operational expenditure from September to the end of December of €315 million. Capital expenditure was €373 million from January to the end of August with projected capital expenditure from September to the end of December of €235 million.

Usage based water charges for residential households were intended to take effect from October 2014, and are projected to yield close to €300 million on an annual basis. The Government directed the CER to set the average household charge for all types of household at just under €240 and the CER settled on an average estimated charge of €238 which, in order to yield €300 million, implies an average of 1.26 million domestic customers for water and wastewater services.[3] Usage based charges should, at least in theory, improve water conservation and the allocative efficiency of water use. On the other hand moving the funding model away from general taxation and towards user charges will reduce the progressivity of the overall system of taxes and benefits, and raises issues of water affordability and water poverty. This is because consumption charges are regressive and impact disproportionately on low income households. Water charges are also more salient than other taxes and charges, and the current structure for water charges – indeed the very concept of charging for what is seen by many as a human right – has been the subject of strong political opposition.

[3] There were 1.25 million private households receiving their water supply from the public mains according to Census 2011 while 1.09 million private households were identified as using a public scheme for wastewater services (CSO, 2012). According to DECLG (2013) Irish Water is expected to have some 1.35 million domestic customers, most of whom will receive both water supply and wastewater services.

A system of free allowances has been proposed by Government in order to alleviate affordability issues. There is no recurrent fixed charge. Instead charges will be based on volumetric use. The assumed consumption is 66m^3 for the first adult and 21m^3 for each adult and child thereafter. The Government directed the CER to provide for a free household allowance of 30m^3 of water per annum for a primary residence on a public supply and an additional free allowance of 21m^3 for every child in the primary residence. Metered rates were set at €4.88 per m^3 of water and waste water, or €2.44 for each service separately. That amounts to just under half a cent per litre for households requiring both the waste and drinking water services. The value of the free household allowance (water and wastewater combined) is €146 per household. Most properties will not be metered when billing starts and assessed charges will be used instead. Even metered households will use an assessed charge for the first nine months. Based on CER calculations, a household with a single adult occupant using both services will pay €176 per annum with the charge increasing by €102 for each extra adult. Customers with specific medical conditions will have their charges capped and there will be a discount where the water supply is unfit for human consumption. I will argue in this paper that the proposed system of free allowances, as currently structured, is expensive, poorly targeted and economically inefficient.

It appears that the monopoly water utility Irish Water will receive somewhere in the region of €1.3 billion for the provision of water and wastewater services in 2015 (see Dáil Debates, 2014b and 2014c). Funding of €533 million is coming from the Local Government Fund, along with €300 million from domestic water charges and €240 million from non-domestic (mainly commercial) water charges.[4] In addition, €222 million will be allocated as an equity investment by the Irish Government in Irish Water.[5] This payment is subject to the Central Statistics Office (CSO) and Eurostat classifying Irish Water as a market institutional unit outside of general government.[6] If Irish Water is indeed classified as outside of general government then the €222 million equity investment in Irish Water won't count towards the General Government Balance (GGB)[7] in 2015, and therefore the government's budgetary targets, and also won't count for the purposes of determining Irish Water's total revenue. It is currently expected that Irish Water will indeed be 'off-the-books' for the purposes of calculating the GGB and the general government deficit and debt. This is because Irish Water's €540 million in projected revenue from user charges (€300 million from domestic users and €240 million for non-domestic users) exceeds the Government's subvention of €533 million. In addition, borrowing by Irish Water to fund capital investment will not add to the government debt provided the utility is off-book.

[4] A different figure for non-domestic charges of €230 million has been stated in some Ministerial Responses to Dáil questions.

[5] A different equity investment figure of €240 million was cited in a Written Response on 4 November 2014 (Dáil Debates, 2014d). That response also stated that the Government agreed to a provision of a total of €406 million in equity investment for the two year period 2015/2016.

[6] To be classified outside of general government Irish Water must meet the commercial test as a market producer. In order to qualify Irish Water must get less than half of its total revenue from the government and must generate enough sales to cover at least half of its operating costs. In addition, Irish Water must be charging economically significant prices for its products and services. This means that prices must be sufficiently large enough to be capable of influencing consumer behaviour.

[7] The General Government Balance (GGB) measures the fiscal performance (surplus or deficit) of all arms of Government. The GGB does not reflect the position of commercial State sponsored bodies as these agencies are classified as being outside the General Government sector.

Overall the total amount of spending that will be off-book for the purposes of calculating the GGB appears to be €762 million[8] while the total amount remaining on-book is the government subvention of €533 million.

Table 2.1: Net improvement in the 2015 public finances related to domestic water charges and reliefs

Funding Source	(€ millions)
Yield from non-domestic charges	240
Revenue from non-domestic charges lost to the exchequer	(240)
Yield from domestic charges	300
Equity investment in Irish Water	222
Total	522
less compensatory fiscal measures	
Income tax relief for water charges	(40)
Change to Household Benefits Package	(42)
Change to Fuel Allowance	(24)
Net fiscal impact	416

Sources: Dáil Debates (2014b, 2014c, 2014d) Department of Finance (2014)
Note: Estimates do not include any potential cost to the exchequer related to the child-based free allowance as it is unclear whether this is already included in the government subvention.

The introduction of domestic water charges has a positive impact on the GGB and the public finances. Provided Irish Water is indeed moved off-book the improvement in the public finances arising from the introduction of domestic water charges appears to be the €762 million in off-book spending less the €240 million in non-domestic charges. The reason for the lower amount is that the yield from non-domestic charges appeared in previous years as an offsetting increase in revenue for the purposes of measuring the budget deficit. If this analysis is correct, the actual improvement in the 2015 budget deficit from the introduction of domestic water charges is in the order of €522 million. However, this figure does not include the cost of the various fiscal measures introduced to help offset the burden of water charges (see DOF, 2014). A 20% income tax relief set against the payment of water charges was introduced in Budget 2015 at a cost of €40 million, at the same time a Water Support payment of €100 per annum was introduced for recipients of the Household Benefits Package (HBP) at a cost of €42 million, while, in a measure explicitly linked to water charges, the Fuel Allowance for those not already in receipt of the HBP was increased by €100 at a cost of €24 million. Individuals in receipt of the relevant compensatory payment from the Department of Social Protection will not be able to claim the tax relief in respect of the same water charges. When the fiscal impact of these three measures is

[8] The €762 million figure is made up of the €300 million from domestic charges added to the €240 million from non-domestic charges and the Government's €222 million equity investment in Irish Water.

considered the net benefit to the exchequer falls to €416 million (see Table 2.1). Finally, the child-based free allowance related to water charges counts as a social transfer in kind and therefore impacts upon the GGB as an item of expenditure – this may cost up to €100 million. The flat fee household allowance associated with water charges counts as a government subsidy. However, it is not entirely clear whether these last two social transfers are already accounted for as part of the government subvention. Regardless of the accounting benefits to the GGB the fact remains that money borrowed by Irish Water will still de facto be debt of the Irish State given that the utility will be 100% state-owned and that the service provided is a non-substitutable necessity that is essential to human life and therefore cannot be abandoned.

The overall breakdown in contributions in 2015 from the different institutional sectors appears to be as follows: €755 million or 58.3% from the government sector (general taxation), €300 million or 23.2% from the household sector (user tariffs), and €240 million or 18.5% from the commercial and other non-domestic sector (user tariffs).

3. RECONCILING POLICY OBJECTIVES

Ireland's water funding model must reconcile multiple policy objectives (see Massarutto, 2007). The fundamental objective is to provide a clean, reliable, and secure supply of water. Beyond this basic goal, policy can be structured around four main 'sustainability dimensions'. These are: (1) Affordable water for all households consistent with the concept of the human right to water. (2) Financial sustainability for an efficiently operating water utility. This means that resource inputs (i.e. capital and labour) are fairly compensated, while at the same time ensuring that the consumer is best protected in terms of the quality and cost of water and wastewater services. (3) Economic efficiency within the water market such that water is allocated to the highest value uses. (4) Conservation and environmental sustainability such that polluters internalise the costs of their pollution. There are additional goals that must also be considered when setting water policy, for example, the need to reduce pressure on the public finances, the need to maximise economies of scale, and the need to minimise the cost of borrowing for investment in the water infrastructure. Finally, the water funding model must be seen as fair or it will not be politically sustainable.

