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Group Water Schemes in Ireland - Their Role within the Irish Water Sector

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Abstract: The Irish water industry as a whole is highly fragmented with five distinct categories of water supply. One in five households is not connected to public mains supply. Presently there are over 5,500 group water schemes (GWSs) in existence serving approximately 10% of the population. Having struggled with water quality issues for years, a substantial number of GWSs are now undergoing a period of transition, upgrading or creating design build operate (DBO) systems to establish economies of scale and improved water treatment. Furthermore, analysis of the effectiveness of implementing metering and volumetric charging on GWSs indicates that significant reductions in average household consumption can be achieved. While vast improvements are ongoing there are still many GWSs in breach of EU drinking water quality standards and this paper explores the issues relating to this including inadequate source protection, exceedances in plant design capacity, high levels of unaccounted-for water and limited training. The paper seeks to assess GWS structure, their merits and faults and discusses the effectiveness and longevity of the GWS model as a substantial sector within the Irish water supply industry in light of achieving sustainability of future water supplies required by the EU Water Framework Directive (2000/60/EC).

Key words: Group water schemes, water management and supply, metering and charging, Ireland

Abbreviations:

DBO	Design, build and operate
DoEHLG	Department of the Environment, Heritage and Local Government
EPA	Environmental Protection Agency
EU	European Union
GWS	Group water scheme
NDP	National Development Programme
NFGWS	National Federation of Group Water Schemes
NRWSC	National Rural Water Services Committee
OECD	Organisation for Economic Co-operation and Development
PrGWS	Private group water schemes
PuGWS	Public group water schemes
PWS	Public water supplies
QA	Quality assurance
RBDs	River Basin Districts
SPS	Small private supplies
UFW	Unaccounted-for water
WFD	Water Framework Directive (2000/60/EC)

1. INTRODUCTION

Group water schemes (GWSs) are independent community-owned enterprises consisting of two or more houses and are a means of providing piped water to rural areas where no such supply exists. In Ireland there are over 5,500 GWSs serving over 170,000 households or 10% of the total population (FSAI, 2006). Prior to the 1950s, rural areas outside Ireland's towns and cities lacked piped water supplies and as a result communities were dependant on barrels and buckets with which to draw water from lakes, rivers and wells for their daily needs (NFGWS, 2008b). To solve this issue a strategy was launched in 1959 for the provision of regional schemes by Sanitary Authorities, the provision of group schemes by local authorities if local sources were unavailable and lastly for the provision of piped water by individual householders where neither of the above options were possible. In the 1960s/1970s, the number of group water schemes dramatically increased often through the efforts of farm organisations and local co-operatives (NFGWS, 2008b). At present one in five households in Ireland is not connected to public mains supply (FSAI, 2006).

This paper, following an overview of the current state of the Irish water industry and present deficiencies, examines group water schemes as an important entity of the Irish water sector including their role in achieving sustainability of water supplies. Following the introduction of metering and volumetric charging the effects on water consumption of GWS households are also presented.

2. AN OVERVIEW OF THE IRISH WATER INDUSTRY

2.1 Water industry structure

Across the Republic of Ireland 34 Local Authorities are responsible for local management and strategic planning of water and sewerage services. The Irish water industry consists of five distinct categories of water supply. These are (i) public water supplies (PWS) which are operated by the Local Authority or by private contractor on behalf of the Local Authority; (ii) public group water schemes (PuGWS) and (iii) private group water schemes (PrGWS) of which neither are operated by the Local Authorities; (iv) small private supplies (SPS) which include industrial water supplies or boreholes serving commercial properties e.g. hotels and public buildings; and (v) exempted supplies serving less than 10m^3/day on average or fewer than 50 people which are not supplying water as part of commercial or public activity. This latter category accounts for 10% of the population and mostly consists of private wells serving individual households (EPA, 2009).

The Department of the Environment, Heritage and Local Government (DoEHLG) develops and implements policies and aids the delivery of water services infrastructure in addition to overseeing strategic planning at a national level (Forfás, 2008). The Environmental Protection Agency (EPA) is responsible for water quality and undertakes a range of activities including environmental monitoring, assessment, licensing and enforcement. The European Communities (Drinking Water) (No. 2) Regulations, 2007 allocate the role of supervisory authority over public drinking water supplies to the EPA. Local authorities in turn are the supervisory authority over private water supplies including group water schemes. Water quality of both public and private supply schemes is often monitored by the Environmental Health Service while in some cases monitoring is carried out directly by the Local Authority (HSE, 2008). One flaw is that the Local Authorities themselves must inform the EPA of failures to meet the required water quality standards to which the EPA can direct the necessary corrective action. Additionally these Regulations do not grant the EPA powers to impeach water suppliers who supply unclean water; the EPA may only prosecute a Local Authority when it fails to heed an EPA Direction (EPA, 2009). Local Authorities administer the Rural Water Programme which involves appraisal and approval of applications for GWS capital grants and its main objective is to ensure that water supplied by rural water systems meets the required standards of the EU Drinking Water Directive (98/83/EC) (EC, 1998). These standards were transposed into Irish law by the European Communities (Drinking Water) (No. 2) Regulations 2007 (S.I. 278/2007) (HSE, 2008). The National Rural Water Services Committee (NRWSC), formally the National Rural Water Monitoring Committee monitor the implementation of the rural water programme by Local Authorities and also advise the Minister for the Environment, Heritage and Local Government on national policy on rural water services (NFGWS, 2010).

Operational costs of water and waste water services are met by Local Authorities through the water services element of the commercial rate, charging of non-domestic users for water and waste water provision and other revenues raised by the Local Authority (DoEHLG, 2000). Costs for provision of water services to domestic users are met as part of the DoEHLG's general fund for local authorities (Forfás, 2008). Figure 1 illustrates the regulation of the Irish water industry.

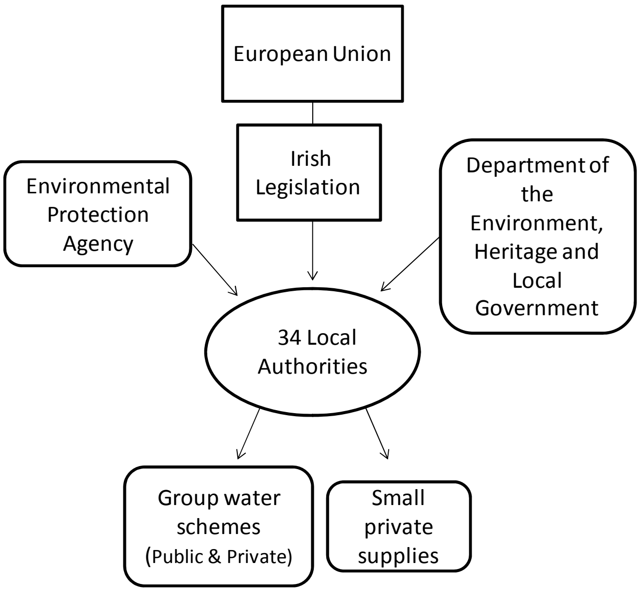

Figure 1. Schematic representation of the regulation of the Irish water industry.

At present public water supplies and group water schemes produce over 1.7 million cubic metres of drinking water per day. Surface water supplies serve 83.7% of the population while the remainder is obtained from groundwater supplies (8.8%) and springs (7.5%). This is mainly the case for public supplies whilst group water schemes and private supplies are slightly more dependent on spring water or groundwater (EPA, 2009).

