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Economic Analysis of Water Use in Ireland Final Report

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FitzGerald Communications



Economic Analysis of Water Use in Ireland

Final Report

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by

Camp Dresser & McKee (Ireland) Ltd

in association with

**Compass Informatics Ltd
DTZ Piedad Consulting
FitzGerald Communications**

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List of Acronyms

DEHLG	Department of the Environment, Heritage and Local Government
CDM	Camp Dresser & McKee (Ireland) LTD
EAUW	Economic Analysis of Water Use Study
ROI	Republic of Ireland
WFD	Water Framework Directive
EU	European Union
RBD	River Basin District
EC	European Commission
NACE	Nomenclature générale des Activités économiques dans les Communautés Européennes (General nomenclature of the economic activities in the European Communities)
CSO	Central Statistics Office
GIS	Geographic Information System
GVA	Gross Value Added
GDP	Gross Domestic Product
ESA	Environmentally Sensitive Area
DED	District Electoral Division
SRA	Special Riparian Area
WSIP	Water Services Investment Programme
RWP	Rural Water Programme
FMS	Financial Management System
GWS	Group Water Scheme
UFW	Unaccounted for Water
NDP	National Development Plan 2000 – 2006
LGF	Local Government Fund
PoM	Programme of Measures
BOD	Biochemical Oxygen Demand
DEFRA	Department for Environment, Food, and Rural Affairs
SEPA	Scottish Environmental Protection Agency

Executive Summary

Scope

This report is produced by Camp Dresser and McKee (Ireland) Ltd (CDM) and a team of associates for the Department of Environment, Heritage, and Local Government (DEHLG), acting on behalf of the relevant local authorities, in fulfilment of a brief to conduct an economic analysis of water use for the Republic of Ireland. This analysis of water use forms part of an initial characterisation report required by the Water Framework Directive (WFD) that is being prepared by the relevant local authorities in relation to each River Basin District (RBD) and overseen at the national level by the DEHLG and the Environmental Protection Agency (EPA). The purpose of this report is to make use of currently available information to provide an initial overview of the current and projected future economic benefits and costs associated with the utilisation of water resources in Ireland.

The Project commenced on 29th April 2004 and was completed on 22nd October 2004. It is intended that this report will provide the foundation for the economic component of the summary national characterisation report due to be presented to the commission of the European Union (EU) by the EPA by 22nd March 2005, under Article V of the WFD. It is also intended that each RBD will use the relevant sections of this report to fulfil the economic analysis requirements associated with RBD-level characterisation reporting. To facilitate this process, economic characteristics of Ireland's RBDs are collectively and comparatively discussed in **Section 3.2**, and individual economic profiles for each RBD are attached in **Appendix B**. Where international RBDs are mentioned, it is the portion of that district which falls in the Republic of Ireland to which this report refers.

This analysis does not purport to be a complete and final statement of the economic role of water resources in Ireland. In common with the entire WFD characterisation process, it is an attempt to collate *readily available* data upon which the best analysis possible at this early stage of WFD implementation can be conducted.

Findings

Findings in this study are reported for the Republic of Ireland as a whole and for each of its RBDs in four general categories:

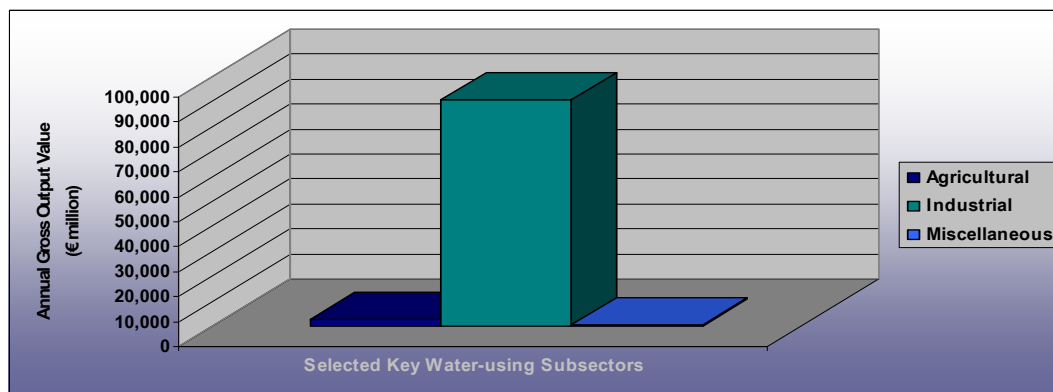
- **water use benefits**
- **water services costs and costs recovery**
- **environmental/resource costs**
- **projections of demand, supply, and costs of water services**

Water Use Benefits

The economic analysis examined the economic impacts and water use values of selected key water-using subsectors of the agricultural and industrial sectors and other miscellaneous water-using categories. Water use values for the domestic sector were also estimated. Key water-using subsectors are defined as those in which water-using activities are critical, due both to the volume of water used as well as the absence of suitable substitutes.

The key water-using agricultural subsectors – potatoes, cattle and cattle products, and sheep and sheep products – and a set of 14 key water-using subsectors in the industrial sector were identified in consultation with Irish and other international experts.

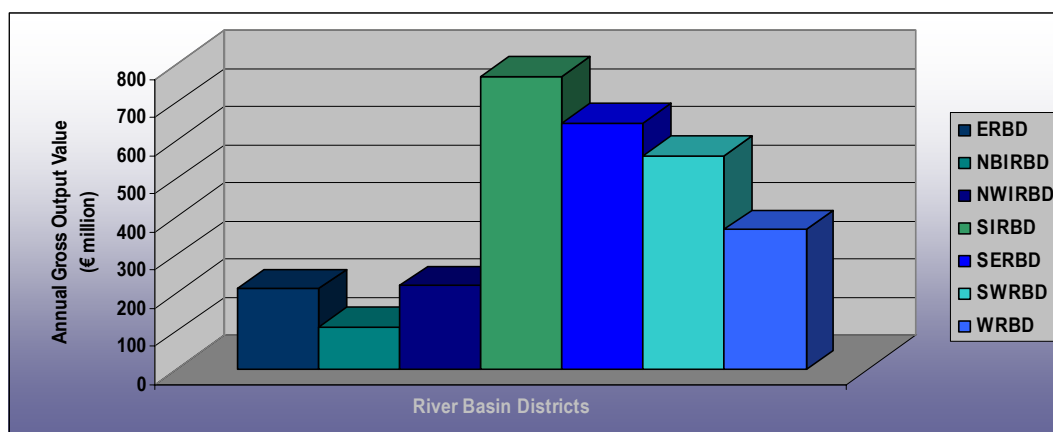
At the sector level, the key water-using industrial subsectors collectively have a significantly higher economic impact in terms of gross output value than do those of the agricultural sector or any other miscellaneous subsectors such as inland commercial fishing or aquaculture. **Figure E-1** illustrates.