Social justice concerns are central to any politically sustainable water funding model particularly given the salience of water charges compared to other taxes and charges. The most economically efficient way to protect vulnerable households, and to prevent hardship, is to supplement the capacity to pay of low-income households through direct cash transfers or some other income supplement. However, because water is a merit good, direct cash transfers are not a complete solution; that is, we want all households to actually benefit from the use of water, not just to have a theoretical capacity to afford water. On the other hand, a universal free allowance is an expensive, badly targeted and economically inefficient solution because much of the benefits accrue to wealthier households. A universal free allowance also reduces the potential for reaping economic and environmental benefits from water charges and places

pressure on other areas of public spending. The crucial policy question is whether vulnerable households can be fully protected without sacrificing the other policy goals.

Environmental sustainability refers to ecological preservation and the minimisation of waste. The quality of the water supply has been badly compromised in a number of Irish counties in recent years, thereby threatening public health, while it is variously estimated that between 35% and 47% of treated water is unaccounted for due to leakages in the deteriorating network infrastructure. Stronger environmental standards and regulatory enforcement will be important factors in achieving acceptable ecological and public health standards. Both supply side and demand side elements are relevant to environmental sustainability. Supply side solutions focus on fixing leaks and efficient distribution. Supply side policies include infrastructure improvements, technology upgrades, and improved network maintenance – all of which require funding for investment. Demand side solutions should also be emphasised. For example advertising campaigns have frequently been found to be effective. Demand side policies include measures to encourage water saving and discourage wasteful use through usage-based pricing and more efficient water using devices. Volumetric pricing is used in a number of OECD countries as a means to internalise the environmental costs of water services to the user of the service. This is based on the 'polluter pays' principle. In theory charging according to the quantity of water used will motivate consumers to conserve water by reducing demand or by switching to more efficient appliances. A general reduction in prices (e.g. from subsidies) lessens economic and environmental signals, and leads to overconsumption. The volumetric charge paid by the user is simply the volume of water consumed multiplied by the volumetric rate per cubic metre (m^3) set by the regulator.

A study of household demand and the welfare implications of water pricing in Cyprus found that price can be an effective tool for residential water demand management (Pashardes, Koundouri and Hajispyru, 2000) while a study of domestic water consumption over ten OECD countries Grafton et al., (2011) also found that residential consumption responds to volumetric pricing.[9] Meta-analysis studies suggest that residential consumption does respond to price changes. Espey, Espey and Shaw (1997) used 124 elasticity estimates to obtain a median short-run price elasticity of demand of -0.38[10] while Dalhuisen et al. (2003) combined 296 price elasticity estimates to derive an overall mean price elasticity of -0.41. Median long-run price elasticity is generally found to be higher while high-income households appear to be less price sensitive than lower income households. These results are not uncontested. Staddon (2010) argues that on balance the existing research suggests that there is little evidence that compulsory metering can achieve water conservation claims and that the experience of water metering as a mechanism for disciplining demand is mixed. He also notes that the conservation benefits should be set against the cost of investing in and installing the water meters.

[9] Grafton et al. (2011) also found that of all water-saving devices, only a low volume/dual flush toilet has a statistically significant and negative effect on water consumption. The reasons may be behavioural. The water efficiency of a device (e.g. a showerhead) effectively reduces the unit cost of the produced service and, thus, could theoretically cause an increase in consumption.

[10] A price elasticity of -0.38 means that a 1.0% increase in the volumetric price will, all else equal, lead to a 0.38% reduction in residential water demand.

The funding model must also consider economic efficiency, affordability and financial sustainability. An economically efficient allocation of water is one that results in the highest return for a given water resource (Johansson, 2000). The basic goal is to ensure water is allocated to its most beneficial use. In welfare economics, the optimal path for development of the industry is where the marginal benefit of the next increment of water supplied equals the marginal cost of supplying that increment. From this perspective, the optimal price which will maximise society's welfare is equal to the marginal cost of production (Bakker, 2001).

However, marginal cost pricing tends to neglect equity issues and raises affordability concerns (Mohayidin et al. 2009). The availability of clean and affordable water and waste water services is essential to a decent quality of life and access to water is a human right. It is not immediately obvious that domestic water charges are at all compatible with the fundamental right to affordable water. Affordability issues may be assessed by comparing the water bill to the user's capacity to pay. For low-income groups the key consideration is not the average tariff over the population but the size of the actual tariff paid by low-income households. While there is no commonly agreed rule, the absolute level of affordability is often measured as a percentage of disposable income, sometimes after considering basic housing costs such as mortgage and rental payments. In most OECD countries the average water and wastewater bill as a share of disposable income for the least well-off income decile[11] is less than 2.5%, and in some countries the bill is substantially lower as a share of income for the poorest income group.

Full Supply Costs (FSC) = capital costs + operation and maintenance costs + debt servicing *3.1*

Full cost of water = FSC + economic and environmental externalities + administration and governance costs *3.2*

There are other issues with a pricing model based purely on marginal cost. Ensuring financial sustainability through a pure tariff model requires the price of the service to be large enough to generate revenues at least as high as the cost of providing that service. The full cost of water not only includes compensating resource inputs (i.e. operation costs, maintenance costs, capital costs and debt servicing costs: the full-supply cost described below in Equation 3.1), but, as described in Equation 3.2, the full cost of water also includes economic and environmental externalities, as well as opportunity costs (Massarutto, 2007). Financial sustainability requires that cost recovery (total revenue) does not fall below the full-supply cost. Cost recovery can be attained through tariffs, through taxes, or through borrowings (future taxes and tariffs). Water service provision is a natural monopoly with high fixed costs and economies of scale, and as a

[11] Deciles are a method of splitting up a ranked dataset (in this case the population of households) into ten equally large subsections. The lowest income decile represents the 10% of households with the smallest disposable income. The 2nd decile represents the next poorest 10% of households and so on. The tenth or top decile represents the richest 10% of households.

result marginal cost pricing will not recover full costs. The water utility will experience a loss since the marginal cost will always be lower than the average cost (Hung and Chie, 2013).

Careful consideration of the appropriate funding structure for water and wastewater services is required. There are clear tensions between a number of the core policy objectives, for example between ecological sustainability and distributional goals. Multiple policy objectives create dilemmas for policymakers and trade-offs are inevitable (see Table 3.1). Best practice for Goal A may not be consistent with Goal B. Significantly, financial, economic and environmental sustainability may not be consistent with water affordability. Multiple policy goals imply the need for multiple policy levers.

Table 3.1: Policy trade-offs and dilemmas

Trade-off	Policy dilemma
Ecological sustainability vs. Social and affordability concerns	Environmental 'user/polluter pays' volumetric pricing may not provide affordable water for those on low incomes.
Ecological sustainability vs. Financial sustainability	Higher environmental standards will increase the cost of water provision.
Ecological sustainability vs. Economic Sustainability	The most efficient 'high value' allocation in terms of financial rate of return may not be consistent with water saving and preservation.
Social and affordability concerns vs. Economic sustainability	Should priority be given to merit uses (e.g. washing), or to high-value uses (e.g. industrial processes)?
Social and affordability concerns vs. Financial sustainability	Full cost recovery through tariffs may not be consistent with affordability. However, universally low tariffs could lead to declining infrastructure and deteriorating services which may hurt the poor more in the long-run
Financial sustainability vs. Economic sustainability	Water pricing for economic efficiency suggests marginal cost pricing. However, from the utilities perspective marginal cost pricing is inconsistent with the accumulation of funds for investment. This suggests the need for average cost pricing or a recurrent fixed charge or subsidy.

Note: Table is based on discussion in Massarutto (2007). See Massarutto for a much wider discussion on policy dilemmas in water policy.

