

WATER FRAMEWORK DIRECTIVE
Summary Report of the economic analysis
required by Article 5
Northern Ireland

March 2005

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1. Introduction

1.1 Article 5 Reporting Requirements

This report provides information required under the Water Framework Directive (WFD).

These requirements cover the following areas:

- An overview of the socio-economic importance of water uses in the River Basin District together with information relating to how this analysis was carried out and how it may be improved in the future.
- An assessment of the current level of cost recovery for water services for household, agriculture and industry, with some indication of a first picture related to subsidies, and information relating to how this analysis was carried out and how it may be improved in the future.
- A summary of work completed to date to establish a baseline scenario including details of work required in the future, particularly covering more complex sectors.

1.2 Structure of the report

This report contains the following sections:

- **Driving Forces:** This section sets out the socio-economic characteristics of Northern Ireland in terms of employment, growth, investment etc.
- **Pressures:** This section attempts to link economic information with the most important activities for the characterisation/risk assessment.
- **Water Services and Cost Recovery:** This section presents information received from Water Service (the Government agency within the Department of Regional Development which is responsible for the provision of water and sewerage services in Northern Ireland) in regard to cost recovery.
- **Cost Effectiveness:** The progress made and the gaps that exist in ensuring costs effectiveness in implementing the programme of measures are detailed in this section.
- **Further work:** Finally, this section sets out the UK Collaborative Research Programme designed to support further work under the Water Framework Directive. In addition it sets out work items that are Northern Ireland specific, i.e. those relating to improving the knowledge and information base.

1.3 Data Sources

This supporting document should be read in association with the Northern Ireland Article 5 Characterisation Summary Report. It has been prepared by the Department of the Environment (Northern Ireland) with economic data collation and analysis undertaken by economic consultants commissioned through the INTERREG-funded North South SHARE project with the guidance and input of independent economist John Joyce, working on behalf of the Department.

A number of data sources have been used in compiling this document. These are detailed as they are encountered in the text, but in summary include data from government, local authorities, environment agencies, university research departments, pressures and impacts outputs and consultancy reports. This assessment is based on pragmatism and the use of existing data sources. The acquisition of new data and integrated data management will form part of the process of improving the knowledge and the information base.

1.4 Public Participation

The need for public involvement is an important feature of the WFD and, in certain areas, such as development of the River Basin Management Plan (RBMP), is statutory. The Department will continue to consult at each stage of the compliance process, even taking into account the small scale of Northern Ireland, and will seek to devise an approach to WFD public participation that has consultation and access to information at its core but that also includes wider active involvement where necessary to help meet the requirements of the Directive.

The preliminary results of the Article 5 pressures and impacts review were published on the Department's website in October 2004, giving stakeholders the opportunity to contribute to the characterisation process. In line with this review, a stakeholder conference was held in early October 2004, focusing on the results of the first phase of characterisation work, along with an overview of the economic element of the characterisation report. The conference included presentations by three key stakeholders on their perspective of the WFD, including the potential impact on their respective interests.

The next steps in implementation of the Directive, and consideration of Programmes of Measures, will involve a higher level of stakeholder engagement.

2. Driving Forces

This section provides an overview of the socio-economic characteristics of the Northern Ireland Economy and includes the following information:

- Economic History
- General Profile: presents an introduction to Northern Ireland's River Basin Districts and IRBDs (RBDs and IRBDs) and details key limitations faced when gathering information.
- Employment: presents an overview of employment and unemployment in manufacturing and services.
- Output and Growth Forecasts.
- Construction and Investment.

2.1 Economic History

Northern Ireland was the only part of the island of Ireland to participate to a significant degree in the birth of the industrial revolution. Development was initially concentrated in the Lagan Valley but subsequently extended to the Bann and Foyle basins. A mix of immigrant expertise and good local raw materials led to the development of a major linen industry in the region, which used water both for motive power and as part of the wet spinning process. Servicing this industry led in turn to the development of a major engineering sector.

The growth of Belfast, in particular, was dramatic. The town with a population of well under 50,000 in 1821 had grown to a city with a population of over 250,000 by 1900. In Belfast early development of linen mills was dictated by the availability of water for motive power and this led to the clustering of mills in north and east Belfast. While the linen industry quickly converted to coal powered steam equipment, these early locational choices by the linen industry are still reflected in Belfast's human and industrial geography today.

Belfast had for long been a port engaged in the Atlantic trade, but port improvements in the 19th century, coupled with the emergence of the linen industry, led to a rapid expansion of trade and the development of a local shipbuilding industry, in both Belfast and Londonderry. Related industries such as boiler-making and rope-making also developed; making Northern Ireland a major centre of import and export trade. Exports of textile-related machinery also contributed to this trade.

The early part of the 20th century was marked by the decline of traditional industries as they struggled to face competition. This was a period of heavy unemployment and low productivity. In the 1960s however, inward investment in a range of new industries brought new jobs and new techniques. The man-made fibres industry was very prominent in these new industries and placed particular demands on Northern Ireland's water infrastructure. By the start of the 1980s, however, both the man-made fibre industries and the traditional Northern Ireland sectors were in decline and

unemployment rose to over 120,000 on a claimant count basis. While clusters of textile manufacturing and the traditional Northern Ireland heavy engineering still remain, they are small in scale and increasingly specialist in nature.