Source: CSO, Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) and CSO, Statistical Yearbook of Ireland, 2003. Multiple sources for miscellaneous categories – see Appendix B-1.

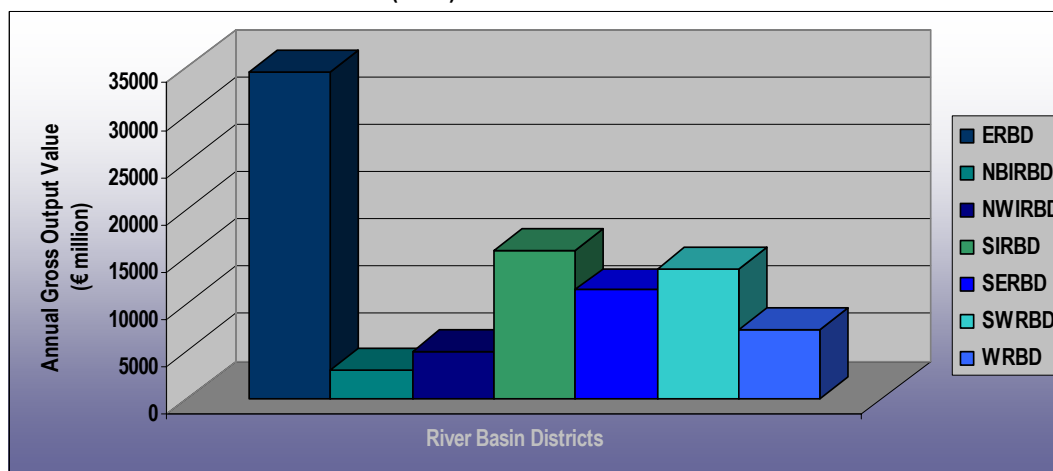
Figure E-1: Estimated National Annual Gross Output Values in Selected Key Water-using Agricultural (2002), Industrial (2001), and Miscellaneous (2002, 2003) Subsectors

As **Figures E-2** and **E-3** illustrate, the relative economic impacts of the key water-using industrial and agricultural subsectors vary significantly between RBDs.



Source: Derived from national estimates from CSO, Statistical Yearbook of Ireland, 2003.

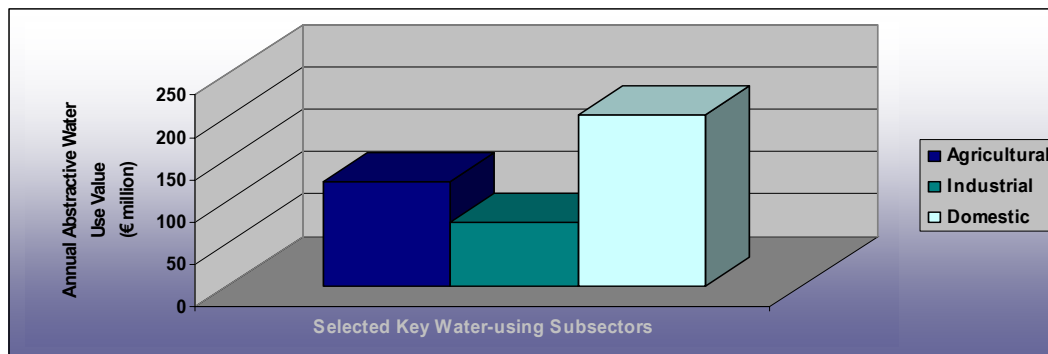
Figure E-2: Estimated Annual Gross Output Values of Selected Key Water-using Agricultural Subsectors in River Basin Districts (2002)



Source: Derived from national estimates from CSO, Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>)

Figure E-3: Estimated Annual Gross Output Values of Selected Key Water-using Industrial Subsectors in River Basin Districts (2001)

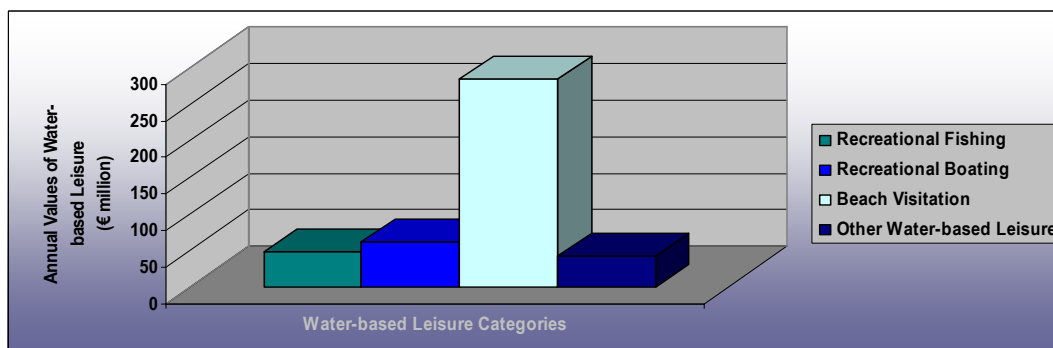
As **Figure E-4** illustrates, the estimated value of abstractive water to the domestic sector exceeds that of both the agricultural and industrial key water-using subsectors. These value estimates are functions of estimated water charge rates and water consumption rates. It is also notable that although the economic impacts of the key water-using industrial subsectors exceed those of the key water-using agricultural subsectors, water usage and thus value of water to the agricultural subsectors generally exceeds that of the industrial subsectors, both nationally and in RBDs.



Source: Derived by multiplying unit use estimates by numbers of units (e.g., person, employees, livestock units) and water rates. See Appendix B-9.