A key driver of water legislation in both the European Union (EU) and Ireland is the Water Framework Directive (2000/60/EC) (WFD) (EC, 2000), transposed into Irish Law in 2003. It aims to protect and improve water resources and aquatic ecosystems. Requiring a more holistic approach to managing water resources, the overall objective is to achieve '*good ecological status'* for all waters by 2015. Four hundred river basins have been grouped into a total of eight identified River Basin Districts (RBDSs), one based entirely in Northern Ireland and three of which are cross boarder districts (Forfás, 2008). A large proportion of National Development Programme (NDP) investment has been spent on reaching the target goals of the EU WFD (2000/60/EC) (EC, 2000), (Forfás, 2008). Therefore in recent years the majority of the focus has been on improving water quality rather than water usage or supply. Due to strong economic and population growth over the last decade, demand for water and wastewater services has greatly increased across Ireland yet an infrastructure deficit still exists.

2.2 Water pricing

In stark contrast to the majority of its European counterparts, Ireland meets the full capital costs for the provision of water services to domestic customers by the Exchequer. Presently only the commercial sector or non-domestic users are charged for water services. The Water Services Act 2007 mandates full cost recovery for the provision of water services to business and industry and National policy requires that by 2010 charges for non-domestic users are based on metered readings (Forfás, 2008).

When compared with ten other countries the average cost of the provision of water and waste water services in the largest cities, Ireland was ranked third cheapest. However within Ireland there is a lack of transparency on water pricing for enterprise with the combined cost (water and waste water charge) varying greatly throughout the country (Forfás, 2008). The combined charge per m^3 in Co. Galway is €1.50 compared to €2.71 in Co. Wexford (Forfás, 2008). Presently it is not possible to ascertain if water and waste water services are fully cost reflective. There is also a need to establish the full costs of providing water services to domestic users.

However the Irish water industry is presently going through a period of dramatic change with the recent budgetary announcement to install water meters on all domestic households in 2011 with a view to volumetric charging of householders. This is in line with one of the requirements of the Water Framework Directive (2000/60/EC), Article 9 which states that Member States must establish cost recovery for the provision of water services by 2010 (EC, 2000). The recent economic downturn resulting in decreased revenue has also influenced this policy change. Yet the government states that charging of domestic users is unlikely to begin before the next general election in 2012 which means implementation of domestic water charges may in fact not go ahead.

2.3 Current water supply deficiencies

2.3.1 Water shortages

Ireland has a population of 4.2 million with over 1 million people residing in the capital, Dublin (Central Statistics Office, 2008). Overall, there is a mismatch between where water supplies are most abundant (north and west) and where the majority of the population is located, in the east of the country. This will undoubtedly pose greater water supply problems in the near future as the population of the Greater Dublin Area is projected to reach 2.4 million by 2026 (Central Statistics Office, 2008). As population increases, the resulting water availability per capita decreases (Proag, 2006). Many regions are now facing a situation where demand exceeds supply unless alternative sources are developed. Dublin, Athlone and Galway are all predicted to experience water deficits by 2013 (Forfás, 2008). Additionally, Dublin City Council announced that Dublin will begin to experience water shortages by 2016. Currently 550 million litres per day is produced and it is estimated that due to population growth over the next 25 years, demand of 800 million litres per day will be required (DCC, 2010). Ten water supply options to augment present supplies were evaluated which included abstraction of water from groundwater sources, a reverse osmosis desalination plant abstracting water from the Irish Sea and seven options which were variations of abstraction options from the River Shannon. The recommended option is to abstract water from Northern Lough Derg on the River Shannon with the construction of a pipeline for pumping of abstracted water to storage lakes in Co. Offaly and the subsequent pumping of treated water to Dublin, Mid East and Midland regions (DCC, 2010). Supply-side management options which involve meeting demand through development of new resources have been the conventional route for most governments and water utilities in the past. This is again typified in proposed solutions to the Dublin water supply shortfall.

As water supply is a crucial component in investment decisions, water infrastructure which is already over and above design capacity in some regions, coupled with projected water shortages will be a major deterrent for future investment. In recent years development has already been hindered in counties Dublin, Galway, Wicklow and Kerry. Moreover there are the impending impacts of climate change. Warming of between 1.25 and 1.5˚C in mean monthly temperatures is predicted for the period of 2021-2060 with the greatest increases expected in the eastern and south-eastern half of the country (McGrath et al., 2005). Furthermore, a 20-30% reduction in summer rainfall in eastern areas is projected by 2050 (Sammon, 2008).

2.3.2 Leakage

There will always be a certain level of leakage which has to be tolerated and in many cases the majority of the leakage is on the consumer side of service pipe connections. Overall high leakage dramatically increases the cost of producing and supplying water and the general condition of mains, service pipes and service reservoirs is the most significant factor affecting leakage levels in a water supply system (Trow and Farley, 2006). The serious issue of projected water shortages in Ireland could be dramatically reduced if high leakage rates were ameliorated. According to Forfás (2008) gateway and hub towns have average water losses of 43% and water loss in the Dublin region is presently at 29% down from 43% in the 1990s (DCC, 2010). Other European countries have Unaccounted-for-Water (UFW) as little as 10% in Denmark and 3% in Germany (Chenoweth, 2007) indicating that substantial reductions in leakages could be achieved. Replacement of mains will always follow laws of diminishing returns yet some sections of the Dublin supply network consist of 140 year old pipes which have had partial collapses in the past (Sammon, 2008). Dublin City Council intend to lower leakage levels to 20% by 2031 and are presently carrying out a major network rehabilitation programme costing €120 million (DCC, 2010). Without knowledge and confidence in the volumes of water supplied throughout the distribution system it is very difficult to manage the operation of the system and establish future development plans (DoEHLG, 2000). Reducing water losses to the economic level of leakage should be the first priority for local authorities before utilising Exchequer funds for the provision of additional capacity to urban centres (Forfás, 2008).

2.3.3 Information deficit

Each Local Authority appears to be very much a separate entity and has varying degrees of information and recording practises relating to water supplies within their vicinities. This pertains to data on populations served, water volumes produced, leakage levels, sector breakdown of consumption and lastly per capita usage per county which is usually a rough estimate. Purported per capita water usage for a sample of counties across Ireland is 140 l/ca/d in Co. Carlow, 150 l/ca/d in the Dublin region and 200 l/ca/d in Co. Kilkenny. Knowledge of domestic water consumption patterns is well established chiefly in developed nations following the implementation of domestic metering and charging over the last few decades. However, as the vast majority of households within Ireland are neither metered nor charged for water usage, it is rather difficult to understand consumption patterns with little data relating to Irish per capita or household water consumption despite domestic consumption forming over 60% of the total demand for water in Ireland (DoEHLG, 2000).

This information deficit was highlighted almost ten years ago in a National Water Study carried out in 2000 for the DoEHLG, where it was found that there was insufficient information relating to water scheme assets, their condition and performance which is crucial in terms of providing adequate future investment. Other studies have reiterated the issue of limited data relating to water usage and consumption trends in Ireland (Scott and Eakins, 2001; O'Doherty et al., 2007).

3. GROUP WATER SCHEMES (GWSS) IN IRELAND

3.1 Group water scheme organisational structure

Group water schemes can be one of either two categories. Public GWSs obtain their water supplies from the Local Authority generally through a purchase agreement, whereby the quantity used is measured by a meter at the point of connection (DoEHLG, 2000). GWSs of this kind are generally supplied off larger public supply schemes and responsibility for the distribution of water supply lies with the GWS. Private GWSs obtain and distribute their own water supply from a private water source such as a lake, well, spring or river (FSAI, 2006). There is large variation in the number of GWSs per county and also regarding GWS sizes which can consist of between 2 houses sharing a water connection from the same source to over 1,000 households, consisting of a mixture of domestic, agricultural and commercial connections. The majority of non-domestic connections on GWS are agricultural connections. Often large GWSs consisting of over 1,000 households employ full time maintenance personnel to achieve effective management and administration which is the recommendation of the National Federation of Group Water Schemes (NFGWS), a representative organisation for both public and private GWSs. All GWSs must register with their relevant Local Authority and members of the group elect trustees who apply to the Local Authority in order to establish the scheme. The Local Authority is not involved in GWS administration and it is the GWS members themselves who are responsible for pipe network maintenance and also filtration systems in the case of private GWSs. Figure 2 displays the water abstraction, treatment and distribution process on a private GWS.