A reflection of these trends is the relatively low level of industrial demand for water, which today accounts for just 13% of Northern Ireland water demand compared to a proportion around half as high again in Scotland (Entec 2004).

2.2 General Profile

Belfast (with a population of 277,391 in the 2001 census¹) is the capital and major centre of population of Northern Ireland which has a total population of approximately 1.7 million. One river basin district (North Eastern) and three international river basin districts (IRBDs) (North Western, Shannon and Neagh Bann) have been identified within Northern Ireland.

For the purposes of this report the scale analysis is at the ‘All Northern Ireland’ level and not RBD level. River Basin Districts in Northern Ireland are relatively small in terms of land area, but are very small in terms of socio-economic scale. For example, the North West IRBD in Ireland/Northern Ireland contains approximately one fortieth of the population that resides in the North West RBD in England. This gives rise to a number of unique factors applying in Northern Ireland that have shaped the analysis, namely: fairness regarding the appropriateness of connecting a single user to a pressure unless there is positive evidence to connect them; and confidentiality because Northern Ireland often has a single company in a particular sector where larger economies have a number of companies in an industry. It is therefore not always possible to extract data from official sources for much of the sectoral analyses that would ideally be sought. Originally, Northern Ireland did not participate in the restructuring of the water sector as undertaken in the rest of the United Kingdom (UK) but is now undergoing strategic change which is discussed in detail later in this document. This change ranges from the introduction of a new separate charge for domestic users, demand management, leakage management, interconnectivity of supply, to the structure of the industry itself.

2.3 Employment

Unemployment has fallen considerably over the last decade and the Northern Ireland labour market continues to perform well and is forecast to continue to do so. The latest employee jobs figure of 683,050 is the highest employee jobs figure on record and the current unemployment rate of 5.1% is 3.0 percentage points below the EU 15 average of 8.1%. In June 2004, there were an estimated 683,050 employee jobs in Northern Ireland – the highest figure on record. The unadjusted total employee jobs figure for June 2004 was 681,370 which represents a decrease of 2,480 from the revised figure for March 2004.

¹ Northern Ireland Statistics and Research Agency
<http://www.nisra.gov.uk/census/Census2001Output/KeyStatistics/keystatrep1.html>

Sector	Numbers (NI)	Percentage (NI)	Percentage (UK)
Manufacturing	-3,760	-4.0%	-2.8%
Services	+14,870	+2.8%	+0.8%
Total(whole economy)	+12,210	+1.8%	+0.5%
Note: Employee jobs figure at June 2004 (seasonally adjusted), Labour Market Statistics also seasonally adjusted			

Sector	Numbers (NI)	Percentage (NI)	Percentage (UK)
Manufacturing	-16,350	-15.5%	-16.8%
Services	+69,830	+14.9%	+8.9%
Total(whole economy)	+57,250	+9.1%	+4.3%

In the period May – July 2004, unemployment in NI stood at 39,000 or 5.1% (seasonally adjusted) of the economically active population; a decrease of 0.03 from the percentage change on the level of a year earlier. In NI the unemployment rate for young people (aged 18–24, unadjusted) for the period May-July 2004 was 12.1%.

The agricultural sector accounted for 2.21% of Gross Value Added (GVA) in 2000 (National Statistics, 2003), with agricultural enterprises employing 58,000 employees, 4.9% of total employment (DARD, 2001). However, employment in agriculture continues to fall, and the number employed in the sector had fallen to 54,500 by 2003. Over the last 25 years, the number of people employed on farms has fallen by a fifth, and the decline is even more significant when the move to part-time and casual labour is taken into account.

2.4 Output and Growth Forecasts

It is estimated that economic growth will accelerate to 3.0% in 2005, with the private sector economy continuing to perform well. 2002 estimates show that total GVA, before allowing for inflation, has been increasing in all the UK regions, although there has been a variation in the rate of increase between regions. In London, the South East and the East of England, GVA per head is above the UK average, while all other regions, including Northern Ireland are below the UK average.

The Q1 2004 estimates for Northern Ireland manufacturing show that there was an increase of 0.7% from the previous quarter, and an increase of 3.8% compared to the same period a year earlier. This rise of 0.7% is the fourth quarter in a row that manufacturing output has increased, however manufacturing output levels are now 2.1% below the highpoint achieved in the first quarter of 2001.

Recent growth estimates and forecasts are shown in table 2.3 below.

	2004	2005
PricewaterhouseCoopers (August 2003)	+2.3%	
First Trust Bank (September 2004)	+3.0%	+3.0%
Note: The 2004 edition of the PwC Economic Outlook for Northern Ireland is not yet available. All First Trust Economic Outlook & Business Review growth forecasts are in % real change.		

2.5 Construction and Investment

The seasonally adjusted Index of Construction for January – March 2004 was down 1.4 points at 102.7 on the previous quarter. The estimated seasonally adjusted value of construction output for the same period was £569m, a decrease of 1.4% on the previous quarter.

32 inward investment projects were secured in 2003/04 offering total investment of £167m, within total commitments to invest approximately £465m in the Northern Ireland economy by client companies of Invest NI, the main economic development organisation in Northern Ireland.