Figure E-4: Estimated National Annual Abstractive Water-use Values of Selected Key Water-using Subsectors (2001 Industrial, 2002 Agricultural) and the Domestic Sector (2003)

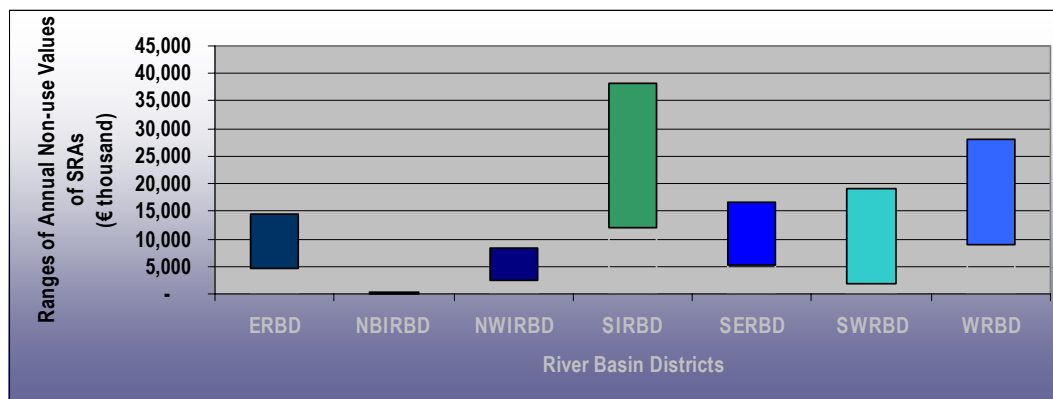
Figure E-5 depicts the results of a recent study conducted by the Marine Institute and the Economic and Social Research Institute to value water-based recreation in Ireland. Essentially every major water-based leisure activity, including those associated with domestic tourism, was analysed in this study. It is clear at the national level that beach visits are highly valued by Irish residents and that recreational fishing, boating, aquatic bird watching, etc. are significant economic activities in Ireland.



Source: Williams, J. and B. Ryan, Participation in Marine-Based Leisure Activities in Ireland, 2003, Economic and Social Research Institute, 2004 forthcoming.

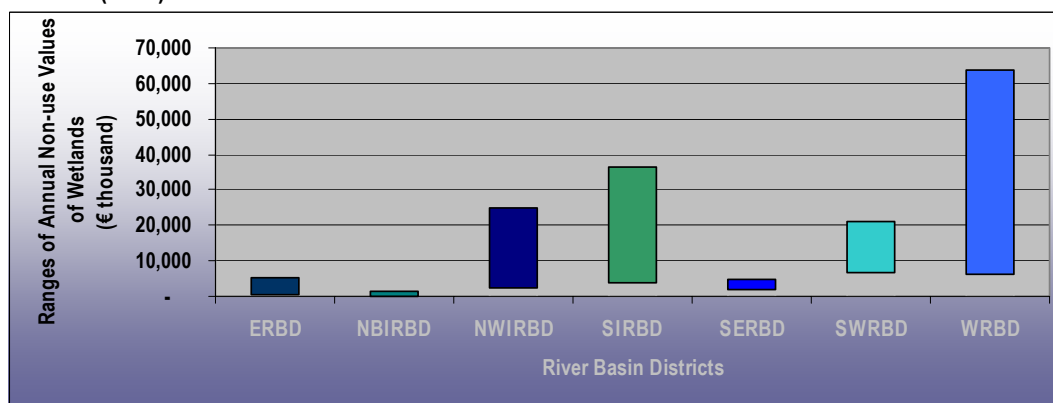
Figure E-5: Estimated Annual Values of Water-based Leisure

Among the more difficult water resources benefits to value are wetlands and other riparian areas that provide unique habitat for species that reside near water bodies. Although no attempt is made here to place a total monetary value on wetlands or these other habitat areas (deemed here Special Riparian Areas (SRAs)), an attempt is made to begin to estimate Ireland's wetland and SRA habitat, or non-use values. **Figures E-6** and **E-7** illustrate the likely economic significance of these partial values of wetlands and SRAs in Ireland, while making it clear that even partial valuations such as the ones undertaken here meet with very high levels of imprecision.



Source: Source: Derived in part by transferring values from studies in Scotland. See Appendix B.

Figure E-6: Estimated Ranges of Annual Non-Use Values of Special Riparian Areas in River Basin Districts (2004)



Source: Derived in part by transferring values from studies in England, Scotland, and Austria. See Appendix B.

Figure E-7: Estimated Ranges of Annual Non-Use Values of Wetlands in River Basin Districts (2004)

Rather than focus on any one particular beneficial use or set of uses of water resources and attempt to arrive at some means of measuring its impact to the national and RBD economies, this work with regard to characterising the beneficial uses of water went far beyond that. The scope of this economic analysis of beneficial water uses is as broad in scale as available data permits. The emphasis on attempting to measure people's willingness and ability to pay for water resources conservation or restoration, rather than only estimating economic impacts such as employment and output from water-using industries, certainly reflects this broad scope. But it also reflects the recognition of a need to begin building the knowledge base upon which user/polluter pays policies pursuant to the WFD might in the future be systematically formulated.

In addition to pursuing any and all available datasets in this broader sphere of water resources benefits, a similar broad-brush approach to analysing the costs associated with water resources use is undertaken here. More specifically, the financial costs of water services and who pays those costs, as well as the environmental/resource costs that often come with water-based economic activities are addressed in this study.

Water Services Costs and Costs Recovery

Table E-1 summarises the most recent data detailing the costs and costs recovery associated with potable water and wastewater services, as accounted for in DEHLG's Water Services Investment Programme and Rural Water Program accounting datasets for 2003.