A tariff model based for domestic water use is consistent with improved economic efficiency and water conservation, and is at least compatible with financial sustainability. However, consumption charges are regressive, impact disproportionately on low income households and raise significant affordability concerns. On the other hand flat charges per household have little to recommend them as a policy tool and should not be introduced even for interim periods. Such charges are regressive and will disproportionately impact upon vulnerable low-income households. In addition, a flat annual charge will generate no price signals, will have no environmental benefits, and may even be counterproductive as consumers will feel they have 'paid' for their water and thus will have no incentive to conserve water. Finally, flat charges provide no benefits in terms of the allocative efficiency of water usage. The 'polluter pays' principle suggests water should be funded, at least in part, through water charges based on the level of water usage, and paid for by the user.

In order to best reconcile the different policy objectives, most OECD countries have adopted a combination of the following elements in their funding models:

A. Connection charges;
B. Fixed charges;

C. Volumetric charges;
D. Block charges; and
E. Minimum charges (see Rogers, De Silva and Bhatia, 2002).

Many OECD countries use a two-part tariff structure with both fixed and variable elements (Rogers et al. 2002). The fixed element protects the supplier from demand fluctuations, reduces financial risk, and provides a stable revenue base. The variable element encourages conservation and is based on consumption levels. The downside is that the pricing mechanism (whether based on marginal or average cost pricing) generates negative distributional consequences. To alleviate the negative distributional effect and ensure low-income households have affordable access to water, regulators can be instructed to employ tariff structures such as increasing block tariffs or, alternatively, legislators can themselves employ mechanisms such as income-related water credits paid for out of general taxation. Increasing block tariffs can be progressive to the extent the tariff structure provides a minimum necessary amount of water at a reduced price, which is then paid for by higher prices beyond this minimum. However, to prevent negative distributional outcomes it is often necessary to either subsidise water provision, adopt different pricing mechanisms for different household income levels, or to provide income supplements for low-income households (Dinar, Rosegrant and Meinzen-Dick, 1997; Mohayidin et al. 2009).

4. NATURAL MONOPOLY AND THE ROLE OF THE REGULATOR

Market failure through 'allocative efficiency'[12] is likely to occur where there is an inadequate level of competition in the market (Brown and Jackson, 1986). Allocative inefficiency occurs in situations where there is a dominant market player, and is commonplace in markets that are natural monopolies. Such industries or services can be identified by the presence of decreasing costs or increasing returns to scale (Baumol, 1977).[13] Classic examples of natural monopolies include ports, water services and other network infrastructures. In some cases, an analysis of the determinants of supply and demand in the market will show that it is possible to rectify the market failure through the application of regulatory measures, for example, ordering and enforcing the breakup of a monopolist or dominant market player. In certain other cases, regulation will be insufficient to rectify the market failure. Some markets are characterised by network infrastructure, high fixed costs, and economies of scope and scale[14] (Silvestre, 1987) and these market characteristics can make competition very difficult to achieve. Indeed competition may actually be destructive in these industries. In such cases, state intervention in the market or even direct state provision of the good or service may be

[12] Allocative efficiency occurs where the social surplus is maximised and there are no deadweight losses. The optimal distribution of goods and services occurs where prices correspond with the firm's long-run marginal cost of supply.

[13] A natural monopoly does not refer to the actual number of sellers in the market but to the relationship between demand and the technology of supply. As technology changes, a market may cease to be, or indeed may evolve into, a natural monopoly. Posner (1969) defined natural monopolies in this way: "If the entire demand within a relevant market can be satisfied at lowest cost by one firm rather than two or more, the market is a natural monopoly".

[14] Economies of scale refer to the presence of efficiency gains (reductions in unit cost) in the production process as the usage of inputs increases. If substantial economies of scale are present then the most efficient market structure may be one containing just a single supplier.

appropriate. The test is whether by intervening in the market and by establishing the rules of the game the state can achieve the same allocative efficiency at a lower cost than the market – and not whether the state intervention is costly per se (Andreosso and Jacobson, 2005).

The provision of water services is a natural monopoly. Market failures are likely with any natural monopoly and these may have important social and economic costs. The monopolist will fix the price of its good or service above the marginal cost of production in order to maximise its profits. This leads to an economically inefficient level of consumption and production causing a deadweight welfare loss to society. The monopolist's super-normal profits also impose competitiveness costs on the rest of the economy. On the issue of privatisation Palcic and Reeves (2011) conclude from their review of the literature that once regulatory environment, size, market structure and incentive structure are all controlled for: "the empirical evidence on the comparative performance of public and private sector enterprises fails to provide a clear-cut consensus regarding the superiority of either form of ownership". Irish Water is set to be a public monopoly.[15]

Public monopolies can suffer from soft budget constraints and an unwillingness and failure to minimise their cost bases. This can lead to technical inefficiency[16] and creates a need for an independent regulator. In principle the inefficiencies caused by the exploitation of a monopoly position can be ameliorated or eliminated by implementing appropriate regulatory mechanisms. The economic goal of regulation is to remedy the inefficiencies of monopoly by simulating the conditions of competition. The regulator must endeavour to minimise the cost to the rest of the economy by ensuring the monopolist cannot earn more than the normal rate of profit, and by ensuring the monopolist is operating to minimise its own internal costs. Regulation itself imposes costs (for example, administration costs for the state, compliance costs for the firm, and legal costs for both) and these costs must be balanced against the gains from regulation. The regulator must also endeavour to avoid setting prices so low that it eliminates the commercial case for future investment.

The regulatory framework and its enforcement sets the 'rules of the game' by which the economic actors must operate. These rules are present in some form in all markets. Along with economic efficiency the regulator may also be asked to consider broader issues of equity, distribution, environment, security of supply and service, social cohesion, human rights, and a variety of other strategic economic development concerns. There will be tensions and trade-offs between these goals making an appropriate regulatory regime complex to design. Regulation is often ineffective as a means of exercising authority and can lead to the phenomenon of 'as bad as

[15] From a societal perspective public enterprises have a number of advantages over commercially run private institutions. For example they can justify running at a commercial loss (paid for by general taxation) to the extent there are community benefits or positive externalities generated by the service. They can also make investments that take into account the benefits to wider society and the economy which a private enterprise might not make (e.g. rural broadband or rural water supply) and provide a counter-cyclical source of employment and investment during economic recessions.

[16] Technical efficiency occurs when the firm is maximising output for a given level of resources.

the law allows'. The regulated firm will choose to obstruct the regulator through whatever means possible (for example legal challenges) unless the costs of doing so outweigh the benefits. There is a need for clear distance between regulator and operator to avert the risk of regulatory failure or regulatory capture. Full transparency can reduce the risk of regulatory capture.

As a form of incentive regulation the CER (2014a) is proposing price/revenue capping with periodic reviews as the revenue framework for Irish Water. The RPI – X formula that will be used is sometimes described as an efficiency glide path because it gives the utility time to reduce its operational costs to efficient levels. Littlechild (1983) argued in favour of a price or revenue cap (RPI – X) as the appropriate regulatory tool. He realised that a price cap – unlike profit controls – could combine price regulation with preserving incentives for efficiency (see Table 4.1). Price cap regulation typically specifies an average rate at which the prices that a regulated firm charges for its services must decline annually after adjusting for inflation (RPI). The specified annual rate of decline (X) should reflect the extent to which the regulated industry is capable of achieving more rapid productivity growth than other firms in the economy. In this way the price cap replicates the discipline of competitive market forces by compelling firms to realise productivity gains and pass these on to customers (Bernstein and Sappington, 1998). The price inflation of inputs relative to price inflation in the economy as a whole will also play a role in the appropriate determination of the revenue cap. However, the actual choice of where to reduce costs is left to the regulated company and this helps minimise the regulatory burden.