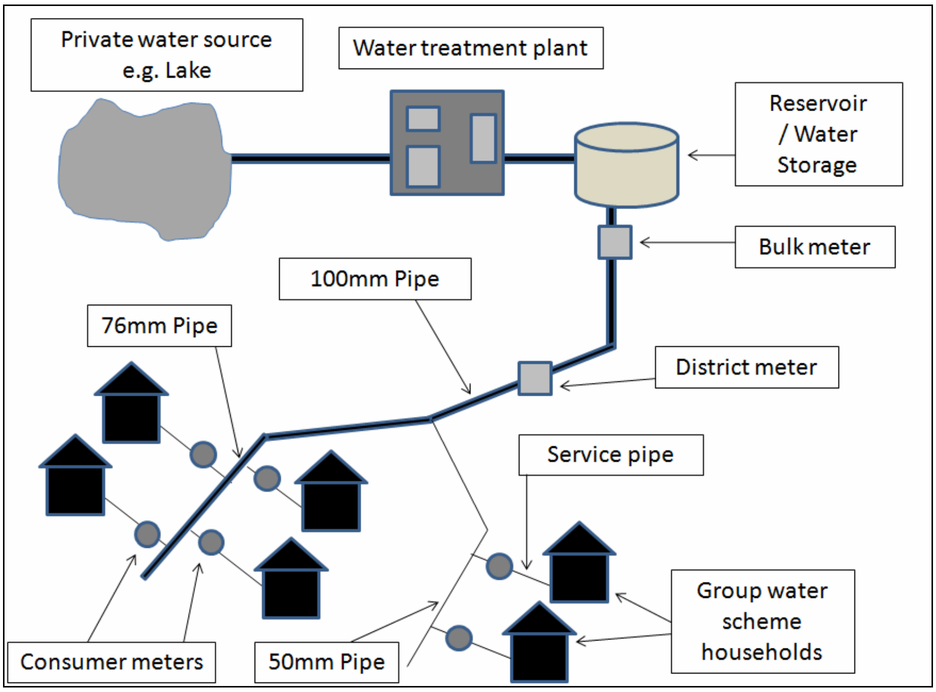

Figure 2. Water distribution network of a private group water scheme.

The overall running of a GWS is becoming increasingly demanding owing to the legalities covering drinking water standards. Many schemes still rely on the voluntary input of members to administer the scheme. The vast array of functions necessary to run a GWS consist of water treatment, establishing safety statements and management, maintaining source protection and monitoring intake, preparation of subsidy claims, meter reading and inspection, leak detection and repairs, billing and fee collection, addressing connections and disconnections, responding to complaints or concerns from members, auditing and accounting, maintaining books and records and holding regular meetings with committee members (Brady, 2006). However, payment of full-time or part-time staff poses greater difficulties for smaller schemes due to a lower consumer base in terms of cost sharing. A possible solution to this issue is for a number of GWSs to ‘bundle’ and share management and maintenance structure (Brady, 2006).

Group water scheme charges are set at Annual General Meetings. The amount each GWS member is charged varies depending on GWS running costs and overheads. There are numerous factors that affect GWSs’ operational costs and these include the size of the network, the raw water quality of the source, pumping versus gravity flow, and membership profile (farming and non-farming) (NFGWS, 2006a). However as citizens receiving water supply via public mains do not pay domestic charges, domestic GWS users are entitled to a subsidy to cover the operating cost of providing for their domestic needs. Local Authorities provide payment to the GWS rather than individual householders (DoEHLG, 2007). The subsidy is divided into two parts (A and B) depending on the operating arrangements of the scheme. Subsidy A is payable to all GWSs to cover operational costs which amounts to €140 per house if water is abstracted from the group’s own source or a subsidy of €70 if the water is obtained from an extension of a local authority water main

(DoEHLG, 2008). A number of conditions are attached to eligibility for the subsidy which include provision of water for domestic purposes that is considered by the Local Authority to be compliant with the European Communities (Drinking Water) (No. 2) Regulations, 2007 (S.I. 278/2007). The GWS must also actively engage in reducing unaccounted-for water (UFW) and implement sufficient measures to conserve water (DoEHLG, 2008). Subsidy B relates to operating costs as part of a design, build, operate (DBO) contract which will be discussed in section 3.3.

Each GWS is considered entirely independent and many are at varying stages of advancement in terms of leak detection and repair and water treatment facilities while a number of smaller schemes use only simple disinfection. The vast majority of GWSs provide information to their members via postal notices but some smaller schemes rely only on word of mouth (NFGWS, 2004).

There are variations across GWSs in terms of meter reading frequency, billing frequency, conservation measures, standing charges, free domestic usage allocations and charges per m³. Some of these variations can be seen in Table 1, which compares pricing structure across 23 GWSs. Many GWSs have been upgraded in recent years with the installation of meters on all connections and thus members are volumetrically charged. However, GWSs still exist where charging is on a flat rate basis. Generally if a scheme can decrease their UFW the charge per m³ can be reduced. The majority of GWSs bill their members annually or biannually. Telemetry systems are often implemented on bulk meters but it is considered too costly to apply telemetry meters on each connection. Consequently meters are usually manually read once or twice per year which can often result in faulty meters or leaks going undetected for long periods. Members themselves should be encouraged to check their meters on a regular basis.

Table 1. Comparison of pricing structures across 23 group water schemes. Source: NFGWS (2006a).

GWS	Maintenance/Standing Charge (€)			Volumetric Charge	Annual free domestic
	House	House & Land	Land	€/ m³	usage allowance (m³)
1	0	0	0	1.06	91
2	100	100	100	0.80	0
3	50	50	0	0.55	136
4	100	100	35	0.44	136
5	40	40	40	0.59	45
6	100	100	100	0.60	100
7	55	55	55	0.55	227
8	50	50	50	0.35	160
9	70	130	130	0.44	273
10	39	39	39	0.55	68
11	90	90	90	0.48	45
12	45	45	45	0.45	100
13	30	30	30	0.50	45
14	100	100	10	0.55	182
15	0	0	0	0.59	0
16	0	0	0	0.33	91
17	90	120	30	0.48	45
18	0	0	0	0.44	0
19	20	20	20	0.60	0
20	50	50	50	0.55	136
21	165	165	165	0.25	136
22	180	220	180	0	0
23	60	100	100	0	0

3.2 Water quality

For many years GWSs have grappled with water quality issues and water supplies on private GWSs have generally been considered inferior to that of both public GWSs and public water supplies. Much of this can be attributed to insufficient funding for infrastructure and treatment facilities coupled with lack of training and limited information on the importance of adequate treatment of water supplies and source protection. Often due to the small size of schemes, it was considered uneconomical to implement advanced water treatment facilities and thus water is insufficiently treated (DoEHLG, 2007).