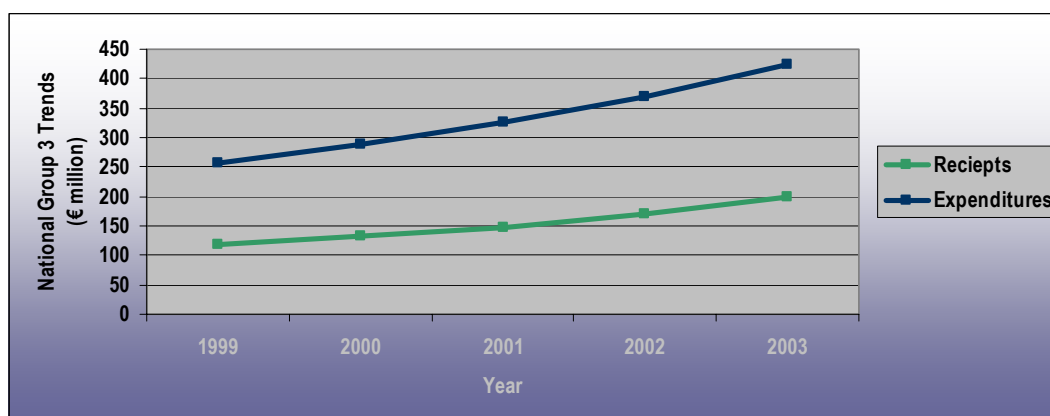
Table E-1: Costs and Costs Recovery of Water Services – National

Local Authority Current Receipts and Expenditure – Program 3	2003
	€
Group 3.1 (Public Water Supply)	141,571,209
Group 3.2 (Public/Sewerage Schemes)	37,031,274
Group 3.3 (Private Installation)	9,419,298
Group 3.8 (Administration and Miscellaneous)	12,205,868
Expenditures	€
Group 3.1 (Public Water Supply)	198,898,031
Group 3.2 (Public/Sewerage Schemes)	132,476,888
Group 3.3 (Private Installation)	9,851,649
Group 3.8 (Administration and Miscellaneous)	82,321,238
Cost Recovery	%
Group 3.1 (Public Water Supply)	71%
Group 3.2 (Public/Sewerage Schemes)	28%
Group 3.3 (Private Installation)	96%
Group 3.8 (Administration and Miscellaneous)	15%
Rural Water Program Expenditures	2003
Expenditures	€
Water	62,733,492
Water - Local Government Fund	9,874,682
Sewerage	10,851,865

Source: DEHLG

Whilst local authorities are in the process of transparently identifying the cost of delivering water and wastewater services to all sectors individually, Government policy and national legislation prohibit direct charges for domestic use. Thus, there is a significant annual shortfall for local authorities in expenditure over receipts in relation to the provision of these services. The source of funding for this deficit is the General Purposes Payments from central funds made to local authorities.

As illustrated in **Figure E-8**, there is a growing gap between the general costs of water services and the costs currently recovered.



Source: DEHLG Local Authority Budgets 1999 – 2003

Figure E-8: National Programme Group 3 Receipts and Expenditure Trends: 1999-2003

The national Water Services Investment Programme Group 3 dataset identifies a significant shortfall across all reporting subgroups with the exception of the Private Installations subgroup. The small shortfall for the Private Installations subgroup indicates the relatively neutral current cost to Local Authorities of providing grants to group water schemes.

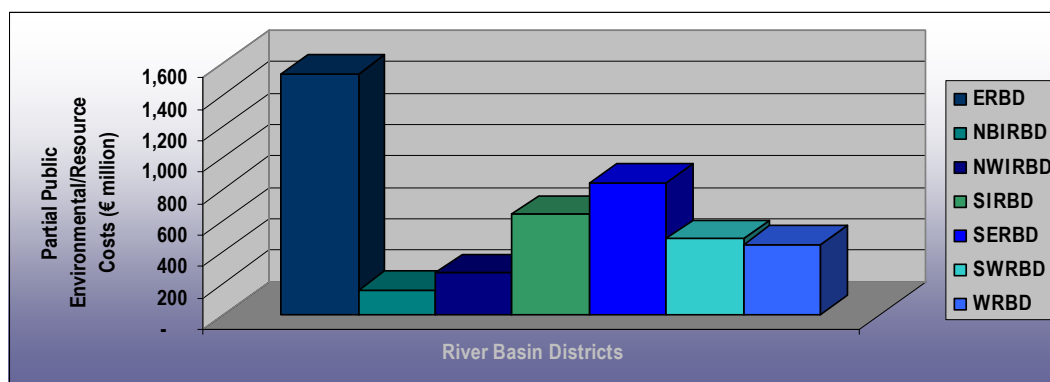
With regard to current receipts, the proportion derived from Public Water Schemes has declined from 78% in 1999 to 71% in 2003. Also, there have been declines over this period on proportionate expenditures on Public Water Schemes and rises in the proportionate expenditures on Public Sewerage Schemes.

The current budget shortfall of Public Water Schemes has widened from €48.3 million in 1999 to €58.3 million in 2003. This trend is even more clearly identifiable with regard to Public Sewerage Schemes, where the current budget shortfall increased from €54.4 million in 1999 to €95 million in 2003.

In 2003 there were an estimated 183,650 non-domestic users of public water and wastewater services in Ireland. The charge per m³ across all local authorities was €0.96, however there was a considerable variance in this charge, and the local authorities charging the most per m³ do not appear to be those experiencing the highest average cost of producing water to non-domestic users.

Environmental/Resource Costs

The only national estimate of the partial public environmental/resource costs available for reporting at this time is €4,380,887,402 for the period between 2004 and 2012. This is the projected wastewater treatment expenditures needs estimate that was provided by local authorities in their Water Services Investment Programme reports. Those estimates are valid partial estimates of the public environmental/resource costs of water pollution given one fundamental assumption: The marginal costs of these wastewater treatment expenditures are less than or equal to the marginal benefits preserved or restored due to these expenditures. **Figure E-9** illustrates the disparities between RBDs for these estimates.