The value chosen for X is crucial. If X is too small the regulated firm will earn excessive profits at the cost of the consumer, yet if X is too large it risks threatening the financial sustainability of the firm and its ability to attract investment at a low cost. The revenue cap (RPI – X) framework is made up of three separate building blocks that allow the regulator to estimate a level of revenue sufficient to guarantee financial sustainability for an efficient well-run utility. The three building blocks are: (1) an allowance for Operational Expenditure to fund the efficient day to day running of the utility; (2) an allowance for Capital Expenditure sufficient to fund an appropriate level of investment in the water services infrastructure and (3) an allowance for the Regulatory Asset Base or RAB. The RAB is a measure of the net value of the utility's assets used in the provision of the regulated activities. These assets (representing previous investments) should be compensated along with opex and capex and the estimated RAB allows the utility to receive a fair return on previous capital investments in the water infrastructure. RPI – X should not be used in a vacuum as it is important to continually compare performance against best practice. Alternatives to RPI – X regulation include rate-of-return regulation; yardstick regulation; banded rate of return, and profit sharing regulation. Although there are no firms in Ireland against which Irish Water's cost base can be compared there is a reasonably compelling case that the costs of equivalent companies in the United Kingdom can be used as a yardstick to determine reasonable allowable revenue for Irish Water. Following its interim revenue review the CER (2014b) proposed allowable revenue of €2,078 million for the period 1st October 2014 – 31st December 2016. Operating expenditure was set at €2.5 billion over 2014-2016, with an average efficiency target of 2.2% for 2015 and 2016. In addition, capital expenditure totalling €1.875 billion over the three year period was allocated within the revenue allowance. The opening Revenue Asset Base (RAB) was set at €1.037 billion.

Table 4.1: Littlechild's evaluation of schemes vis-á-vis no regulation

	No explicit constraints on profits	Modified profit ceiling (MRR)	Output-related profit levy (ORPL)	RPI – X (Local) tariff reduction scheme
Protection against monopoly	Fail	Pass	Pass	Pass
Encourage efficiency and innovation	Pass	Fail	Fail	Pass
Regulatory burden	Pass	Fail	Fail	Pass
Promotion of competition	Pass	Fail	Fail	Pass
Regulatory scheme better than none?	NA	Fail	Fail	Pass

Source: Littlechild (1983)
Note: Table is from an unpublished conference paper. A paper by that author is forthcoming.

5. WATER AND WASTEWATER BILLS: SOME INTERNATIONAL COMPARISONS

Water tariffs, or charges, are the norm in most OECD countries. Ireland has been a notable exception in this regard since the mid-1990s when water charges were abolished, although non-domestic charges have remained in place continuously throughout the period. Denmark had the most expensive water and wastewater services, including taxes, for domestic users of twenty two OECD countries surveyed in 2008 (OECD, 2010) while Mexico had the cheapest. Prices ranged from €5.43 per m^3 in Denmark to €0.40 per m^3 in Mexico (see Table 5.1).

Table 5.2 shows the average household bills across different water service providers in Great Britain in 2011/2012. The average bill for water and sewerage was €37 per month (€111 per quarter or €444 per year) and ranged from an average of just over €30 per month in Severn Trent (the Midlands) to an average of just over €50 per month in the South West of England. Applying the British average figure of €444 for combined water and sewerage services in 2011/2012 over 1.3 million Irish households would yield €577 million of revenue annually from domestic charges. The British industry average for domestic water and wastewater in 2013/2014 was €476. Bills are quite a bit reduced if we look at average household bills excluding sewerage provision. When average household bills for water alone are considered, the average industry weighted figure comes to €219 in 2013/14 (see Table 5.3).

Table 5.1: Unit price of water supply and sanitation services to households, including taxes, in OECD countries, 2008

Country	Price	Country	Price
Denmark	€5.43	Poland	€1.72
Scotland	€4.63	Hungary	€1.64
Finland	€3.57	New Zealand	€1.60
Flanders (Belgium)	€3.35	Spain	€1.56
Wallonia (Belgium)	€3.18	Japan	€1.50
England & Wales	€3.09	Canada	€1.28
France	€3.03	Italy	€1.17
Sweden	€2.91	Greece	€1.13
Switzerland	€2.54	Portugal	€1.00
Austria	€1.98	Korea	€0.62
Czech Republic	€1.97	Mexico	€0.40

Source: OECD (2010)

Notes: Prices are Euros per cubic metre. One cubic metre equals 1,000 litres. Figures are converted from UD Dollars at an exchange rate of 1 US Dollar equals 0.81 Euro.
OECD estimates based on country replies to a 2008 OECD survey.

Table 5.2: Annual water and sewerage household bills in Great Britain

Water and sewerage company	Average bill for 2011/12	Forecast average bill for 2013/14
South West	€608	€587/€646*
Wessex	€504	€562
Dŵr Cymru	€484	€511
Anglian	€468	€511
Southern	€467	€528
United Utilities	€442	€478
Yorkshire	€399	€433
Northumbrian (North East)	€395	€422
Scottish Water	€381	€393
Thames	€375	€416
Severn Trent	€366	€394
Industry Average	**€444**	**€476***

Sources: Wallace (2011), Ofwat (2013), Scottish Water (2013)

Notes: Companies in table to match those used by Wallace (2011). Converted from Sterling. Figures are based on an exchange rate of 1 Euro equals 0.85 British Pound Sterling. Median annual bill 2011/12 = €442; Median annual bill 2013/14 = €478
*Customers of South West Water will receive a £50 subsidy, bringing the forecasted average bill from €646 to €587. Industry average is based on the lower figure for South West Water

Table 5.3: Annual water only household bills for 2013/14 in England and Wales

Company	Water only company	Average water bill	Company	Water only company	Average water bill
Wessex		€293	Severn Trent		€208
South West		€270	Affinity Water (Central)	Yes	€205
Northumbrian (Essex & Suffolk)		€260	Affinity Water (East)	Yes	€201
Thames		€244	Yorkshire		€196
Cholderton	Yes	€240	Northumbrian (North East)		€193
Affinity Water (South East)	Yes	€239	Southern		€186
South East	Yes	€236	Bournemouth	Yes	€181
Anglian		€228	Dee Valley	Yes	€176
United Utilities		€227	South Staffordshire	Yes	€169
Bristol	Yes	€225	Cambridge	Yes	€153
Sutton & East Surrey	Yes	€219	Portsmouth	Yes	€113
Dŵr Cymru		€213	**Average (weighted)**		**€219**

Source: Ofwat (2013)

Notes: Converted from Sterling; Figures are based on an exchange rate of 1 Euro equals 0.85 British Pound Sterling
Median annual water only bill 2013/14 = €213
*Customers of South West Water receive a £50 subsidy for their combined water and sewerage bill. This table does not include the subsidy.

Fitz Gerald and Morgenroth (2012) estimate that an efficient Irish water utility would require total revenue streams of €1 billion a year. The company sector currently pays €230 million a year and FitzGerald and Morgenroth (2012) envisage that €350 million in revenue could be sourced from company charges. In the absence of any subsidy the remainder of €650 million would therefore need to be sought from domestic water charges. Given DECLG's (2013) estimate that Irish Water will have close to 1.35 million domestic customers - the €650 million figure suggests an average water and wastewater bill of €481. This is very much in line with the average water and wastewater bills prevailing in Great Britain. The average water and wastewater bill is estimated to be €238 in Ireland in 2015 (CER, 2014b) which is exactly half of the average bill in Great Britain.

There is substantial variation across the OECD countries in terms of the financial burden placed by water and wastewater charges on the lowest income decile (i.e. the poorest 10% of households). Estimates are shown in Table 5.4 (OECD, 2009). Not including Ireland, water and wastewater bills for the lowest income decile range from a high of 10.3% of disposable income in Turkey to 0.8% in Iceland. The unweighted average for the OECD is 2.3%. This equates to €200 per annum for the poorest income decile in Ireland.[17] Fifteen out of thirty

[17] Based on a gross household income for the bottom decile of €8,676 - calculations are based on microdata from CSO's 2011 Survey on Income and Living Conditions

OECD countries (including Ireland) were able to keep water and wastewater bills at or below 2% of disposable income for the poorest income decile in 2005 while eleven out of thirty OECD countries were able to keep those bills at or below 1.5% of disposable income for the same group. However, at least eight out of thirty OECD countries would have failed to meet the minimum standards required by the United Nation's 2010 resolution on the right to affordable water (United Nations, 2010) as the cost of water and wastewater exceeded 3% of disposable income for the poorest income decile.