In 2001, 485 GWSs indicated some degree of faecal contamination and of these cases, 373 exhibited serious incidents of faecal coliform contamination (i.e. > 20/100 ml) (EPA, 2002). On the 14th November 2002 the European Court of Justice found Ireland in breach of water quality standards and thus its obligations under the EU Drinking Water Directive (98/83/EC) (EC, 1998) (NFGWS, 2003). This Directive applies to schemes serving more than 50 people (>15 households). Moreover a later report to the European Commission in 2006 identified a total of 729 schemes that required upgrading (DoEHLG, 2007). The Court threatened to impose a sizeable fine on Ireland unless substantial improvements were made. In order to achieve compliance with drinking water standards the DoEHLG established a number of possible routes for upgrading the substandard private GWSs: (i) Become part of a Design, Build Operate (DBO) strategy; (ii) carry out minor upgrades where groundwater supplies are of appropriate quality; (iii) connect to Local Authority mains supply and become a public GWS or (iv) be taken in charge by the relevant Local Authority. The remaining unsatisfactory schemes which were public GWSs were either to be taken over by the Local Authority or receive pipe network upgrades (DoEHLG, 2007).

DBO bundling continues to be the favoured option of the Department of Environment, Heritage and Local Government (DoEHLG), the National Federation of Group Water Schemes (NFGWS) and the National Rural Water Services Committee (NRWSC). Table 2 indicates the relevant responsibilities for each water scheme type.

Table 2. The relevant responsibilities involved in the water supply process from source to distribution for each water scheme type. Adapted from DoEHLG (2007).

Scheme	*Water Source*	*Water Abstraction*	*Water Treatment*	*Water Distribution*
DBO	*GWS*	*DBO Provider*	*DBO provider*	*GWS*
Private GWS	*GWS*	*GWS*	*GWS*	*GWS*
Public GWS	*Local Authority*	*Local Authority*	*Local Authority*	*GWS*
Local Authority takeover	*Local Authority*	*Local Authority*	*Local Authority*	*Local Authority*

3.3 Design Build Operate (DBO) bundling

A DBO contract involves contracting a single service provider to construct, install and operate water treatment facilities for a period of 20 years (the expected life cycle of a treatment plant) while the GWS remains in charge of the distribution network and the source. Plant capacity is based on theoretical design demand for the number of households on the scheme coupled with future development requirements to 2020 and 25% unaccounted-for-water allowance (DoEHLG, 2007). The optimum process in terms of achieving cost-effectiveness and cheaper operating costs is by means of bundling a number of GWSs to procure treatment plants by a single DBO contract. The bundling option arose after the National Rural Water Monitoring Committee members visited a number of small communities in Brittany, France in December 1999 to assess their facilities for water and wastewater treatment. The plants were under State control yet the small treatment plant technologies utilised in these rural areas were very relevant to Ireland (DoEHLG, 2007). Following this, a pilot bundling scheme was launched in Co. Monaghan comprising of three public schemes and seven GWSs (NFGWS, 2009a). Of the various upgrading options DBO bundling was also considered to be the optimum method for rapidly improving water quality on the greatest number of schemes in the shortest possible timeframe. The DoEHLG accordingly directed Local Authorities to give priority consideration to DBO bundling options when allocating funding for GWSs (DoEHLG, 2007).

The Local Authority acts as employer during the design and construction phase of the project while GWSs then take over as DBO employer during the operation and maintenance phase. The cost of mechanical and electrical works of the DBO treatment plant is 100% funded by the DoEHLG while they also fund 85% of the civil works including the plant building and rising mains with a 15% contribution from the GWS (DoEHLG, 2007). The operation and management costs of the DBO water treatment plant and pipe network distribution system must be paid by the GWS. Subsidy B (section 3.1) is provided to GWSs towards the costs of water provision for domestic use under a *bona fide* operational and maintenance contract as part of a DBO project. This subsidy covers the fixed charge to a maximum of €220 per house for the provision of services to domestic consumers set out in the contract (DoEHLG, 2008). It also covers the volumetric charge stated in the contract for water supplied to domestic users only. GWSs must provide a free allocation of up to 227m³ per household annually. However, for most GWSs it depends on what they can supply and the majority provide in the region of between 100-150m³ free per household. Full universal metering is being installed or is already in place for DBO GWSs. However DBOs are not without their problems particularly in the construction and early operation phases. Difficulties encountered included deteriorating raw water quality, algal blooms, phenol and manganese contamination on schemes and failures despite water treatment due to poor distribution networks. Across Ireland there are a total of 17 DBO projects most of which are now nearing completion. A breakdown of DBO projects per county is shown in Table 3.

Table 3. Design Build Operate (DBO) projects in various counties across Ireland. Source: NFGWS, 2008a.

County	*Number of DBO Projects*	*Number of GWSs involved in DBO projects*	*Total Number of households*
Cavan	*4*	*29*	*8,496*
Clare	*1*	*4*	*3,360*
Galway	*3*	*59*	*8,619*
Limerick	*1*	*18*	*2,790*
Mayo	*2*	*39*	*6,661*
Monaghan	*1*	*10*	*5,708*
Roscommon/Leitrim	*2*	*28*	*2,055*
Sligo	*2*	*11*	*1,990*
South Leinster DBO (Counties Carlow, Kildare, Kilkenny, Laois, Wexford, Wicklow)	*1*	*20 (Also includes 16 public water schemes).*	*3,132*

3.4 National Federation of Group Water Schemes (NFGWS)

The NFWGS was established in 1997 and is the representative organisation for both public and private GWSs. Currently 364 GWSs serving 65,621 households are affiliated with the Federation (NFGWS, 2009d). The primary function of the NFWGS is to service the needs of their GWS members and they actively engage with the DoEHLG in negotiating subsidies and grant supports. They also collaborate and develop partnerships with Local Authorities and other rural organisations and have played a key role regarding the formation of water services legislation (NFGWS, 2009c).

They have greatly aided GWSs through their active role in helping them attain the required drinking water quality standards and once this standard has been achieved, they assist in implementing a Quality Assurance (QA) Scheme to reduce risks of recontamination of supplies. A GWS will not receive full grant support from the Rural Water Programme unless they have participated in QA scheme training (NFGWS, 2009e). To date 200 GWSs have completed the quality assurance training course (NFGWS, 2009d). A number of Local Authorities are keen for their publicly-sourced GWSs to also avail of this course (NFGWS, 2009b).

The NFGWS has dramatically assisted schemes through the provision of other training courses for members in various local venues. These include a leakage reduction course which 65 schemes have availed of and also a management education programme for GWS committees which 107 schemes have completed (NFGWS, 2009d). Training is crucial for members to aid their understanding of the necessary requirements for effective and efficient operation of their GWS.

Furthermore the NFGWS recognises the increasing costs to schemes in achieving drinking water quality standards and actively promotes that schemes amalgamate with their neighbours in order to lessen the financial strain.

4. THE EFFECTIVENESS OF METERING ON GROUP WATER SCHEMES

Metering coupled with pricing can be effective at reducing consumption whilst concurrently recovering costs for the provision of water services. As a water demand management mechanism metering is important on the basis that it links consumption and price in conjunction with informing people on their overall water usage. Arlosoroff (1999) states that a pricing system based solely on a flat rate tariff regardless of volume used would not have any incentives to conserve water as once the flat rate is paid, the price for the volume used is essentially zero. This view is reiterated by the Organisation for Economic Co-operation and Development (OECD) where the abolishment of flat rates is recommended in order to encourage water conservation (OECD, 2006). In Ireland a survey was carried out in 2000 which indicated that if water supply costs were going to increase 56% of individuals would prefer to pay according to the quantity used rather than an increase in taxes or a fixed service charge (Scott and Eakins, 2001).