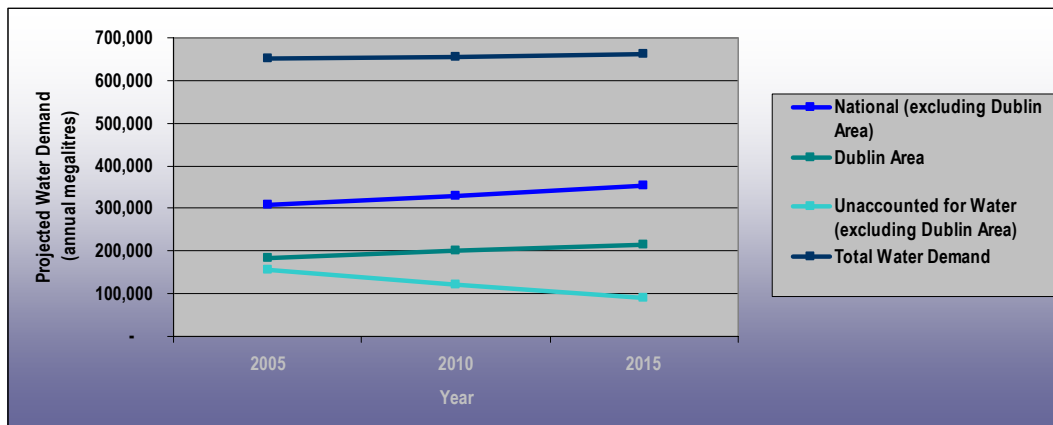
Source: Derived from local authority Water Services Investment Programme Assessment of Needs reports

Figure E-9: Estimated Partial Public Environmental/Resource Costs: 2004 – 2012 (if the marginal costs of these wastewater treatment expenditures are less than or equal to the marginal benefits preserved or restored due to these expenditures)

The water resources benefits and costs in Ireland nationally and for each of its RBDs have thus been broadly characterised in this report to the extent that readily available data have allowed them to be. However, the WFD planning process that is implicitly prescribed in its articles and supporting guidance documents requires not only a characterisation of current national and RBD ecologies and economies, but also projections about future water resources pressure and impacts and their respective economic impacts and influence on how people use and value water. To this end, projections of demand, supply and costs of water services are undertaken here.

Projections of Demand, Supply, and Costs of Water Services

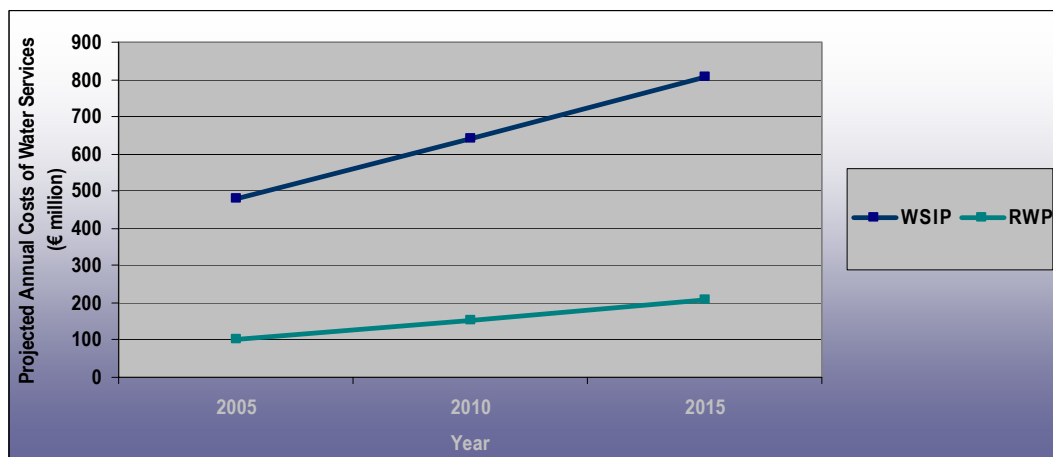
The national abstractive water demand by customer class is provided in **Figure E-10**. Because of its relative magnitude, the Dublin demand projection for all customer classes is included as a single independent projection.



Source: Based on National Water Study (W.S. Atkins Ireland 2000) demand modified for Census 2002 population estimates, unaccounted for water projections provided by DEHLG, and Dublin area demand projections from Dublin City Council

Figure E-10: Projected Annual Water Demand and Unaccounted for Water: 2005 - 2015

National level conclusions regarding potable water future supply capacity were not able to be made, although tables included in **Appendices B2 – B8** provide a qualitative overview for each RBD. The projected costs of water services through to 2015, estimated via simple trend analysis of Water Services Investment Programme and Rural Water Programme data for 2000 – 2003, is provided in **Figure E-11** below.



Source: Derived from trend analysis on DEHLG Water Services Investment Programme and Rural Water Programme data for 2000-2003

Figure E-11: National Projected Costs of Water Services – Water Services Investment Programme (WSIP) and Rural Water Programme (RWP) Water and Sewerage Costs

Conclusions

Based on the findings of this study, it is concluded that the remaining economic information needed to implement the WFD with respect to its economic analysis reporting requirements is extensive. As such, it is critical that information generation for the evaluation of potential alternative programmes of measures, water body derogations, and pricing policies pursuant to user/polluter pays principles are prioritised in a systematic, transparent, and coherent planning process. It is suggested that critical to this planning process will be the immediate development of an RBD information management system. Included in **Section 4** is a recommended strategy to pursue a series of case studies upon which to begin to build this system and upon which decisions regarding the relative importance of information generation needs should begin to be made.

As identification of information gaps is an intrinsic element of the characterisation process, these gaps are summarised in **Section 4**. This gap analysis serves as a preliminary guide to the formation of future economic analysis strategies.

However, one of the more significant conclusions of this analysis is that a gap in characterisation reporting information does not necessarily equate to a priority information need. For example, the values of foregone water resource uses due to water pollution need not be determined in subcatchments in which no derogations are likely to be proposed, and for which only a cost-effectiveness analysis of alternative programmes of measures will be conducted. It is suggested that making this distinction between characterisation information gaps and priority information needs early in the WFD implementation planning process will lead to a much more efficient use of the administrative resources Ireland allocates to the effort of complying with the WFD.

It is also recognised here that although an information gap identified in this Report does not necessarily equate to an information need in the context of WFD reporting, filling this gap may remain a priority. For instance, estimates of the economic impact of foreign water-based tourism and leisure in Ireland were not available for reporting at the national or RBD levels. It may be that this information is a significant incentive to the public to maintain or achieve 'good' or higher ecological status for water bodies, and as such may be an information need outside of the direct context of WFD reporting requirements.

Finally, it is recommended that intensive consultation between central government authorities, RBD authorities, and those conducting future economic analysis is a necessary prerequisite to the development of economic analysis priorities, and thus critical to the efficient and successful implementation of the WFD in Ireland. Given the timeline for development of programmes of measures, it is further recommended that the case studies, the development of the information management system, and this consultation process be underwritten and undertaken immediately.