Table 5.4: Average water and wastewater bills for the lowest income decile in 2005

Country	% of disposable income	Country	% of disposable income	Country	% of disposable income
Turkey	10.3	Belgium	2.4	Greece	1.4
Poland	9.0	France	2.2	Switzerland	1.4
Slovakia	5.3	USA	2.2	Canada	1.3
Hungary	4.8	UK	2.1	Norway	1.2
Czech Rep.	3.9	Australia	2.1	Korea	1.1
Germany	3.5	Spain	2.0	Italy	1.1
New Zealand	3.3	Austria	1.7	Netherlands	1.1
Mexico	3.1	Luxembourg	1.6	Sweden	1.1
Denmark	3.0	Finland	1.6	Iceland	0.8
Portugal	2.7	Japan	1.5		

Source: OECD (2009)
Notes: Median = 2.1%; The lowest income decile represents the poorest 10% of households.

6. AFFORDABILITY POLICIES

Service charges, like consumption taxes, are generally regressive. In this context care must be taken that low income households and those with particular needs are protected. Water is an economic good and in principle there is no compelling rationale for water to be treated differently to other essential goods such as food, shelter, clothes and energy. The problem of water affordability and equity can be considered in one of two ways:

(A) We can treat the problem as being that water is too expensive, or

(B) We can treat the problem as being that certain people do not have enough resources (TASC, 2012).

There are therefore two broad strategies that can be used to resolve the affordability and equity problem. The first strategy is to reduce the price of water – potentially all the way to zero. The second and alternative strategy is to supplement the incomes of those on low income. Most affordability strategies ultimately fall into one or other of these two categories.

The more economically efficient way to resolve the affordability problem is to allow the price to be set as normal, and then to supplement the capacity to pay of households with low disposable income and other vulnerable households. This strategy avoids price distortions and directly addresses the distributional issue. The alternative strategy of reducing the effective price of water via a universal free allowance, universal subsidy, or some similar

mechanism will lessen the degree of water conservation and lessens the allocative efficiency of water use. Crucially, the key consideration for protecting low income groups is **not** average tariff levels over the population.

A Universal Free Allowance (UFA) contravenes the 'polluter pays' principle, is poorly targeted, highly costly, and unless generous, will be ineffective as a means of averting affordability concerns for low-income households. Low-income and other households with special needs can be better protected, and less expensively, by supplementing their income. While an income supplement will require funding from general taxation, a UFA could require even greater funding depending on the generosity of the allowance. UFAs generally represent bad value as measures to help those on low income because, to provide a small subsidy to low-income households, the Government will have to subsidise water for all households regardless of means and circumstances. A UFA has to be subsidised either through higher charges on use above the UFA or through general taxation. In addition, unless the UFA is differentiated by household it will disadvantage larger households relative to single person households, and will also disadvantage those with greater water requirements. The Commission on Taxation (2009), argued against the introduction of a free water quota in its 2009 report. It argued that a relatively generous quota would not encourage conservation and a low quota per householder posed significant administrative difficulties (Commission on Taxation, 2009).

Table 6.1: Common policies to support water affordability in the OECD

Policy measure	No. of countries
Income support for low-income households	30
No disconnection of water supply for low-income households in arrears	14
Subsidies for water supply and/or sanitation over 30% of total service cost	13
Progressive water tariff in general use	13
Social water tariff (reduced price for certain groups of users)	12
VAT on water below normal rate	11
Unmetered (cheap flat rate tariff)	11
Targeted assistance (grants or forgiveness of arrears for low-income groups)	9
No fixed fee (only proportional fee)	8
Reduced waste water tax or other water charges for low-income groups	6
Provision of first block at zero price for low-income or all households	3

Source: OECD (2006), Table 6
Note: Out of 30 OECD countries surveyed

Overall the UFA is an inefficient social policy and one that will lead to overconsumption of water. Fortunately there are a number of other superior ways to reduce the burden of water charges on low-income households. Table 6.1 outlines the most commonly used affordability measures in the OECD. Income supports were common to all thirty countries in 2005, while fourteen out of thirty OECD countries forbade disconnection of the water supply (OECD, 2006). Substantial subsidies as a percentage of total cost for water and sanitation supply, reduced prices for certain groups (social tariffs), progressive water tariffs, and reduced VAT on water, are all commonly used by OECD countries as measures to increase affordability. Flat

rate tariffs are often identified as an affordability option but offer few advantages other than simplicity and should not be introduced even for an interim period; they are regressive and will disproportionately impact upon vulnerable low-income households. In addition, a flat annual charge will generate no environmental benefits and may even be counterproductive as consumers will feel they have 'paid' for their water and will have no incentive to conserve water.

The Department for Environment, Food and Rural Affairs (DEFRA) in the United Kingdom established an *Independent Review of Charging for Households and Sewerage Services* which compared a number of different charging bases (e.g. flat rates, rateable value, property type and occupancy) against eight defined fairness principles (see Walker, 2009). Table 6.2 shows the conclusions. Only volumetric charging scored well as a charging base. Volumetric charging satisfied a majority of the fairness tests – although crucially the one test it did fail was the affordability test. This suggests that in order to fully address fairness principles a volumetric tariff structure needs to be combined with income supplements for low income and other vulnerable groups.

Table 6.2: Comparative assessment of charging bases against fairness principles

Principle	Flat rate	Volumetric	Rateable Value	Household Occupancy	Bedrooms	Property Type
Water efficiency incentive	No	**Yes**	No	No	No	No
Cost-related	No	**It can be**	No	No	No	No
Polluter pays	No	**Yes**	No	**Partly**	No	No
Affordable	No	No	No	No	No	No
Fair to companies	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Simple and transparent	**Yes**	**Yes**	No	**Yes**	No	No
Administratively feasible	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**

Source: Walker (2009), Table 4
Note: Rateable value is conceptually similar to using property tax bands

From an efficiency perspective it is preferable to charge the full cost of water including the cost of environmental externalities. However, efficient water pricing mechanisms almost invariably have negative redistribution implications (Dinar, Rosegrant and Meinzen-Dick, 1997). Negative distributional effects can be eliminated through a system of differentiated income supplements to support low income households and other defined groups. Examples include differentiated water contributions, direct cash transfers and social tariffs.

Water credits

Income supplements can come in the form of differentiated water contributions (water credits) or direct cash transfers. Under a system of water credits, a designated government department would directly contribute a defined percentage of the water bill for each household. The size of the contribution from the government department could be anywhere from 0% to 100% and would be calculated based on the characteristics of the household, for example, the household's disposable income, the number of people in the household and any special need for water (e.g. related to certain medical conditions). For a substantial percentage of households the contribution would be set at 0%. Water is a merit good and there is a public interest in ensuring that, for public health purposes, each household uses a certain minimum amount of water. A properly designed water credit model would ensure that those on lower incomes would not have to decrease their water consumption below a level necessary to maintain public health.

Direct cash transfers

Direct cash transfers would have the advantage of providing the recipient household with greater choice over their household expenditure. Direct cash transfers would also be more economically efficient than water credits but would not deal with public health concerns as effectively as would water credits. This is because the social health benefits of water usage exceed the private benefits of water usage, and therefore the willingness to pay for water services is below the socially optimal level (Hall and Lobina, 2010); in other words, there is a risk that households suffering from deprivation will be forced to divert the direct cash transfers towards other essential items, and to reduce their use of water below the optimum level for their own health and for public health generally.

Cross-subsidisation

A variation on the water credit model is the cross-subsidisation model. Differentiated water credits can be funded by government subsidies or through cross subsidisation by higher income groups. The cross subsidisation model is similar to the basic water credit model with the important exception that higher income households would receive a negative water contribution, i.e. an additional charge, and this additional charge would offset the positive water credit allocated to lower income households. Although cross-subsidisation is more progressive than funding from general taxation there are likely to be major administrative complexities associated with developing a cross-subsidisation model. The cross-subsidisation model is also likely to be difficult to implement politically and may lead to over-consumption by subsidised consumers and under-consumption by subsidising consumers (Hung and Chie, 2013).