Water consumption can greatly differ between metered and unmetered households. Following the introduction of a volumetric charge, average demand is reduced by 10% and peaks by 30% (The National Metering Trials Group, 1993). Furthermore comparison of water consumption of ninety households when converted from a flat rate pricing policy to volumetric pricing in Abu Dhabi City found 73% of the households reduced their consumption by an average of 29%. The remaining 27% of households who did not reduce consumption significantly is attributed to the fact that those consumers are high-income households in which water price increases are a smaller fraction of their income (Abu Qdais and Al Nassay, 2001). In a report published by the Environment Agency in England and Wales, 30% of households are now metered and pay volumetric charges. The highest rates of consumption are mostly in unmetered households with some households in the South East of England consuming more than 170 litres per capita per day (Environment Agency, 2008). This is also evident in Canada where individuals paying flat rates use 74% more water than those under volume-based price structures (Brandes *et al.*, 2006).

GWS households are the only metered and charged households in Ireland and provide a valuable insight into the effectiveness of metering and volumetric charging in reducing usage when compared to that of flat rate charging. The benefits of meter installation on GWSs are four-fold: (i) Individuals are only charged for the quantity used and thus are more aware of their usage; (ii) it facilitates leak detection on the consumer side which is most often where leakage occurs; (iii) individuals will augment supplies from other sources for non-domestic use to save on costs and finally (iv) it aids the discovery of illegal connections. Despite receiving a subsidy towards domestic usage, the numerous benefits of meter installation were evident in two separate GWSs described below.

4.1 Implementation of meters and volumetric charging on a group water scheme in Co. Laois

Given the high cost of water treatment coupled with stringent water quality standards which must be met and maintained by all schemes, reducing wastage and promoting water conservation are key goals for all GWSs in the coming years. The implementation of both bulk and universal meters is fundamental in achieving theses objectives. The graph below displays average daily water usage on a 90 household GWS in Co. Laois from July 2006 to July 2008 (Figure 3) (Brady, 2008). Average daily usage is displayed before and after the installation of meters on domestic connections and also before and after the first issuing of bills to consumers.

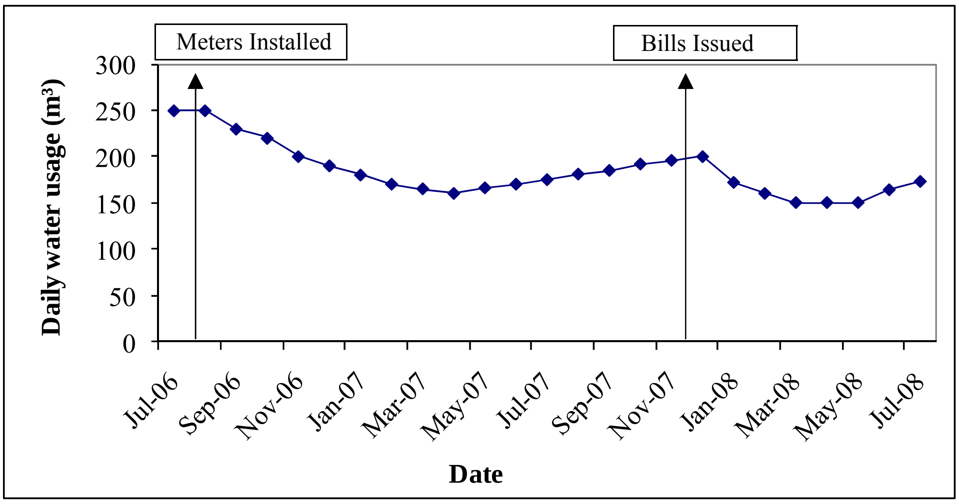

Figure 3. Average daily water usage on a GWS in Co. Laois consisting of 90 households. Source: Brady (2008).

It is evident from the graph that following the installation of meters, consumers begin to reduce their usage. However after a period of time complacency may have set in as the quantity of daily water usage begins to increase. Conversely once bills were issued for the first time, consumers learnt that they were exceeding their domestic allowance and accordingly had to pay. Thus their usage dropped with a reduction of 40% in overall daily water usage. This large reduction is also most likely due to the discovery of leaks after the installation of meters which following repair would decrease daily demand.

4.2 Installation of meters and comparison of household water usage following the switch from flat rate to volumetric charging on a group water scheme in Co. Clare

The effectiveness of metering and charging was also evident on a private GWS in Co. Clare. Water consumption values of 163 households during the years 2007 and 2008 were collected from the GWS which is currently producing 350m^3/day. The scheme which is mostly rural is 15 miles in diameter and comprises of approximately 400 domestic connections. Members are billed annually. Originally the scheme had UFW at 62%, producing 35m^3/ hour. However since implementing meters, leakage has been dramatically reduced and presently the scheme is producing less than 15m^3/hour.

Prior to installing meters, each household was charged an annual flat rate of €75 and non-metered farms were charged €200. To date meters have been installed on 360 households who are now charged 0.90 euro/m^3 if they exceed their domestic allowance of 150m^3 per household. According to the manager an average family of four are unlikely to exceed this quantity unless a leak is present. Running costs for GWSs can be staggeringly high and in 2007 it cost €500,000 to run the scheme. However, an overall decrease of 14% in average household water usage was observed between 2007 and 2008 following the switch from flat-rate to volumetric charging.

These two case studies give further valuable evidence into the effectiveness of metering and volumetric charging in controlling wastage of treated water, thus reducing household usage even with the provision of a free domestic usage allowance. Where water is not metered or measured, it results in overuse of water and provides no incentives for efficient use (Gleick, 2000). There is a serious need to operate water services more cost-effectively. However, it is important to also consider the costs of installation and management when implementing metering. The demand mechanism of volumetric metering and charging alone will not achieve consistent reductions as with increasing income, water charges represent a smaller proportion of income (Abu Qdais and Al Nassay, 2001). Consumers must also be informed of the average water usage for a household with similar occupancy and also of the value of water and fragility of supplies. Promotion of augmenting existing supplies through water reuse and rainwater collection will also reduce demand on resources. A holistic approach to water management is central in securing cost effective and efficient functioning of all schemes, both public and private.

5. PROBLEMS WITHIN THE GROUP WATER SCHEME SECTOR

5.1 Water quality concerns

Despite considerable improvements in both water quality and the operation of GWSs in recent years, deficiencies still remain in this sector of water supply. The most recent Environmental Protection Agency (EPA) report highlights that GWS supplies continue to be second-rate to public water supplies (EPA, 2009). This is not to say that public water supplies are wholly efficient as 52 supplies (5.5%) were found to have exceeded E. *coli* standards with 11 cases displaying serious exceedances in the years 2007-2008. Yet in comparison, of the 586 private GWSs monitored, 184 schemes or 31.4% exhibited E. *coli* contamination with 65 (11%) cases displaying serious exceedances. Additionally, 103 small private supplies (13%) were also found to exceed E. *coli* standards with 40 serious cases. The issue of inadequate disinfectant and maintenance of the distribution mains on GWSs is also a concern as 54% or 318 private GWSs failed to meet the coliform bacteria EU parametric value. Furthermore 298 small private water supplies also failed to meet the coliform standard (EPA, 2009).

Schemes which upgraded via installation of disinfection/sterilisation were still found to exceed drinking water standards. Ineffectiveness was also found in the case of larger non-DBO upgrading of schemes. This may be due to insufficient network maintenance (DoEHLG, 2007). Regular flushing and scouring of the network is crucial to avoid contamination. However a study of 75 randomly sampled GWSs carried out in 2003 found that almost one third of GWSs do not scour their distribution networks (NFGWS, 2004). Particular focus must be placed on smaller, less well organised GWSs or on those GWSs not upgrading as part of a DBO contract as corrective action programmes must be in place to address breaches of water quality standards.