This highlights the extent to which the Northern Ireland economy is undergoing a structural shift. Over the next ten years or so investment that has yet to be made may represent around half the total plant in operation at the end of that period. From a WFD standpoint therefore the nature of this investment is at least as important as the present state and distribution of industry. This investment is concentrated in the knowledge economy - rather than traditional sectors such as textiles. The impact of this investment focus will be to reduce the water requirement per unit of Gross Domestic Product (GDP).

3 Pressures

3.1 Sectors Impacting on Water Status

This section provides information on the sectors that significantly impact on water status. The sectors with a particularly important relationship are:

- Water services;
- Agriculture; and
- Industry.

Information detailing the ‘Characteristics of water use’ (including abstractions, flow regulations, discharges and morphology) is detailed in the Sections 5.4, 5.5, 5.6 and 5.7 of the Article 5 Characterisation Summary Report, which this document supports.

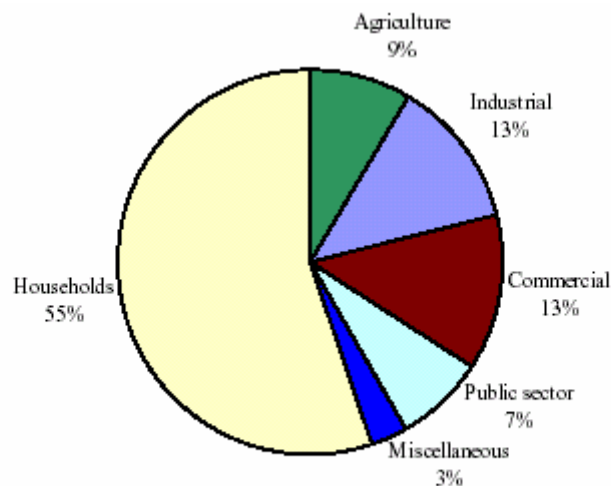
Article 5.1 of the Directive requires that each Member State carries out an economic analysis of water use for each RBD or portion of an international RBD falling in its territory. In practice it has not been possible to work at the scale of the RBD for this reporting requirement and reporting is detailed here on an “All Northern Ireland” scale. Nevertheless, aggregating current water ‘resource zones’ (see table 4.1 below for explanation of ‘resource zones’) to RBD scale will require close co-operation between pressures and impacts analysts and GIS analysts, and this will form part of improving knowledge and information base. This will ensure that assessment at the RBD scale will be made possible by 2008 in line with the requirements in reporting sheet Eco1². In addition, trends in the demand for water and abstraction volume of groundwater and surface water or intake of seawater for key users will also form part of improving the knowledge and information base.

² European Commission (2004), Reporting Sheet ECO1 October 13th, 2004. Version 6.

Water Services

Water and sewerage services in Northern Ireland have been delivered by central government since 1973. The Water Service is an Executive Agency within the Department for Regional Development. The Agency provides water and sewerage services to over 730,000 domestic, agricultural, commercial and business customers throughout Northern Ireland. Water Service accounts for a significant proportion of all pressures³. Currently 37 per cent of all treated water is lost through leaking pipes, and a water efficiency plan is in place to address leakage and related issues (reference <http://www.waterni.gov.uk/pdfs/WEPLAN.pdf>). Water Service's approach to managing water supply was revised and culminated in the publication of the Water Resource Strategy 2002-2030 (<http://www.waterni.gov.uk/pdfs/WRSFinal.pdf>), with demand management and an increase in volumes of abstractions from loughs and rivers, key elements of the strategy⁴. In order to assess water supply, the domestic and non-domestic activities for which water is supplied are detailed in Chart 3.1 below. This chart does not include information on private abstractions.

Chart 3.1 Water supply in Northern Ireland (Source: Entec 2004)



The majority of water is supplied for domestic use, with industrial and commercial users supplied with approximately 50,000m³ per day. Over 99% of households in Northern Ireland are connected to the mains for the supply of clean water⁵. However, the remainder (approximately 15,000 people) are reliant on private sources and there may be additional use of private abstractions by those supplied with mains water. In Northern Ireland, the Department of the Environment's Drinking Water Inspectorate is responsible for regulating and assessing the quality of the public water supply and working with Local Councils in monitoring private water supplies. For the disposal of

³ Please note that Water Service identify 'key users' in terms of their social importance – e.g. a hospital – rather than simply on their usage.

⁴ The Strategy does not contain information on direct abstractions of water – domestic abstractions is thought to be minimal, industrial abstraction could be more significant, resulting in industrial use being understated. The Department of Environment Northern Ireland is currently developing proposals for the introduction of an abstraction licensing system. It is envisaged that such a system would require prior approval for new abstractions and the establishment of a register for larger abstractions.

⁵ DRD, 2003

sewage, 83% of households are connected to the mains sewage system⁶. The remaining households have private septic tanks, the majority of which are emptied by Water Service. It is estimated that Northern Ireland's housing stock is set to expand by 10,000 units per annum over the period to 2030. This will place pressure on existing water and sewerage networks. A recent study commissioned by Environment and Heritage Service (Smith, et al *forthcoming*) calculated the diffuse agricultural phosphorous (P) contribution to inland waters by using export coefficients (see below under agriculture). This study also identified the human contribution to the overall P budget was divided into mains-sewered households (945 tonnes), households connected to septic tanks (118 tonnes) and industrial discharges (40 tonnes).