Social tariffs

Social tariffs entail setting different tariff structures for different categories of people. Typical categories include the unemployed, pensioners, the disabled and low-income groups. Social tariffs are intuitively attractive. The increase in the Household Benefits Package and the Fuel Allowance announced in Budget 2015 can be thought of as working in similar fashion to social tariffs given they benefit defined categories of people and were explicitly introduced to help offset the cost of water and wastewater bills. However, Gorecki, Lyons and Morgenroth (2013)

modelled a number of affordability options as part of research conducted for DECLG and found that the Household Benefits Package and the National Fuel Scheme are actually very poorly aligned with those households likely to experience water poverty. Given their ineffectiveness at dealing with water poverty it is not recommended that these packages and schemes should operate as the core policy levers for ameliorating water poverty. It is useful to clarify and remember the purpose of affordability measures. The justification for an affordability measure is to ensure that:

1. The overall water charging regime does not increase poverty or push households below a certain minimum standard of living, and
2. The overall water charging regime does not reduce the progressivity of the overall system of charges, taxes and benefits.

In this context income, net wealth and poverty (post water charges) are the only objective criteria that should be used as the basis for affordability measures. Exceptions might be appropriate for certain groups such as individuals with increased water requirements e.g. related to a medical condition. Different affordability models are compared in Table 6.3.

Table 6.3: Comparison of water affordability models

Model	Administrative complexity	Subsidises	Subsidy type	Funding	Environmental benefits	Exchequer cost
Universal Free Allowance	Low	All	Fixed	Taxes	Low	Highest
Direct Cash Transfer	Low/ Medium	Lower income or other defined group	Variable	Taxes	High*	
Income Related Water Credits	Medium	Lower income (tapered)	Variable	Taxes	Medium	
Cross Subsidisation	High	Lower income	Variable**	High income groups	Medium/ High	Minimal
Social Tariffs	Low/ Medium	Defined groups	Fixed	Taxes	Medium/ High	

Source: TASC (2012)
Notes: *Potential public health risks
** The subsidy under a cross-subsidisation model will be negative in some cases

There is no commonly agreed rule on what constitutes water affordability, but it is generally understood to refer to the user's capacity to pay. That is the share of the household's disposable income that is required to pay the bill. However, measuring water affordability is difficult and complex. According to Ofwat (2011: 8) any measure or indicator chosen will "inevitably reflect a judgement about the relationship between water . . . and other household needs. So, for individual customers, how difficult they find it to pay their water and sewerage bills will depend on a range of factors – including other demands on their household income".

An independent advisory group was established by Ofwat to examine suitable approaches and developed an indicator based on the percentage of income (after housing costs) that was spent on water and sewerage services. The group settled on an indicative threshold of above 3% of household income spent on water bills. In many OECD countries the average water and wastewater bills as share of income of the lowest decile of the population is below 2%.

When considering a water credit model the precise scale of a particular household's water credit (or other income supplement) could vary depending on the characteristics and circumstances of the household. Examples of relevant characteristics include household income and household size. One option would be to cap water and wastewater charges for all households at a defined percentage of the household's disposable income. While there is no universally agreed threshold for assessing water affordability a reasonable affordability goal would be to ensure the cost of water does not exceed 2% or even 1% of disposable income for the poorest income decile. This seems an achievable goal. The average water and wastewater bill as a share of disposable income of the lowest income decile of the population is just 1.1% in Sweden, the Netherlands, and Italy (OECD, 2006). This equates to a bill of close to €94 per annum for the lowest income decile in Ireland.

A second and more administratively straightforward option would be to have the government subsidise the water and wastewater bill by a defined percentage of the bill with the exact subsidy determined by the household's characteristics including its disposable income and its size. For those household's already in poverty any charge will simply push them deeper below the poverty line. In this context it might be unwise to rely too much on share of disposable income as the only metric for assessing water poverty. It also suggests that the required contribution from government could conceivably be as high as 100% for those households' already experiencing poverty.

7. THE GOVERNMENT'S PROPOSED FUNDING MODEL

The previous funding model for water was heavily reliant on general taxation and therefore contained progressive (income tax) and regressive (VAT) elements. The new funding model for domestic water charges is regressive in its current form. The Gorecki et al. report (2013) noted that concern over water affordability issues among low income households is well-merited. The Irish Government has directed that a Universal Free Allowance (UFA) of 30,000 litres (30m^3) per household will be provided for water and for wastewater. The value of this subsidy is €146 per household using both services. In addition, there is a UFA of 21m^3 for each child. There will be no recurrent fixed charge and the combined service will cost domestic users €4.88 per m^3. The average bill per household is expected to be a little over €238 which over a reasonably conservative base of 1.3 million or so households generates a yield of €310 million from domestic water charges.

The Commission for Energy Regulation projects that the most common household type - a two adult household - will pay €278 per annum and the CER has announced that this amount will be the assessed charge for non-metered households and for all households for the first nine months of charges. €278 represents 3.2% of disposable household income for the bottom (poorest) income decile, 1.8% for the second poorest income decile and 1.3% for the third

poorest income decile. This suggests that under the original plan as announced in July 2014 Ireland would not meet the United Nation's basic affordability threshold of 3% for all households. Meanwhile a two adult household in the top (richest) income decile will on average have to spend just 0.2% of their disposable household income on water services (see Table 7.1). Large households and low income households are clearly the most vulnerable under the original plan. Table 7.1 illustrates the extreme regressivity of the current water charges regime.

Table 7.1: Water affordability measured as share of disposable income under the Government's July 2014 plan (€)

Decile	Gross Household Income	Disposable Household Income	1 Adult Household Bill	1 Adult Share of Income	2 Adult Household Bill	2 Adult Share of Income	3 Adult Household Bill	3 Adult Share of Income	4 Adult Household Bill	4 Adult Share of Income
Bottom	8,675.89	8,657.62	176	2.0%	278	3.2%	380	4.4%	482	5.6%
2nd	15,317.67	15,289.46	176	1.2%	278	1.8%	380	2.5%	482	3.2%
3rd	21,949.04	21,804.00	176	0.8%	278	1.3%	380	1.7%	482	2.2%
4th	27,852.17	27,368.66	176	0.6%	278	1.0%	380	1.4%	482	1.8%
5th	34,795.24	33,814.83	176	0.5%	278	0.8%	380	1.1%	482	1.4%
6th	43,264.32	40,708.83	176	0.4%	278	0.7%	380	0.9%	482	1.2%
7th	55,139.07	49,716.98	176	0.4%	278	0.6%	380	0.8%	482	1.0%
8th	70,347.16	61,010.92	176	0.3%	278	0.5%	380	0.6%	482	0.8%
9th	93,277.24	76,537.41	176	0.2%	278	0.4%	380	0.5%	482	0.6%
Top	159,018.00	118,250.49	176	0.1%	278	0.2%	380	0.3%	482	0.4%

Sources: CSO (2013); CER (2014b)

Notes: 30% of households contain one adult; 49% of households contain two adults; 13% of households contain three adults; 6% of households contain four adults and 2% of households contain five or more adults

An average of 1.3 million customers receiving both water and wastewater services would yield close to €365 million. However, not all customers will receive both services. The CER estimates an average household bill of slightly over €238. This implies a yield of €310 million based on 1.3 million customers.

Calculations from NERI micro-model using micro-data from CSO's 2011 Survey on Income and Living Conditions

Bills represent annual amounts and are based on CER calculations. The CER assumes that the 21m^3 allowance per child will cover the total water usage for the child.

Each income decile represents 10% of households. The figures for gross income and disposable household income are for 2011 and represent averages within each of the decile groups

The annual water bill is the baseline for a household using both services

The three reliefs announced in Budget 2015 (DOF, 2014) cost a combined €106 million and will ameliorate the impact of water charges but will not fully avert water poverty, while the fundamentally regressive nature of the water charging regime will remain in place. The net gain to the government from domestic water charges therefore appears to be close to €200 million per annum. Even assuming a maximum €100 reduction for each household still leaves households with two or more adults in the bottom income decile, as well as households with four or more adults in the second income decile, facing water bills in excess of 2% of disposable income.[18]

[18] It was claimed in the media that a revised plan involving capped charges was being considered by Government in early November 2014. Apparently a one adult household would pay about €180 per annum (€80 after considering a water-support payment by government) while all other households

8. AN ALTERNATIVE FUNDING MODEL

The UFA model is an ill-thought out and inefficient affordability mechanism. Reducing the average tariff level through a UFA is costly and reduces the scope for better targeted affordability measures for lower income groups. The UFA structure in its current form should be abolished although there is a strong argument in equity that the 21m^3 allowance per child should be retained. A charging model with zero household allowances but with tapered percentage contributions from a designated government department and a capped annual charge would more efficiently and equitably resolve the water affordability issue. Abolishing the 30m^3 UFA creates scope for a system of water credits that would ameliorate (and potentially reverse) the regressive nature of a funding model based on consumption.