One likely cause of contamination with regard to water supplies is the high percentage of malfunctioning septic tanks which blanket rural areas. It is estimated that there are approximately 300,000 of these individual wastewater treatment systems nationwide (DoEHLG, 2007). Septic tanks pose threats to both groundwater and surface water supplies if not properly maintained. Preliminary figures from a National Source Protection Pilot Study indicate that 65% of septic tanks are not functioning correctly (NFGWS, 2008d). Lack of knowledge or misinformation can also play a part in that many GWS members are perhaps unaware of the dangers posed by allowing farm animals to pass through streams which feed sources used for the provision of drinking water to schemes. Accordingly the promotion of source protection to all GWS members is crucial in maintaining contamination-free water supplies.

5.2 Local Authority takeovers/Group water scheme connection to public mains supply

Whilst substantial progress has been made regarding DBO bundling of schemes, a number of Local Authority takeovers and connection to public mains have had less success. Some GWSs that are due to upgrade are reluctant to agree to either option. Agreement of all members is required to have a scheme taken over by a Local Authority. However the Water Services Act 2007 consolidates all existing water services legislation and includes provision for the licensing of all water services agencies, including group water schemes. The legal criteria for securing a licence will be to comply with EU drinking water standards (98/83/EC) (EC, 1998). Furthermore this legislation will provide for legal takeovers where two thirds of GWS members agree (DoEHLG, 2007). Licensing is due to commence in 2010 (NFGWS, 2009d).

Reasons for this reluctance often include an unwillingness of non-domestic consumers to pay Local Authorities for the water supply. As the DoEHLG recommend that domestic users receive 227m³ or 50,000 gallons per year for free, only non-domestic consumers on public GWSs would have to pay Local Authority water charges. Many GWS members stress the important of local control and ownership of supplies as the scheme can then determine the charge for water provision (NFGWS, 2008c). Deane (2003) found that the average price per 1,000 gallons (5m³) of water on GWSs was cheaper by over €1 when compared with the price charged by Local Authorities. Also annual charges for farm connections to Local Authority water supplies were found to be more expensive when compared to that of GWSs (Deane 2003). GWS members may also be concerned to switch to public supplies following the highly publicised Cryptosporidiosis outbreak on a public water supply in Galway City in 2007. On the other side of the spectrum, GWSs who are willing to connect to neighbouring mains supply often discover that public supplies are not equipped to cope with the required additional demand as often GWSs attempting to join have high levels of UFW.

5.3 Information deficit

To date, no comprehensive study or national mapping of GWSs in Ireland has been undertaken. While the annual EPA drinking water report (2009) indicates increased monitoring on public GWSs, private GWSs and also small private supplies, a monitoring shortfall remains where no monitoring was undertaken on 9 public water supplies, 60 public GWSs and 2 private GWSs. Furthermore a large number of Local Authorities have yet to identify small private supplies serving less than 50 persons (<15 households or <10m³/day) supplying water as part of a commercial or public activity. Crucially these private supplies must meet EU drinking water standards (98/83/EC) (EC, 1998) but it is unknown whether these supplies are in fact achieving this.

With regard to training, a survey of 68 GWSs affiliated with the NFGWS in 2003 revealed that smaller GWSs had low levels of training (Deane, 2003). Training is a vital aspect for the successful running of a GWS as it informs members of the importance of consistent maintenance of distribution networks and source protection. Evidently if this is the case for small GWSs affiliated with the NFGWS, it is unknown how many smaller GWSs outside the NFGWS are also deficient in training. Local Authorities should insist that all GWS personnel attend mandatory training to achieve effective and efficient management of their GWSs.

5.4 Group water scheme plant design capacity exceedance and leakage levels

Addressing unaccounted-for-water (UFW) is a major priority for GWSs as high leakage levels result in higher water production costs in addition to wastage of energy and materials for water treatment. Some GWSs have had UFW as high as 94% and excessive abstraction to cope with this higher demand can risk the long-term sustainability of the source due to resulting slower recharge and poor quality raw water being drawn into the plant (NFGWS, 2007a). Furthermore high UFW causes the design demand or maximum output of a treatment plant to peak much earlier than projected. Treatment plants are generally designed to include projected growth over twenty years plus an allowance of 25% UFW (Deane and Gallagher, 2008). Figures 4 and 5 illustrate average daily demand for two private GWSs in Co. Monaghan. The straight line indicates the design capacity of the treatment plant from which it is evident that these two plants greatly exceeded their maximum water treatment capacity.

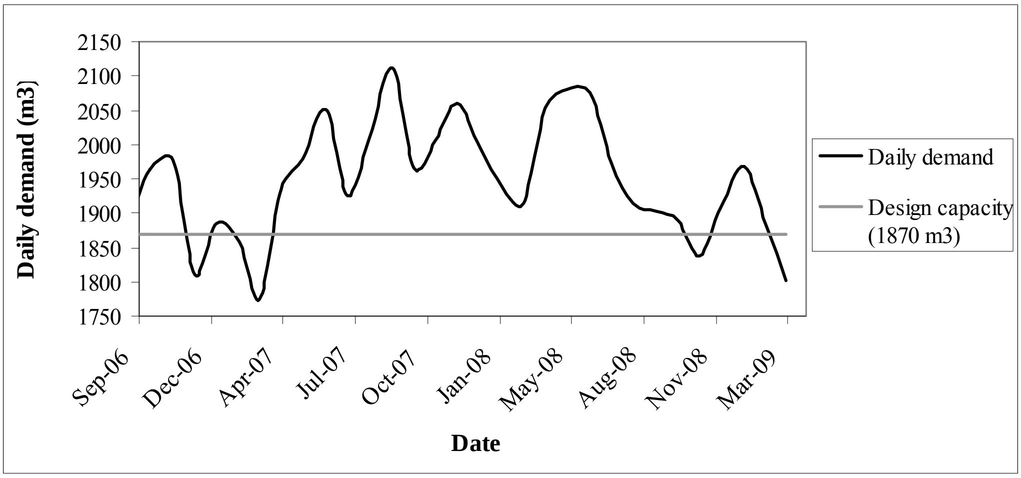

Figure 4. Daily demand and design capacity of a water treatment plant on a private GWS in Co. Monaghan from September 2006 to March 2009. Source: Monaghan County Council, 2009.

Figure 4 displays daily demand of a private GWS serving approximately 1,000 members comprising over 400 farming households and over 500 domestic connections. It consists of 237km of distribution piping. This scheme set about a major UFW identification and demand planning project which was crucial to help identify leaks and reduce strain on both the treatment plant and the source. As can be seen from the graph, daily demand at its peak was 13% over the maximum capacity of the plant but this was dramatically reduced towards the end of 2008. However demand rose again slightly in January 2009 which may have been due to a burst pipe. Longer pipe networks are typical of rural GWSs due to the high dispersal of households when compared to urban areas. Consequently this increases the risk of high UFW due to losses at pipe joints.