Agriculture

The Agriculture sector has the potential to have a number of impacts on water quality. Agriculture is an abstractor of water, as well as a source of diffuse pollution (mainly nitrates, phosphorous and pesticides). Sediment run-off can also impact on morphology. Within the sector, the majority of farms are based on livestock, particularly cattle, which are found on 84% of farms. This is shown below in table 3.1. Going forward, output forecasts for key agricultural sectors are currently unavailable and will form part of improving knowledge and the information base going forward.

% of farms with	1990	2000
Diary cows	23	18
Beef cows	55	56
Cattle	87	84
Sheep	38	36
Pigs	9	3
Cereals	19	13

Source: Extract from Entec 2004, drawing on DARD, 2001.

Approximately half of all pressures identified in the Pressure and Impacts analysis (Article 5 Characterisation Report) are diffuse pressures associated with agriculture. A further significant source of pressure in the agricultural sector relates to morphological changes within river basins.

There is a growing recognition that phosphorous (P) is the key nutrient in controlling the degree of eutrophication of inland waters in Northern Ireland. The study referred to in the previous paragraph (Smith, et al *forthcoming*) calculated the diffuse agricultural contribution by using export coefficients. By this method it was determined that 1130 tonnes of P are exported from agricultural land to inland and coastal waters. In addition there are other diffuse contributions from urban streets and surfaces, moorland, forests and peat bogs, which total 165 tonnes of total P. The adoption of the “total territory” approach for the whole of Northern Ireland under the Nitrates Directive (Regulations came into force on the 29th of October 2004) will be followed in due course by regulations setting out appropriate Action Programmes to be implemented to reduce nitrate pollution in Northern Ireland (alongside promoting better farming practices). This will likely lead to a reduction in overall stock density/need for more diversification in the farming industry/rural economy. Successful implementation of the Regulations will reduce nitrate use and the incidence of these diffuse pressures. The ongoing reform of the Common Agricultural Policy (CAP) will also help in the move towards

⁶ DRD, 2003

environmentally sustainable farming through changes in the basis of support for this sector.

Going forward, a key step to improve knowledge and the information based in the agricultural sector will be to build a model able to explain the agricultural pressures on the water system and the reaction of agricultural water users to changes in explanatory variables such as prices and technology. In addition agricultural sector expenses associated with water use, including items such as levies, investment programmes and pollution limited activities will be detailed following this current reporting requirement.

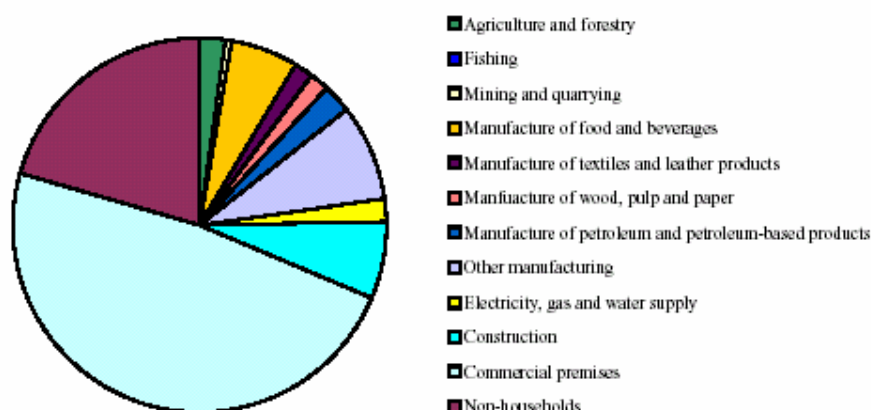
Industry

At the level of an individual RBD in Northern Ireland many industrial sectors are dominated by a single firm or plant, accordingly the projection of the industry is impossible without considering that individual large firm. However, commercial confidentiality limits the extent to which individual firm data can be considered and released. An individual firm displays a much higher risk profile than the industrial sector it inhabits, and any central projection would have to be considered therefore as exhibiting such wide confidence limits around it as to render it useless for progressing the objectives of the WFD. Future analysis will generally consider single plant operations (e.g. filtration technology) than on the prospects for the general sub-sector. In addition, the knowledge and information base will be improved by detailing in as far as possible all industrial service expenses for water and wastewater disposal charges, levies, VAT, pollution reduction schemes etc. Industrial demand is expected to fall slightly, as limited increases in overall levels of output are offset by increased efficiency in use and a sectoral shift towards the knowledge economy.

3.2 Gross Value Added by sector in Northern Ireland in 2003

In order to assess the significance of water use, the activities for which water is used are detailed. These can be consumptive, as for production of mineral water, or non-consumptive, as for cooling of industrial facilities. The value of these processes is considered here in terms of Gross Value Added (GVA) to the economy and employment. This is detailed in Chart 3.1 below.

Chart 3.2 Gross Value Added by sector in Northern Ireland in 2003 (Source Entec 2004 and National Statistics Office)



Collectively, the key water-user - agriculture - and manufacturing industry account for around a fifth of all GVA in the Northern Ireland Economy. Water has a significant cooling use in power stations and with the rest of the utilities sector brings major water consumers to close to a quarter of all GVA. The remaining three quarters of the economy (by GVA) use water in cooking, sanitation and related uses.