Section 1

Introduction

On April 29, 2004, the Department of the Environment, Heritage and Local Government (DEHLG), acting on behalf of the relevant local authorities, engaged the firm of Camp Dresser & McKee (Ireland) LTD (CDM) and associates to undertake an economic analysis of water use in the Republic of Ireland (ROI). The work is pursuant to the requirements of the Water Framework Directive (WFD) of the European Union (EU). The economic analysis will form part of a required characterisation report being prepared in relation to each river basin district (RBD) by the relevant local authorities. The preparation of the characterisation reports for RBDs is being co-ordinated at the national level by the DEHLG and the Environmental Protection Agency (EPA).

1.1 Purpose

The purpose of this report is to make use of existing and readily available data to provide an initial overview of the economic benefits and costs associated with the utilisation of water resources in Ireland. Emphasis is placed on characterising a broad range of water uses, including in-stream uses such as water-based recreation, commercial fishing, and aquaculture, rather than focusing exclusively on abstractive uses and water services. This is done at both at the national level and in each of Ireland's river basin districts. In addition to and in the context of this initial overview, this study also provides a planning framework for implementation of the WFD, one that integrates the remaining economic analysis requirements that are not met in this initial characterisation.

1.2 Background

Economic analysis is a key part of the implementation of the WFD. The WFD implicitly contains a number of provisions for economic analysis at the national, RBD, and subcatchment levels. The key elements of the analysis can be described in three broad areas:

- **General economic analysis of water use**, including the current and future economic significance, demand for, and supply of water resources;
- **Cost-effectiveness analysis and cost-benefit analysis** of potential programmes of measures for achieving good water status; and
- **Assessments of institutional alternatives** for the recovery of water services costs, including distributional issues associated with water pricing.

'...The WFD clearly integrates economics into water management and policy making. The Directive calls for the application of economic principles (e.g. the polluter pays principle), approaches and tools (e.g. cost effectiveness analysis) and for the consideration of economic instruments (e.g. water pricing) for achieving its environmental objectives, i.e. good water status for all waters, in the most effective manner.'

(Wateco, 2002)

The Directive itself, though, only provides a broad overview of the required economic analysis. To assist the implementation process, the European Commission (EC) established an expert group – Wateco – that brought together experts from across the EU to develop more detailed guidance on how to complete the economic analysis.

The key to the guidance developed by this group was a three-step approach to provide a coherent and logical framework for economic analysis. The steps are summarised as follows:

Step 1 – Characterisation of river basins in terms of the economics of water uses, current levels of costs and costs recovery, and trends in water supply and demand

Step 2 – Identification of water bodies at risk of not achieving the environmental objectives of the WFD

Step 3 – Developing programmes of measures that are cost effective, and in cases of derogations, planning for cost beneficial WFD implementation over time

One particularly relevant guidance document from Wateco is *The Implementation Challenge of the Water Framework Directive* (Wateco 2002), which was endorsed by the EU water directors. The authors of the guidance document acknowledge that the document only serves as guidance and should be adapted to local conditions, but it is assumed that reports generally following this guidance are compliant with the legal requirements of the WFD.

Subsequent to the publication of the Wateco guidance was the publication of two additional series of discussions on WFD economic analysis, which were led by the United Kingdom's Department for Environment, Food, and Rural Affairs (DEFRA). The collective conclusions drawn from these and the Wateco efforts to develop economic analysis guidance for the implementation of the WFD were that the economic analysis should have the following characteristics:

- **Policy-relevant**, forward-looking approach where each element of the analysis is a building block for the next step;
- **Integration**, on a number of different levels, including the integration of economic expertise with policy makers and water resources scientists;
- **Proportionate**, including adaptation of guidance to local use, while maintaining the integrity of the implementation objectives of the WFD;
- **Transparent**, where all assumptions are clearly shown and results are accessible;
- **Iterative and gradual**, including the acknowledgement of gaps in information and a genuine attempt to use available information while identifying gaps; and
- **Participatory**, involving consultation with stakeholders throughout the process.

This study is focused on meeting the requirements for the 2004 reporting deadline, which essentially calls for the completion of Step 1 as listed above – to provide an initial economic characterisation for each RBD. This is a requirement of Article 5.1 of the WFD, which came into force in 2000.

‘Each Member State shall ensure that for each river basin district or for the portion of an international river basin district falling within its territory:

--An analysis of its characteristics,

--A review of the impact of human activity on the status of surface waters and on groundwater, and,

--An economic analysis of water use is undertaken according to the technical specifications set out in Annexes II and III and that it is completed at the latest four years after the date of entry into force of this Directive’

(WFD Article 5.1)

The Wateco and DEFRA-led guidance documents do in fact specify in some level of detail what is required in 2004. The main element of the work is a **general economic analysis of beneficial water uses**. This work is to illustrate the importance of water resources to the economies of each RBD and to the national economy. It is to be understood as a stepping stone to the full identification of significant water management issues to be reported to the public by 2007.

The guidelines also stipulate an **analysis of the financial costs of water services**, an **assessment of the nature of costs recovery**, and an **estimation of the environmental/ resource costs** associated with over-extractions and water pollution, as available information permits.

The work for 2004 is to provide a **baseline of information from which projections of water resources demands and supplies can be made** under various scenarios of future impacts and pressures, and under alternative combinations of programmes of measures.

Finally, the collective guidance stipulates that this work is to serve in the development of a **framework for future economic analysis**. This includes initiating the collection and systematic collation of relevant economic information and recommending a strategy for generating the information needed for future economic analysis that is not already available.

1.3 Scope

In keeping with the objectives set forth broadly in the WFD and more specifically in the guidance documents mentioned above as they relate to the 2004 reporting requirements, this report provides:

- Estimates of the economic impacts and values associated with the major uses of water resources at the national and RBD levels, where “uses” include such activities as fishing, boating, and aquaculture, as well the abstractive uses associated with the agricultural, industrial, and domestic sectors;
- An identification of the current levels of water services costs and costs recovery in each district, where “costs” include the expenditures by national and local governments for the provision of potable water and wastewater treatment and disposal, as well as those imposed by water pollution from public and private enterprises;
- Projections of water demand, water supply, and water services costs through to 2015, estimates that will serve in part as the baseline for future assessments of potential programmes of measures under various impacts and pressures scenarios; and
- The development of a strategy for the continued collection, creation, and integration of economic information in subsequent years that will fulfil the economic analysis reporting requirements of the WFD and that can be incorporated into a systematic and transparent WFD implementation planning process.