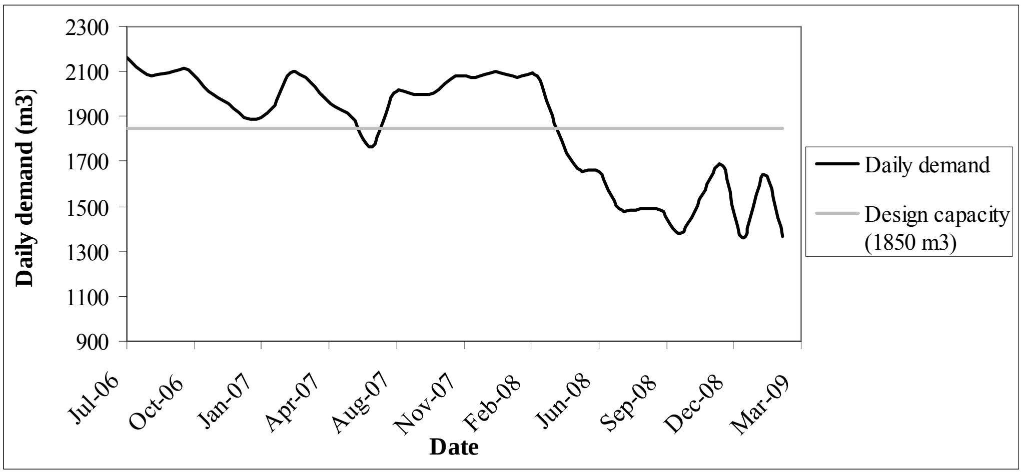

Figure 5. Daily demand and design capacity of a water treatment plant on a private GWS in Co. Monaghan from July 2006 to March 2009. Source: Monaghan County Council, 2009.

Figure 5 displays a private GWS which is widely dispersed across 16 km comprising of over 800 households. The distribution network is 75km long. This treatment plant was exceeding maximum output by 17% in July 2006 but following the implementation of meters and extensive leak detection and repair, daily demand had substantially decreased by 43% to 1364m^3.

The GWSs in the above figures are by no means an exception with many schemes across Ireland greatly exceeding the design demand of their treatment plants. For example, a large GWS in Co. Cavan grappled with daily demand more than twice the design capacity of the treatment plant. Through a multi-faceted approach including bulk and universal metering coupled with leak detection and mains replacement, wastage was reduced by 42% and financially the scheme now saves

€230,000 annually (NFGWS, 2007b). High UFW can be due to a multitude of factors, most notably burst pipes or leakage in the distribution network. Illegal connections can also be a major problem as often a member is unaware they are providing water supply to their neighbour. The installation of universal metering on all GWSs would greatly assist in both the detection of leaks and illegal connections, thus reducing UFW and pressure on supplies. There are also cases where some members are simply excessive users of water. Consequently the promotion of water conservation is vital is maintaining demand below design capacity.

6. THE FUTURE OF GROUP WATER SCHEMES

In light of their original success it is unfortunate that there existed a somewhat negative perception of GWSs and this is partly due to poor water quality standards which led to the European Court of Justice finding in 2002 that Ireland was in contravention of the EU's Drinking Water Directive (98/83/EC) (EC, 1998). However these schemes, mostly run by voluntary staff, coupled with inadequate investment and training had been struggling to maintain effective treatment of supplies. Following the European Court of Justice ruling, GWSs are finally receiving much needed funding and attention from the DoEHLG. However the response from the Government appears more reactive than proactive and had Ireland not been threatened with significant fines, the question remains, would the upgrading of GWSs have progressed much more slowly?

GWSs are presently going through a period of major transition and huge strides have been achieved towards more effective water treatment and operation. Yet a disparity exists between various schemes in terms of their advancement particularly with regard to smaller GWSs. In light of this, the question must be posed; where do GWSs fit in terms of Ireland's water sector and future sustainability of water resources?

6.1 Public water supplies and public group water schemes

Consistent investment from the DoEHLG is crucial to the effective operation and provision of water by public water supplies. In comparison to private GWSs, public GWSs have less water quality issues and this is attributed to the fact that they receive their water supplies via the relevant Local Authority mains with water treated centrally by conventional water treatment plants. Generally public supplies and public GWSs are supplying sufficient quality water to their members and it is envisaged that over time many public GWSs will eventually be taken over by Local Authorities. In the meantime appropriate maintenance of distribution networks will be crucial for public GWSs to prevent recontamination of treated water supplied by their Local Authority. Every year many schemes request to be taken over by their relevant Local Authority due to insufficient resources to maintain the GWS themselves.

6.2 Design Build Operate (DBO) bundles

DBO bundling attracts more competitively priced bids and creates economies of scale for GWSs. By far the crucial benefit of DBOs is that they ensure more effective water treatment and assist compliance with the EU Drinking Water Directive (98/83/EC) (EC, 1998). The understandable hastening by the DoEHLG to avoid substantial fines led to a huge push towards DBO projects with Local Authorities instructed by the DoEHLG to give priority funding to DBOs (DoEHLG, 2007). However the DBO option was found to be the most costly treatment solution, receiving the greatest amount of funding so far and it may take several years to fully ascertain whether they provide value for money (DoEHLG, 2007). Furthermore in a small number of cases the DBO process design has proved inadequate in terms of effectively treating the raw water which necessitates further works (NFGWS, 2009d). Yet in many cases the DBO project was the only viable answer where connection to mains supply was not feasible due to remoteness or in cases where the raw water chemistry on a scheme was not suitable for disinfection/sterilisation (DoEHLG, 2007). For a small number of GWSs the DBO route was chosen because the GWS was simply unwilling to connect to public mains supply despite this been the more economically advantageous solution (DoEHLG, 2007).

Generally pipe network upgrades are being carried out in conjunction with the construction of a DBO plant. However, whilst the DBO operator may produce high quality treated water the onus is on the GWS to maintain the distribution network so as to avoid recontamination of supplies. Otherwise this costly option could be an ineffective upgrade solution.

Whilst DBOs ease the extensive fragmentation of GWSs by means of bundling a number of GWSs together, a number of poorly functioning smaller GWSs still remain and it is these schemes that pose the most concern together with small private supplies serving less than 50 persons (<10m³/day) supplying water as part of a commercial or public activity which have yet to be identified. DBOs should incorporate as many smaller GWSs as possible within the bundle process as these schemes are less well organised, have inadequate training and are less likely to consistently comply with water quality standards (Deane, 2003).

DBOs are essentially a short to medium–term solution to an immediate problem. Due to the 20 year contract, DBOs will most certainly be in existence for this period but it is unknown what will happen after this timeframe as this upgrade solution is as much a learning curve for the DoEHLG as it is for the GWSs involved. In 20 years time the plant will most likely require substantial upgrading, a problem which will be left to the GWSs and Local Authorities to rectify. Another crucial issue is that if Local Authorities wish to carry out widespread upgrading and extension of distribution networks within their region they will be unable to extend this upgrading to any DBO GWSs due to the 20 year contract period.

6.3 Private group water schemes

Despite years of underfunding in terms of investment and facilities, the majority of large and medium sized GWSs are actively engaging with Local Authorities and making considerable progress towards more effective organisation and meeting the required EU drinking water standards (98/83/EC) (EC, 1998). For many GWS members there is a great sense of community, proud ownership and achievement in the provision of a valuable water service for their community.

However private GWSs remain of chief concern to the DoEHLG following EPA annual water quality reports. Traditionally pipe network maintenance was carried out voluntarily on GWSs often by individuals with limited training. However the NFGWS is dramatically assisting schemes through the provision of training courses for GWS personnel. The importance of knowledge and competence in this area of operation and management is vital to the effective treatment and distribution of water supplies (DoEHLG, 2007).

The NFGWS itself is concerned about the future viability of smaller GWSs due to increasing costs in meeting EU water quality standards (98/83/EC) (EC, 1998) and promotes amalgamation of GWSs with neighbouring schemes or connection to public water supplies in an effort to lessen the operational costs on these GWSs (NFGWS, 2006b). In 2009 41 private GWSs connected to public mains supply (NFGWS, 2009d). However, some schemes resist connection to public supplies or Local Authority takeovers and cases exist where the GWS members are dissatisfied with all upgrade options proposed to them (DoEHLG, 2007).