4 Water Services and Cost Recovery

4.1 Introduction

Article 9 of the Directive aims to ensure that pricing policies improve the sustainability of water resources and requires pricing policies to perform the following functions by 2010:

- Take account of the principle of the recovery of the costs of water services, including environmental and resource costs,
- Embody the polluter pays principle,
- Provide adequate incentives to use water resources efficiently,
- Ensure that water use groups (separated into at least industry, households and agriculture) make an adequate contribution to the costs of water services.

4.2 Water services and Northern Ireland

Water Services are defined by the Directive as in Box 4.1

Box 4.1 Definition of Water Services

“All services which provide, for households, public institutions or any economic activity:
(a) abstraction, impoundment, storage, treatment and distribution of surface water or groundwater;
(b) waste-water collection and treatment facilities which subsequently discharge into surface water.”

Definition of Water Services, WFD Article 2 Paragraph 38

In Northern Ireland, water and sewerage services have been delivered by central government since 1973, as opposed to the current ‘water industry’ in other parts of the UK. Currently, Northern Ireland Water Services follow the strategy outlined in the Water Resource Strategy 2003-2030 (<http://www.waterni.gov.uk/pdfs/WRSFinal.pdf>).

This strategy is based on the delivery of services in 15 Resource Zones, whose deployable output is shown in the table overleaf, along with Water Available for Use (WAFU) which adjusts this output to allow for possible outages, such as loss of pumping power, algae blooms and so on. It is not possible to simply aggregate these zones down to RBD scale. Going forward, as part of the analysis to improve the knowledge and information base, these zones will need to be adjusted to the RBD scale.

Resource Zone	Deployable Output (MI/d)	Water Available for Use (MI/d)
Antrim/Larne	33.9	32.9
Altnahinch	17.0	16.5
Ballymena	26.2	25.4
Ballinrees	25.0	24.3
Magherafelt/Cookstown	29.5	28.6
Eastern General	355.0	344.4
Lough Cowey	3.8	3.7
Craigavon	67.6	65.6
Dungannon	4.0	3.9
Armagh	21.0	20.4
Lough Ross	6.8	6.6
Newry	53.0	51.4
Faughan/Altnaheglish	59.2	57.4
Derg/Braden/Macrory	32.0	31.0
Killyhevlin	36.9	35.8
Total	770.7	747.9

4.3 Water service providers, users and polluters

Service Providers

In addition to the Water Service in Northern Ireland there are a number of *private providers of water services*. Approximately 15,000 people are reliant on private sources and there may be additional use of private abstractions by those supplied with mains water. Water Service currently provides a service to empty private septic tanks.

Water Users

Water users are defined in Article 2 as: “water services together with any other activity identified under Article 5 and Annex II having a significant impact on the status of water. This concept applies for the purposes of Article 1 and of the economic analysis carried out according to Article 5 and Annex III, point (b).” Article 9 of the Directive specifies that the water uses should include at least households, agriculture and industry.

An attempt is made as far as possible to report the information on water uses into these categories, however some uses cannot be disaggregated in this way and this will need to be subject of further analysis after the Article 5 report. This further work will also consider the appropriate sub-categorisation in the context of water pricing and programmes of measures. Current sub-categorisation is on the basis of the uses identified in the Pressures and Impacts analysis.

Some water uses, such as land reclamation, drainage etc. do not fit easily within the categories of households, industry and agriculture. As recognised in the Eco1 guidance it is necessary to include these “other uses” which are identified on the basis of the river basin characterisation. For the purposes of this report, water uses that have a significant impact on the status of water are disaggregated into Water Services, Agriculture and Industry.

Water Services

The best estimate of per capita household consumption in Northern Ireland is 144.01 litres per person per day. With a population of 1,697,000 in 2001⁷, this suggests a total household consumption of 244 MI/day⁸. Growth in households (small rise in population coupled with a fall in average household size) is expected to increase domestic demand for water. It is estimated that Northern Ireland's housing stock is set to expand by 10,000 units per annum over the period 2030. The Water Resource Strategy (2002-2030) (<http://www.waterni.gov.uk/pdfs/WRSFinal.pdf>) projects that present demand for water in Northern Ireland will increase by 150 million litres per day by 2030.

⁷ Northern Ireland Statistics and Research Agency, 2003

⁸ Please note that this figure is significantly higher than the 217MI/day suggested in the Water Resource Strategy. At least some of this difference can be accounted for by metered agricultural premises, which were excluded from the lower figure, and by direct abstractions. From a figure for average domestic consumption of 0.6m³/day in rural areas, Robins (1996) estimates that those domestic properties reliant on private sources may abstract as much as 2MI/day in Northern Ireland.

Agriculture

The Water Resource Strategy (2002-2030) estimated total agricultural water consumption (incorporating domestic agriculture; cattle troughs; out farm and intensive units) at 44.95MI/d. Furthermore, it was estimated that agriculture water use from boreholes could be as high as 11MI/d (Robins, 1996).

Industry

Industry water consumption according to the Water Resource Strategy (2002-2030) is 47.09MI/d. Industry is required to adhere to discharge consents, although compliance varies between activities.