1.4 Content of the Report

Section 1 is a general introduction to this report. The following **Section 2** details the methodologies employed to generate the numerical estimates and qualitative characterisations of the current and future-projected benefits and costs associated with Ireland’s water resources. **Section 3** presents the results of this analysis for each RBD and for the Republic of Ireland as a whole. **Section 4** provides a framework for integrating the future economic analysis required by the WFD into a larger, systematic, and transparent WFD implementation planning process. **Appendices A-B** provide details critical to characterisations at the RBD level. **Appendix C** is a primer on river basin management decision support systems.

Section 2 begins with a description of the methodologies employed to generate the estimates of water use benefits presented in this report. This characterisation includes an economic impact assessment of the agricultural and industrial sectors and selected subsectors. It also includes valuations of abstractive water uses for the domestic sector and for selected agricultural and industrial subsectors. Important in-stream uses of water are also valued, such as those associated with water-based leisure activities.

Methodologies for making RBD-level estimations of the financial costs and costs recovery of water services – potable water supply and wastewater treatment – are also explained in **Section 2**, along with the methodology employed to arrive at partial public environmental/resource costs estimates. An account of the means by which projections of the demand for potable water and the costs of potable water and wastewater treatment, through to 2015, is provided in the concluding parts of **Section 2**.

Section 3 is a relatively brief presentation and discussion of study findings made in two major sections – a national profile and an RBD profile. The brevity of discussion is a reflection of the scope of work under the WFD, which does not include a policy analysis or a series of subjective conclusions.

Section 4 is a recommended framework for incorporating future economic analysis into the larger WFD implementation planning process.

Appendix A is a report on consultations that were conducted with five local authorities regarding the costs of water services, how these costs are accounted for, and the extent to which and nature by which these costs are recovered.

Appendix B is a series of tabular profiles that provides currently available details – both for the Republic of Ireland as a whole and for each RBD - on the economics of Ireland's water resources. The information contained in the RBD-specific profiles is inclusive of essentially all of economic analysis outputs each RBD characterisation reporting team needs for compliance with their 2004 WFD reporting requirements.

Appendix C is a primer on river basin management decision support systems.

Section 2

Methodology

Section 2 details the methodologies employed to produce the following:

- A general economic analysis of beneficial water uses,
- An assessment of the costs and costs recovery of water services and a partial estimate of public environmental/resource costs, and
- Projections of the demand, supply capacity, and costs for water services.

2.1 Estimation of Water Use Benefits

Economic impact assessments of key water-using activities and valuations of abstractive and in-stream water resources in each RBD were conducted and are described in **Sections 2.1.1 – 2.1.2**, respectively. Estimates of the values of water resources (i.e., the estimated Euro amount people are willing and able to pay for the use of various water resources) were generated and included in the characterisation of the economic importance of water resources to each RBD. This was done in an effort to contribute to the information bases ultimately needed to analyse water pricing policies pursuant to the WFD “user pays” principle.

2.1.1 Economic Impact Assessments

Multiple datasets and publications were reviewed to identify data that would enable an assessment to be made of the economic impacts of the agricultural and industrial sectors and selected key water-using subsectors in Ireland’s river basin districts. The following are the primary sources from which data reported here were drawn:

- Williams, J. and B. Ryan, Participation in Marine-Based Leisure Activities in Ireland, 2003, Economic and Social Research Institute, 2004 forthcoming.
- Bord Iascaigh Mhara, Annual Review, 2003.
- Irish Seaweed Centre, personal contacts, June 2004.
- Teagasc, Management Data for Farm Planning, 2003.
- Teagasc, personal contacts, June 2004.
- Department of Finance, Budget and Economic Statistics, March 2004.
- Government of Ireland, Economic Review and Outlook, 2003.
- Irish Hydropower Association website: <http://www.irish-hydropower.org>.
- Electricity Supply Board, personal contact, July 2004.

- Bord Iascaigh Mhara, personal contact, June 2004.
- Central Statistics Office website: <http://www.eirestat.cso.ie>.
- Central Statistics Office, Statistical Yearbook of Ireland, 2003.
- Department of Agriculture and Food website: <http://www.agriculture.gov.ie>.

Key water-using subsectors are defined as those in which water-using activities are critical, due both to the volume of water used as well as the absence of suitable substitutes. Agricultural subsectors for reporting were selected in consultation with experts at Teagasc. Industrial subsectors were selected based on consultations with international experts (Dziegielewski 2000 - 2004) and on a set of gallons per employee day coefficients developed for water demand forecasting models in North America (Planning and Management Consultants, 1995).

As shown in **Table 2-1**, the production of potatoes, cattle and cattle products, and sheep and sheep products were identified as key water-using subsectors in the agricultural sector.

Table 2-1: Key Water-using Agricultural Subsectors

NACE Code	Agricultural Subsectors
0112	Growing of potatoes
0121	Farming of cattle, dairy farming
0122	Farming of sheep

A set of 14 key water-using subsectors in the industrial sector was identified by NACE category (NACE being the nomenclature of the economic activities in the European Communities) as listed in **Table 2-2**.

Table 2-2: Key Industrial Water Users by NACE Categories – Initial Selections

NACE Code	Industrial Subsectors
13	Mining of metal ores
151	Production, processing and preserving of meat and meat products
152	Processing and preserving of fish and fish products
153	Processing and preserving of fruit and vegetables
1583	Manufacture of sugar
1596	Manufacture of beer
1598	Production of mineral waters and soft drinks
211	Manufacture of pulp, paper, and paperboard
241	Manufacture of basic chemicals
274	Manufacture of basic precious and non-ferrous metals
29	Manufacture of machinery and equipment n.e.c.
30 - 33	Manufacture of electrical and optical equipment
34 - 35	Manufacture of transport equipment
40-41	Electricity, gas and water supply

Based on typical NACE-category aggregations in the 2000 Census of Industrial Production and Ireland's Central Statistics Office's (CSO) Eire Stat Spreadsheet Service industrial sector datasets, the 10 aggregations listed in **Table 2-3** were made in order that economic impact data would match the NACE-category reporting aggregations.