Evidently a pattern is emerging where medium to larger schemes are making significant progress with smaller GWSs lagging behind. Over the coming decades it is envisaged that some of these smaller GWSs will be taken over by Local Authorities due to lack of compliance with water quality standards whilst other GWSs may amalgamate or become part of DBO bundling. It would appear that the DoEHLG is unofficially encouraging the formation of public GWSs rather than private as there is a decrease in the numbers of newly-formed private GWSs. It is most likely that this strategy is to avoid a recurrence of deficient water quality issues on some private GWSs (DoEHLG, 2007).

6.4 Effectiveness of the group water scheme model and its future

Overall the GWS model has been a success as prior to the 1950s/1960s there was a grave need for piped water supplies in small communities and rural homes due to both an infrastructure and investment deficit. Without the onset of GWS formation, this need would not have been fulfilled. The establishment of GWSs provided a core service to rural communities and their success in conjunction with community initiative ensued in the rapid expansion of similar schemes throughout rural parts of Ireland much quicker than the development of public water supply schemes. Furthermore due to the voluntary efforts of their members, GWSs were much less costly to run compared to public supply schemes (DoEHLG, 2007).

However in the last decade the ‘Celtic Tiger’ generated massive economic development and population growth which in turn placed increased pressure on existing GWS water supplies and now the GWS sector somewhat mirrors the rest of the Irish water industry, both are fragmented and playing catch up in terms of infrastructure, meeting demand and the provision of safe drinking water.

Conversely Ireland appears to have been more proactive in addressing water quality issues of small supplies in comparison to efforts in other EU countries. Approximately 40-50 million Europeans or one in ten individuals obtain drinking water from small supplies (serving more than 50 but less than 5,000 people) or very small supplies (serving less than 50 people) including private wells, yet there is a serious lack of information regarding the numbers of these supplies and the number of people served (Hulsmann, 2005). Connection of these small and very small supplies to a centralised mains system is the most popular choice of water treatment solutions among EU countries while provision of information and guidelines is the second most popular (Hulsmann, 2005). Ireland is considered unusual in this regard due to extensive decentralised systems in operation. Finland, Romania and Slovakia are other countries which have undertaken a decentralised approach. However in Finland a policy exists to increase the use of public water services particularly where well water is of poor quality (Hulsmann, 2005).

Given Ireland’s small geographical area, with extensive upgrading and investment public mains water supply could effectively be supplied to most areas which would greatly aid enterprise and industrial development and thus boost the economy in regions outside the capital. However the aspect of value for money must be considered as pumping water through long distribution networks across rural areas would be very costly. Accordingly GWSs will certainly exist for many decades in Ireland particularly in remote rural areas.

Smaller GWSs will be of primary concern to both the DoEHLG and the NFGWS over the coming decades as these schemes are the least well equipped to cope with the many challenges in providing water supplies of sufficient quality. Medium to large sized GWSs are found to be well organised and are an example of effective decentralised water treatment systems. Establishing amalgamation of smaller GWSs to create larger schemes could provide economies of scale through a larger consumer base to carry management and operational costs and thus reduce the risk of poor water provision. As DBOs are the most costly option for the taxpayer and exchequer it is not feasible to fund this option for all substandard GWSs (DoEHLG, 2007). Additionally little is yet known regarding their efficiency and effectiveness into later years of plant operation. Continued investment and upgrading of public water supplies is also crucial to cope with additional capacity requirements for GWS takeovers. A possible concern is that once the DoEHLG implements nationwide metering and charging of domestic users, members will most likely want to retain their GWSs for price control of water provision and this could result in greater reluctance of GWS members to agree to Local Authority takeovers or connection to Local Authority mains supply. Furthermore as a priority Local Authorities must identify private water supplies serving less than 50 people (< 15 households) supplying water as part of a commercial or public activity. These supplies which must meet the required standards of the EU Drinking Water Directive (98/83/EC) (EC, 1998) will undoubtedly require upgrading and it is possible individuals may be unaware that their water supplies are of deficient quality.

The underlying issue for Ireland is the major fragmentation within the water sector both in public water supplies and GWSs. There is a need to assess the effects of this overcomplicated system on catchments. An information deficit exists regarding the condition of assets, UFW, quantitative and qualitative information on the amounts of water available from the natural environment and in relation to demands for water supplies (DoEHLG, 2000). Standard data collection methodologies must be established as rational water management cannot take place in the absence of this vital information. Article 5 of the EU WFD (2000/60/EC) (EC, 2000) requires the characterisation of each river basin district and this process will greatly aid in establishing valuable information on water resources. However the extensive decentralisation of the water sector makes determining the many pressures and impacts on supplies much more difficult particularly as many supplies serving less than 50 persons supplying water as part of a commercial or public activity have yet to be identified. Additionally many supplies are outside of the Drinking water regulations (98/83/EC) (EC, 1998) but may still be impacting water resources which could pose further problems in achieving the objectives of the WFD (2000/60/EC) (EC, 2000).

Also Article 7.3 of the EU WFD (2000/60/EC) requires the avoidance of deterioration in the quality of water bodies in order to reduce the level of purification treatment required in the production of drinking water (EC, 2000). Accordingly source protection will be a high priority for group water schemes as effective treatment of polluted water will no longer be considered adequate (DoEHLG, 2007). The NFGWS are actively involved in promotion of source protection and several schemes in Counties Monaghan and Cavan are implementing preliminary source protection plans (NFGWS, 2009d).

The water sector where currently water is purchased and sold across rigid administrative boundaries needs to be simplified to achieve improved water supply management and operation. Organisation according to river basin districts where water requirements of a particular region are supplied by available resources within that region could provide economies of scale and create greater efficiency in overall water provision. Under the Water Framework Directive (2000/60/EC) (EC, 2000) 400 river basins have already been grouped into a total of eight identified River Basin Districts (RBDs) which provide geographic structures for this alternative supply route (Forfás, 2008). Furthermore supply/demand balances within the river basin district could be calculated as part of strategic planning for investment and future sustainability of resources. In addition water conservation strategies incorporating metering and charging should assume a high priority to aid leak detection and evoke behavioural change on a national scale. If introduced, this river basin district management structure would of course revoke the proposed Shannon-Dublin pipeline supply option. Thus the Shannon would be utilised for water provision to surrounding areas rather than costly transporting water to Dublin which already has a high leakage level of 29% coupled with a lack of metering and volumetric charging of all domestic water consumers.

7. CONCLUSION

There are considerable logistical problems associated with large numbers of smaller supply schemes. Despite significant progress through the implementation of DBOs, treatment plant upgrading, leak detection, mains replacement, connection to public supplies and Local Authority takeovers, there still exists a number of concerns particularly for smaller GWSs. Promotion of source protection and adequate training on the operation and management of a GWS is vital for the effective provision of safe drinking water.

That said the majority of GWSs provide a successful and crucial service to rural communities. Additionally these schemes provide a valuable insight for Local Authorities and the Department of the Environment, Heritage and Local Government into the effectiveness of universal metering on reducing household water consumption, assisting in leak detection and the discovery of illegal connections. The case for implementation of volumetric charging versus flat rate is substantial. Data collated and analysed from a GWS in Co. Clare having switched from flat-rate to volumetric charging indicated a reduction of 14% in annual average household usage. Furthermore daily demands were reduced by up to 40% on a GWS in Co. Laois. This large reduction is also most likely due to additional leak detection and repair which would further decrease daily demand.

Many challenges lie ahead not only for GWSs but also for the Irish water sector as a whole. In the long-term water provision according to river basin districts would reduce water sector fragmentation and achieve economies of scale. Crucially a long-term strategic approach to national planning for future water requirements must be developed in light of projected economic and population growth and the impending impacts of climate change.

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