4.4 Identification of significant polluters

There are different types of pollution in the context of the WFD and it is useful to identify polluters who give rise to increased costs of providing water services. This is a technically difficult area and a large number of assumptions are required to arrive at an answer. A detailed analysis of the allocation of costs to users and polluters in Northern Ireland will form part of improving knowledge and the information base.

4.5 Current level of financial costs of the water service

The Income and Expenditure Account for Water Service (i.e. the financial costs of the water and sewerage service) year ending 31st March 2004 is summarised in table 4.2 below.

Income from Activities	40,870
Expenditure	
Staff Costs	52,375
Operating Costs	86,616
Depreciation	80,893
Total Expenditure	219,885
Net deficit on operations before interest and cost of capital charges	(179,015)
Interest payable on loans	184
Cost of capital charge	168,033
Net deficit on operations after cost of capital and interest charges	(347,232)

As part of improving the knowledge and information base going forward, the financial costs of Water Service will be assessed by looking at operating and maintenance costs, capital costs, administrative costs and taxes and subsidies.

4.6 Current level of environmental and resource costs

Environmental and resource costs arise where costs are imposed on water service providers from polluting activities. Environmental and resource costs also arise where water services abstractions and discharges contribute to water bodies failing to achieve good ecological status. As there is no definition of good ecological status at present it is not possible to measure the gap between current and good status and hence level of environmental and resource costs being incurred.

Households' value for good ecological water quality (i.e. the WFD standard) was recently investigated by a 'willingness to pay' (WTP) survey carried out by Queen's University, Department of Agriculture and Food Economics: Hutchinson et al (2004). The preliminary results are shown in the table below, for two levels of provision; a 'maintenance' programme and an 'improvement' programme.

	Mean	Standard Deviation
Maintenance Programme	£10.04	£17.34
Improvement Programme	£15.92	£25.35

Source: QUB, Dept of Agriculture and Food Economics: Preliminary results

The preliminary results show that the Mean WTP for the Maintenance Programme was £10.04 per year (standard deviation = £17.34) and Mean WTP for the Improvement Programme was £15.92 per year (standard deviation = £25.35). Given that there are 627,000 households in Northern Ireland, the Total Economic Value per year of good ecological water quality is £6.3million for the maintenance option and £10.0m for the improvement option.

The risk assessment showed that the Water Service together with industrial sector abstractions and discharges were associated with a number of instances where water bodies are at risk of failing to achieve good ecological status.

The Collaborative Research Programme on RBMP Economics will involve research to establish the level of environmental and resource costs to aid in the assessment of disproportionate costs under the programmes of measures. This information will also be of use in examining pricing policies and the adequacy of the recovery of costs, including environmental and resource costs.

One task in the CRP is to understand which measures identified as options for river basin management plans are potentially disproportionately costly. Part of this task will involve identifying the main gaps in information to draw up an appropriate process for assessing and filling these gaps. This will build on work undertaken for the Cost Effectiveness Analysis and Developing a Methodology for Assessing Disproportionate Costs, which can be found at:

<http://www.defra.gov.uk/environment/water/wfd/economics/index.htm>.

4.7 Revenues and Cost Recovery

Ultimately the analysis of cost recovery needs to be undertaken at a RBD scale. However for Article 5 reporting it is acceptable to report rates of cost recovery on the basis of water service areas. Hence the following analysis of cost recovery in Northern Ireland is at the Water Service scale, i.e. all Northern Ireland.

Water Service's annual budget forms part of the voted resource (the 'Vote') for the Department for Regional Development, which is financed from the Northern Ireland Departmental Expenditure Limit, (that expenditure which is under the control of the Northern Ireland Administration (under devolution) or Ministers (under Direct Rule). The voted resource is on a nett basis – various costs are met from income that derives from direct charges to customers for specific services. This income is 'appropriated-in-aid' of the Vote. Currently, income is made up, predominantly from the direct metered water charges to non-household customers in the agricultural, industrial, commercial and business sectors. A smaller element consists of trade effluent charges to industrial and commercial concerns. The remaining income is made of up various miscellaneous charges such as connection charges.

It is acknowledged that Northern Ireland's water and sewerage infrastructure is suffering from deterioration. Large parts of the water main network are cast iron and vulnerable to bursts after severe cold spells. Furthermore, large parts of the Belfast sewerage network rely on Victorian brick sewers which are vulnerable to collapse and are likely to give rise to major traffic disruption. It is estimated that investment of £3 billion over the next 20 years is required (Northern Ireland Asset Management Plan (NIAMP2)). If these improvements are to be realised, fundamental change in the organisation and financing of the Water Service is needed because:

- The present funding arrangements do not provide a reliable source of finance for the sustained investment programme that is required over the medium to long term;
- There is no possibility of securing additional resources from the UK Treasury under the public expenditure funding rules at present; and
- Allocating more money from the Northern Ireland public expenditure budget could not be done without compromising the necessary levels of public expenditure in other key services such as health, education, roads, and transport.