The most cost effective way to deal with the issue of water affordability is to restrict household subsidies to those vulnerable to water poverty. This could be achieved through a system of income related water credits where an assigned government agency would directly make a percentage contribution to the water bill for each household. The exact size of the government's contribution to the water bill would vary from 0% to 100% depending on the household's disposable income. Affordability issues related to household size or a specific medical condition may best be resolved by establishing a capped annual charge. Disposable household income is the most appropriate subsidisation criteria because water affordability is best assessed by comparing the water bill to the users' capacity-to-pay and by considering the users' disposable income post water charges. Reasonable targets would be to ensure that the cost of water for households does not exceed an average of 2%, or even 1%, of disposable household income for all income groups and that water charges do not push households any deeper into poverty.

A viable water credit based scheme needs to be consistent with a number of policy goals. These include the sustainability dimensions (conservation goals, economic efficiency, financial sustainability and affordability itself – which in this context is relevant for political sustainability purposes) as well as the general tenets of design for taxes and charges (equity, efficiency and simplicity). Water charges must be affordable, must not push households into

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would pay €310 per annum (€210 after considering a water-support payment by government). As 30% of households have one adult and 70% have more than one adult this tariff structure suggests a gross yield of €352.3 million based on 1.3 million domestic customers – although this figure is an overestimate given that it assumes all customers are using both services. Adjusting for the fact that a portion of households are using only one service generates a yield of close to €300 million. €300 million would appear to be sufficient to keep Irish Water off-books, albeit barely. The cost of the water-support payment would be €130 million if applied to all households but presumably the relief will be halved for households using just one service – adjusting gives a cost of close to €110 million. Presumably the three reliefs announced in Budget 2015 and costing €106 million would be scrapped. Water charges would remain extremely regressive under this new formula and even after incorporating the €100 water support payment households with two or more adults in the bottom decile will still be vulnerable to water poverty, spending an average of 2.4% of their disposable income on water and wastewater services. Households in the second income decile would have to spend an average of 1.4% of their disposable income on water and wastewater services. It is unclear whether the revised plan will entail fixed or volumetric charges. If the charges are volumetric and a €310 per annum cap is in place it becomes difficult to envisage how sufficient revenue will be gleaned from domestic charges to keep Irish Water off the books.

poverty and will preferably be progressive. On the other hand sufficient revenue must be raised to facilitate borrowing for necessary infrastructure investment and within the context of EU fiscal rules this points to a need to have the water utility 'off-books'. This means close to €300 million is required in 2015 from tariffs on domestic water use.

Table 8.1 describes an alternative charging structure for domestic water use. The gross yield is set at €500 million with an average contribution of 40% from government subsidies. This results in a net yield of €300 million from domestic users. Crucially the alternative structure provides for no household allowance but does retain the allowance for children. €500 million generated from 1.3 million households equates to an average bill of €385 per household. This is a lower average than the forecast average for every one of the regions in Great Britain (Scottish Water is lowest at €393). It is suggested that the gross annual bill per household would be capped at €450 for all households. This is to protect large households and households with medical conditions requiring high water usage. As shown in Table 8.1 no household would have to spend more than 1% of their disposable household income on water and wastewater services while no households would be pushed deeper into poverty.

Table 8.1: Illustrative water credits based charging structure (€)

Decile	Gross Household Income	Disposable Household Income	Gross Average Household Bill	Scale of Subsidy	Value of Subsidy	Net Average Household Bill	Net Average Household Bill as Share of Income	Gross Capped Bill	Net Capped Bill	Net Capped Bill as Share of Income
Bottom	8,675.89	8,657.62	385	100%	385	0	0%	450	0	0%
2nd	15,317.67	15,289.46	385	100%	385	0	0%	450	0	0%
3rd	21,949.04	21,804.00	385	80%	308	77	0.4%	450	90	0.4%
4th	27,852.17	27,368.66	385	60%	231	154	0.6%	450	180	0.7%
5th	34,795.24	33,814.83	385	40%	154	231	0.7%	450	270	0.8%
6th	43,264.32	40,708.83	385	20%	77	308	0.8%	450	360	0.9%
7th	55,139.07	49,716.98	385	0%	0	385	0.8%	450	450	0.9%
8th	70,347.16	61,010.92	385	0%	0	385	0.6%	450	450	0.7%
9th	93,277.24	76,537.41	385	0%	0	385	0.5%	450	450	0.6%
Top	159,018.00	118,250.49	385	0%	0	385	0.3%	450	450	0.4%
Average			385	40%	154	231				

Sources: See Table 7.1

Notes: See Table 7.1

A gross average household bill of €385 over 1.3 million domestic customers will yield €500 million. A net average household bill of €231 over 1.3 million domestic customers will yield €300 million. €385 equates to €96.25 on a quarterly basis. €231equates to €57.75 million on a quarterly basis. €385 figure assumes usage by adults of slightly over 87m^3 and a price of €4.41 per m^3.

The water credit structure as described[19] will retain strong price signals for at least two thirds of the population and will therefore contribute to conservation and to economic efficiency. The structure described should also be sufficient to keep Irish Water off the books but if needs be the price per m^3 could be adjusted upwards to meet Eurostat requirements. Water credits would replace the series of water reliefs announced as part of Budget 2015. The price per m^3

[19] See the Appendix for a description of how a water credit system could be operationalised in practice.

would effectively have to be set in order to yield the gross average household bill of €385. Thus the price per m^3 would be a function of estimated water usage. We can estimate based on the composition of households by adult occupancy and the CER's estimated consumption patterns of $66m^3$ for the first adult and $21m^3$ for each additional adult that estimated average use per household is a little over $87m^3$ and this implies a combined charge for water and wastewater of around €4.41 per m^3.

9. CONCLUSION

The market for water services is a natural monopoly and the decision to move to a single provider has a strong economic logic. Strong and independent regulation will be required to ensure that Irish Water operates with technical efficiency and consumers are best protected in terms of both cost and quality of service. The introduction of water meters and usage based water charges will improve water conservation by reducing demand and helping to identify leaks within the system. A user based system will also contribute to the economic efficiency of water use and the financial sustainability of the water utility. The pricing structure and Irish Water's allowable revenue should be decided by an independent regulator.

On the other hand solutions to affordability questions are more properly decided by the legislature. This paper assumes that a system of water charges will be retained. The change in funding model from general taxation to user based tariffs raises affordability issues for low income households. The government's proposed funding model is highly regressive. The universal free allowance is identified as a serious barrier to the creation of a system of progressive water charges that could ensure the cost of water service provision is fairly distributed over the population while maintaining the conservation and efficiency advantages of a user based model. If a water charging system is to be retained long-term then the universal free allowance system should be abolished and replaced by a system of income related water credits. This would best protect low income households and ensure that no household is pushed deeper into poverty by the move towards a user based funding structure.

REFERENCES

Andreosso, B. and Jacobson, D. (2005) *Industrial Economics and Organisation: A European Perspective*, McGraw Hill

Bakker, K. J. (2001) *Paying for Water: Water Pricing and Equity in England and Wales*, Discussion Paper, Department of Geography, Oxford University

Baumol, W. (1977) *On the Proper Cost Tests for Natural Monopoly in a Multi-product Industry*, American Economic Review, 67(5), 180

Bernstein, J. and Sappington, D. (1998) *How to Determine the X in RPI – X Regulation: A User's Guide*, NBER

Brown, C. and Jackson, P. (1986) *Public Sector Economics*, 3rd Edition, Oxford: Blackwell.

Central Statistics Office (2012) *This is Ireland: Highlights from Census 2011, Part 1*, Dublin: Government Publications.

Central Statistics Office (2013) *Survey on Income and Living Conditions: 2011*, Dublin: Government Publications.