Charges

All charges are calculated on a cost recovery basis. Water Service is currently unable to disaggregate any of these costs on a RBD basis, and developing such analysis will form part of improving knowledge and the information base. All current metered water customers pay charges for water according to the following scheme:

(i) Standing Charge

Firstly, a standing charge is levied dependent on supply pipe size. The current tariff is shown below:

Standing Charges (Source: Water Service)

Size of Supply Pipe	Standing Charge
Up to 15mm	£46
16-20mm	£69
21-25mm	£92
26-40mm	£173
41-50mm	£289
51-75mm	£578
76-100mm	£1040
101+mm	£1502

(ii) Volumetric Charge

In addition to the standing charge there is a Volumetric Charge, currently at 79.74 p/m³.

(iii) Large User Discounts

Large user discounts are then applied (where relevant) as follows:

Consumption: up to 100 megalitres (100,000 m ³)	Discount rate = nil
Consumption: 100,000 – 250,000 m ³	Discount rate = 20%
Consumption: 250,000 – 500,000 m ³	Discount rate = 25%
Consumption: >500,000 m ³	Discount rate = 30%

This schedule could generate a perverse incentive, where a higher volume is taken to benefit from increased discount.

Trade Effluent

The charging scheme for trade effluent is as follows: All industrial, trade or commercial operations discharging trade effluent from de-rated, rate-exempt or rate-rebated premises to the public sewer are liable to pay trade effluent charges. Charges are determined using a standard water industry methodology - the Mogden formula. The charging scheme for 2004/2005 is:

Trade Effluent Charges: 2004/05

Mogden Formula Element	Charge
Reception & Conveyance (R)	14.02 pence/m ³
Volumetric Treatment (V)	11.83 pence/m ³
Biological Treatment (B)	10.60 pence/m ³
Sludge & Treatment & Disposal (S)	6.54 pence/m ³
Standard Charge	42.99 pence/m ³
Chemical Oxygen Demand (COD)	422 mg/l
Solids in Suspension (SS)	332 mg/l

As charges are calculated on a 'full cost recovery basis' there are a number of areas where 100% is recovered. These 100% recovery cases include: trade effluent customer & miscellaneous charges (e.g. water connections).

The level of cost recovery for metered water customers is less than 100%, and for 2003 was 81%. To date, the overall level of cost recovery for Water Service (i.e. total directly

charged income received divided by total costs to the Agency) is much lower again, at 11%. This is shown in table 4.3 below, which summarises the overall charging regime.

Water User	Pricing Regime	%Cost Recovery
Domestic	See below under Household	See below under Household
Metered	All non-domestic supplies metered and charged on volume basis, with allowances and volume discounts as detailed above	81% (of which large users are 100%)
Trade Effluent	Based on Mogden formula – which charges in relation to condition of effluent	100%
Other Charges	Connection charges – based on individual survey Miscellaneous charges	100%
Weighted Average All users		11%
Note: the charging authority – where charges are levied – is in all cases the Water Service, a single authority for all Northern Ireland. There is no cross-subsidisation – charges are on the basis of cost recovery.		

Current effluent charges are determined using a standard water industry methodology - the *Mogden* formula. The application of the above by sector is shown below.

Agriculture

Virtually all agricultural properties are metered and pay metered water charges less domestic allowance (where applicable) – there are around 47,000 agricultural meters.

Commercial / Industrial

Larger water users are metered – generally metering has been targeted at those premises which consume more than the domestic allowance (i.e. more than 200 m³ per annum). There are around 16,000 non-domestic non-agricultural meters plus a further 9,000 meters classified as (non-chargeable) test meters. No metered sewerage charges are levied although trade effluent charges are levied against 500 de-rated or rates exempt industrial / commercial properties.

Household

Domestic water users in NI currently pay a contribution to water and sewerage services through the combined Domestic & Regional Rates payment system in NI. A strategic change now being proposed is that all consumers will be charged a specific amount towards the supply of water and sewerage services. This means that households will pay a direct charge for water and sewerage services. It is proposed that household water and sewerage charges will consist of a standing charge of around £55 each for water and for sewerage, plus an element based on property value. The standing charge will broadly reflect costs associated with maintaining connections to the public water and sewerage networks. Charges will be phased in with customers paying one-third of the annual charge in the first year, and two-thirds of the annual charge in the second year following their introduction (1st April 2006 or as soon as practicable thereafter). Once charges are fully introduced, the lowest household charge will be around £150 per year,

and the maximum charge payable will be capped at around £750 per year. The proposals also include provisions for the protection of low-income households, whereby those households on particular means tested benefits would be eligible for a 25 per cent discount on their annual charge.

The introduction of universal metering was initially ruled out as an option for domestic charging. While the metering of supplies potentially provides the greatest incentive for the efficient use of water, it was considered that it might give rise to a potential adverse impact on low income, larger households, and on customers who require larger volumes of water on health grounds. Furthermore, metering would cost £120 million in total if applied universally to all households, and this would have to be met from public expenditure or recovered through charges levied on customers. However, a consultation exercise conducted in 2003 revealed that many people had a strong preference for metering. In light of this it has been decided to make provision for household metering once charges are fully phased in. Consideration will need to be given to the best way to do this and the implications of metering for all customers before any scheme is finalised. In terms of non-domestic customers, many of whom currently pay for a metered supply, it is proposed that metering continue to be the preferred basis for charging this sector, and that Water Service would continue to extend the scope of metering through the customer group. An unmeasured regime will be introduced for the many small businesses which have low water usage.

5 Cost-Effectiveness Analysis

The Pressures and Impacts analysis reveals that a large number of activities contribute towards pressures on water bodies in Northern Ireland. Many water bodies are at risk from multiple pressures. Information on costs and benefits, including environmental and resource costs and benefits, is needed to inform the design of cost-effective programmes of measures and the consideration of less stringent environmental objectives.

It is not possible at present to provide this information, principally because:

- We have limited information on the measures likely to be needed, and their effectiveness and costs. Good information is available in some areas (e.g. water industry) but there is very limited information elsewhere.
- We do not have a clear specification of the Directive's meaning of 'environmental and resource costs' at a European level. Work is needed to provide a practical definition with due regard to the approach adopted in other Member States.
- We do not yet have a definition of 'good ecological status', or 'good ecological potential' – this is needed to assess environmental and resource costs. The results of the pressures and impacts analysis take us some way towards this goal. However, other work, including the results of inter-calibration of sites across Europe, must be completed to show the gap between current and required status, and before environmental and resource costs (ERC) can be quantified.

It is important that a common approach to assessment of cost-effectiveness and information on disproportionate costs is adopted. A method has been developed in a study entitled *Cost-Effectiveness Analysis and Developing a Methodology for Assessing Disproportionate Costs*⁹. Work is underway as part of the UK-wide Collaborative Research Programme (CRP) to develop this into a practical approach.

The CRP will take forward work on a cost-effectiveness analysis. This includes work on cost-effectiveness and a scoping study on the scale and nature of the potentially disproportionately costly cases and an assessment of various alternative methods for assessing their costs and benefits to aid judgements on them. This work will take place over then period 2004 to 2006. Also, the Environment Agency for England and Wales is undertaking work on estimating costs, effectiveness and valuing economic resource costs.

6 Improving Knowledge and the Information Base - Next Steps

Proposing activities for enhancing the information and knowledge based are not formal requirements of the Directive for this first reporting requirement. However, these have been identified by the Common Implementation Strategy (CIS) WFD Working Group 2.6 on Economic Analysis (WATECO) as being necessary at this stage to pave the way for the development of the RBMPs and the interim deliverables in 2006 and 2007.

This section is divided into two elements, one focusing on improving the knowledge and information base via the CRP. The other looks at issues specific to Northern Ireland.

A CRP draft programme of work on assessing the costs and benefits of options in River Basin Management (RBM) for implementing the Water Framework Directive has been developed.

The draft CRP builds on the three scoping studies that DEFRA commissioned in 2003/04 on *Cost-Effectiveness Analysis and Developing a Methodology for Assessing Disproportionate Costs*; *Cost Recovery and Incentive Pricing*; and the *Economic Characterisation and Dynamics of Water Use*. Each of these reports identified a list of actions. These actions have been prioritised, and the CRP is taking forward those that are most important for implementing the WFD. It identifies and justifies the need for research, outlines the key collaborative requirements and prioritises and schedules the research in the light of the time and likely resources available. A key feature of the process is the collaborative involvement of a wide range of stakeholders from the start.

The draft CRP has the following sequential tasks:

1. To set out an initial identification and illustration of the issues related to the economic analysis and its role in the decision making for programmes of measures under the WFD. (2004)

⁹ <http://www.defra.gov.uk/environment/water/wfd/economics/index.htm>

2. To determine how to assess costs and economic impacts for each of the main types of options affecting the major different sectors that will need to be appraised in RBMPs in an even handed manner. (2004-05)
3. To scope and characterise the potentially disproportionately costly cases in RBMPs and the main gaps in information to draw up an appropriate process for assessing them and making best use of original and existing work to fill these gaps. This will include exploring alternative assessment methods. (2005-06)
4. Focus group analyses to specify clearly environmental damages of concern in these cases. (2006)
5. Development, trial and refinement of guidance on benefits assessment for RBMPs. (2006-2008)
6. New studies to provide better assessments and related demand information of the major environmental benefits of RBMPs. (2006-2008)

Northern Ireland - specific tasks

While DOE is involved in the UK wide Collaborative Research Programme, a number of Northern Ireland specific tasks can also be identified and will need to be considered and developed as part of the further characterisation process:

1. Continuation of the iterative processes linking economic analyses and pressures and impacts analysis;
2. Collation of new data and the development of integrated data management systems;
3. Aggregation of current water 'resource zones' to RBD scale – incorporating pressures/use, Water Service financial and operational data and cost recovery;
4. Assessment of the financial costs of Water Service including analysis of operating and maintenance costs, capital costs, administrative costs and taxes and subsidies.
5. Calculation of demand trends for water and abstraction volumes of groundwater and surface water and intake of sea water for key users;
6. Calculation of demand trends for industrial discharges from key users;
7. Analysis of all relevant industrial sector expenses including water and wastewater disposal charges, pollution reduction activities, levies and taxes.
8. Calculation of output forecasts for key agricultural sectors;
9. Construction of a model able to explain the agricultural pressures on the water system and the reaction of agricultural water users to changes in explanatory variables such as prices and technology, and
10. Detailing of agricultural sector expenses associated with water use, including items such as levies, investment programmes and pollution limiting activities.

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