Commission for Energy Regulation (2014a) *Economic Regulatory Framework for the Public Water Services Sector in Ireland Consultation Response Paper*, 15 July 2014, CER/14/075

Commission for Energy Regulation (2014b) *Water Charges Plan Consultation (Executive Summary)*, 31 July 2014, CER/14/366

Commission on Taxation (2009) *Report of the Commission on Taxation: 2009*, Dublin: Government Publications.

Dáil Debates (2014a) *Written Answer to Question 42684/14: Irish Water Expenditure*, Department of Environment, Community and Local Government, 6 November 2014.

Dáil Debates (2014b) *Written Answer to Question 40441/14: Water Charges Introduction*, Department of Finance, 21 October 2014.

Dáil Debates (2014c) *Written Answer to Question 41161/14: Irish Water Funding*, Department of Environment, Community and Local Government, 4 November 2014.

Dáil Debates (2014d) *Written Answer to Question 41407/14: Irish Water Funding*, Department of Finance, 4 November 2014.

Dalhuisen, J., Florax, R., de Groot, H. and P. Nijkamp (2003) *Price and Income Elasticities of Residential Water Demand: A Meta-Analysis*, Land Econ., 79(2), 292-308

Department of Environment, Community and Local Government (2013) *Water Sector Reform Programme*, December 2013, Dublin: Government Publications.

Department of Environment, Community and Local Government (2012) *Reform of the Water Sector in Ireland: Position Paper*, January 2012, Dublin: Government Publications.

Department of Finance (2014) *Budget 2015*, Dublin: Government Publications.

Dinar, A., Rosegrant, M. and R. Meinzen-Dick (1997) *Water Allocation Mechanisms: Principles and Examples*, World Bank Policy Research Working Paper No. 1779

Espey, M., Espey, J. and W. Shaw (1997) *Price Elasticity of Residential Demand for Water: A Meta-Analysis*, Water Resources, 33(6), 1368-74

Fitz Gerald, J. and Morgenroth, E. (2012) *Submission to the Department of the Environment, Community and Local Government on the Establishment of a Public Water Utility and the Future Funding of Water Services*, ESRI, February 2012

Gorecki, P., Lyons, S. and E. Morgenroth (2013) *Affordability and the Provision of Water Services in Ireland: Options, Choices and Implications*, Appendix 5 in Report of the Interdepartmental Working Group on Affordability Measures, DECLG, December 2013.

Grafton, R., Ward, M., To, H. and T. Kompas (2011) *Determinants of Residential Water Consumption: Evidence and Analysis from a 10-Country Household Survey*, Water Resources Research, W08537

Hall, D. and Lobina, E. (2010) *The Past, Present and Future of Finance for Investment in Water Systems*, Paper for Keynote Presentation at IRC Conference "Pumps, Pipes and Promises" Den Hagg, November 2010

Hung, M. and Chie, B. (2013) *Residential Water Use: Efficiency, Affordability, and Price Elasticity*, Water Resources Management, 27, pp. 275-291.

Johansson, R. C. (2000) *Pricing Irrigation Water: A Literature Survey*, World Bank Policy Research Working Paper No. 2449

Littlechild, S. (1983) *Regulation of British Telecommunications Profitability*, Report to the Secretary of State, Department of Industry

Massarutto, A. (2007) *Abstraction Charges: How Can the Theory Guide Us?* OECD Expert Meeting on Sustainable Financing for Water Services from Theory to Practice, November 14-15

Mohayidin, G., Attari, J., Sadeghi, A. and M. Hussein (2009) *Review of Water Pricing Theories and Related Models*, African Journal of Agricultural Research 4(13), pp. 1536-44.

OECD (2006) *Water: The Experience in OECD Countries*, Paris: OECD.

OECD (2009) *Managing Water for all: An OECD Perspective on Pricing and Financing*, Paris: OECD.

OECD (2010) *Pricing Water Resources and Water and Sanitation Services*, Paris: OECD.

Ofwat (2011) *Affordable for all: How can we help those who struggle to pay their water bills?* Birmingham: Ofwat.

Ofwat (2013) *PN03/13 Water and sewerage bills to increase*, Birmingham: Ofwat

Palcic, D. and Reeves, E. (2011) *Privatisation in Ireland: Lessons from a European Economy*, Palgrave MacMillan.

Pashardes, P., Koundouri, P. and S. Hajispyru (2000) *Household Demand and Welfare Implications for Water Pricing in Cyprus*, University of Cyprus Discussion Paper 2001-0

Posner, R. (1969) *Natural Monopoly and its Regulation*, Stanford Law Review, 21(3), 548-643

PWC (2011) *Irish Water: Phase 1 Report*, Dublin: PWC.

Rogers, P., De Silva, R. and R. Bhatia (2002) *Water is an Economic Good: How to Use Prices to Promote Equity, Efficiency, and Sustainability*, Water Policy 4, pp. 1-17

Scottish Water (2013) *You and your home: 2013-2014 charges*, Dunfermline: Scottish Water.

Silvestre, J. (1987) Economies and Diseconomies of Scale in Eatwell, J., Milgate, M. and A. Shliefer, *State versus Private Ownership*, Harvard University Press

Staddon, C. (2010) *Do Water Meters Reduce Domestic Consumption? A Summary of Available Literature*, Heterodox Economics for Environment and Development Network

TASC (2012) *Water Charges: An Equality-Proofed Approach*, TASC Submission to the Consultation on the Establishment of a Public Water Utility and the Future Funding of Water Services, February

United Nations (2010) *General Assembly Resolution on the Right to Water: A/64/292*, New York: United Nations.

Wallace, C. (2011) *Transforming a National Water Industry – Towards a Hydro Nation. The Scottish Experience*, IIEA Seminar, 9 November

Walker, A (2009) *Independent Review of Charging for Households and Sewerage Services*, London: DEFRA.

APPENDIX

The example shown in this Appendix is based on the assumption that user based charges are retained in some form and is intended to illustrate how a water credit system could be operationalised in general terms.

Water bills are set to come due every quarter. Before paying their first bill householders could be given the choice to 'opt-in' for water credits by declaring the household's estimated annual income on a form sent out to all households by the relevant government agency e.g. the Department of Social Protection (DSP) or the Revenue Commissioners. The householder would simply tick the box next to the income tax band containing the estimated gross household income for the year. The bands could be based on the income deciles shown in Table 7.1 and updated once a year to reflect the latest data from the CSO's Survey on Income and Living Conditions (SILC), although the bands could also be quintile based or otherwise based on some defined set of income ranges. The system could be conducted on a self-assessment basis but with random audits. Once returned to the relevant government agency the form would establish the scale of the water credit subsidy owed to the household. The water credits would be expressed as a percentage of the household's total water and wastewater bill. To enable time for the appropriate administrative and IT systems to be established it is suggested that the first bill due in late January 2015 be delayed until late April 2015 and that the first bill would be for six months. Subsequent bills would all be quarterly. Customers could 'opt in' at any time and would potentially qualify for credits from that point onwards. Customers could also opt out at any time.

Example:

Suppose the Government decides to adopt the sample schedule of water credits described in Table 8.1.

1. In advance of the first bill each household would receive a form from DSP (or Revenue if appropriate) asking them to tick the box representing the household's estimated income level, to nominate a bank account, and to return the form to the DSP. A new form would be sent each year asking the householder to update the details. The household may choose not to tick the box but in this event would not qualify for water credits that year. The household address is then linked to a household ID Number which is shared with Irish Water. Suppose the householder ticks the band representing the 5th income decile. This would qualify the household for a 40% subsidy under the schedule.
2. The household sets up a direct debit or some other method of payment with Irish Water and the bill for the address for the first quarter amounts to €80.
3. The household pays the €80 to Irish Water. Irish Water then automatically notifies the DSP that the household address (identified by its ID Number) has made a payment of €80. The DSP pays an amount equal to the appropriate percentage of the bill – in this case 40% of the value of the bill or €32 - into the nominated bank account.
4. As part of each quarterly bill from Irish Water there would be a reminder to the household of the option to opt-in to water credits and a phone number to contact the DSP. In any event the DSP would send out a statement each year to the household

outlining the schedule of subsidies paid by the Department and containing an opt-in form.

5. At no point would the household's income and opt-in details be shared with Irish Water. Only the DSP and Revenue would have this information (and in Revenue's case only in the event of a random audit).