Table 2-3: Key Industrial Water Users by NACE Categories – Reporting Aggregations

NACE Code	Industrial Subsectors
10-14	Mining and quarrying
15-16	Manufacture of Food products; beverages and tobacco
21-22	Manufacture of Pulp, paper and paper products; publishing and printing
24	Manufacture of chemicals, chemical products and man-made fibres
27-28	Manufacture of basic metals and fabricated metal products
29	Manufacture of machinery and equipment n.e.c.
30-33	Manufacture of electrical and optical equipment
34-35	Manufacture of transport equipment
40	Thermoelectric power generation
40	Hydroelectric power generation

Thermoelectric power generation, a key industrial abstractive water user, and hydroelectric power generation, a key industrial in-stream water user, are both in NACE category 401 (Production and supply of electricity). Both are set aside from their typical NACE-category reporting aggregations (i.e., NACE 40-41: Electricity, gas and water supply), despite the fact that no published economic impact data are currently available for them individually. The Electricity Supply Board (ESB) is the sole known source of economic impact information related to these subsectors, as ESB facilities provide most of Ireland's hydroelectric and thermoelectric power (although 16 other relatively low-output hydroelectric facilities and three other significant thermoelectric facilities are not operated by ESB). The ESB provided national-level data on the output values, employment, and wages and salaries for the hydroelectric and non-hydroelectric power generating facilities in Ireland. Non-hydroelectric facilities are generalised to the thermoelectric subsector.

The economic impacts of public services are not addressed in this report due to lack of readily available data.

Data describing the economic impacts of the commercial services sector and its subsectors were not identified from public sources, nor did an attempted acquisition of such data from a private source produce utilisable data.

Economic impacts of five other key water-using subsectors not categorised as agricultural or industrial, but for which data were identified, are reported. **Table 2-4** lists these subsectors.

Table 2-4: Other Key Water Users by NACE Categories (where applicable)

NACE Code	Miscellaneous Subsectors
0200	Forestry, Logging and Related Services
0510	Inland Commercial Fishing
N/A	Seaweed Harvesting
0520	Operation of Fish Hatcheries and Fish Farms (Aquaculture)
N/A	Water-based Leisure

Non-uniformity of reports of economic impact parameters among sectors and sub-sectors and the periods of their availability constrain reporting of contemporary and identical economic impact parameters for identical years across all sectors and subsectors. Five general economic impact parameters do appear relatively common throughout the various data sources:

- 1) **Establishment counts**
- 2) **Gross output values**
- 3) **Gross value added estimates**
- 3) **Employment, and**
- 4) **Wages and salaries**

It is noteworthy, however, that all sometimes take on slightly different meanings depending on any given reporting terminology.

- For the agricultural sector, **establishment counts** are numbers of farms, also referred to as holdings. For the industrial sector, establishment counts are numbers of local units under the local units industrial census, and numbers of enterprises under the enterprise industrial census. Local units are reported here, as these counts include the satellite establishments of multi-regional enterprises.
- **Gross output values** are the gross values of goods and services and are generally reported across sectors and subsectors, as opposed to turnover figures, which tend to be reported less consistently. Gross output values have imbedded in them the factor costs of production, such that summing them across all subsectors results in double counting of economic activity and impacts.
- **Gross value added (GVA) estimates** are such that summing them across all subsectors *does not* result in double counting of economic activity, as these estimates are essentially the total revenues less the outlays for the factors of production. GVA estimates are reported in the enterprise industrial census, while net output values, a similar estimate, are reported in the local units industrial census. The gross value added estimates are the best identified available numbers for division by national total gross value added to arrive at percent of Gross Domestic Product (GDP). **GVA as a percent of GDP** is reported here. It is noted, however, that GDP is a composite value produced by two methodologies – one related to value added and the other to personal income.
- **Employment** is a fairly standard measure within and across sub-sectors and is quantified on a per person basis, although farm labour is often accounted for in work units, rather than on a per capita basis, due to the fact that much of the labour in the agricultural sector is part-time and family-based. As such, farm employment numbers reported here are in work units rather than total persons engaged. **Percent of national employment** is also reported.
- **Wages and salaries**, rather than compensation or remuneration, is used as an economic impact indicator (unless otherwise noted) due to the fact that this category is reported more consistently and frequently in economic impact datasets. **Percent of national wages and salaries** is also reported.

The disparate temporal distributions and geographical aggregations of contemporary, potentially utilisable datasets describing the economic impacts of the major water-using sectors and subsectors are illustrated in **Table 2-5**.

Table 2-5: Economic Impact Assessment Data Parameter Availability by Sector/Subsector

Sector/Subsector EIA Parameter	1998	2000	2001	2002	2003
Agricultural					
Establishment Count		DED		national	
Gross Output Value		national		national	
Gross Value Added				national	
Employment		DED		national	
Wages and Salaries				national	
Farmland Count		DED		national	national
Agricultural/Cattle & Sheep Subsectors (respectively)					
Establishment Count		DED	national		
Output Value		national		national	
Gross Value Added				national	
Employment					
Wages and Salaries					
Livestock Count		DED			national
Agricultural/Potato Subsector					
Establishment Count					
Gross Output Value	national			national	
Gross Value Added				national	
Employment					
Wages and Salaries					
Crop Hectarage Count		DED		national	national
Industrial/Industrial Subsectors*					
Establishment Count		county	national		
Gross Output Value			national	national	
Gross Value Added			national		
Employment			national		
Wages and Salaries			national		
Hydro/Thermoelectric Subsectors					
Establishment Count					national
Gross Output Value					national
Gross Value Added					
Forestry					
Employment					national
Wages and Salaries					national
Commercial-Services					
Establishment Count					
Gross Output Value					
Gross Value Added					
Employment				national	
Wages and Salaries				national	
Inland Commercial Fishing**					
Establishment Count					
Gross Output Value				national	
Gross Value Added					
Employment					
Wages and Salaries					

Table 2-5: Economic Impact Assessment Data Parameter Availability by Sector/Subsector (Cont.)

Sector/Subsector EIA Parameter	1998	2000	2001	2002	2003
Seaweed Harvesting					
Establishment Count					site
Gross Output Value					national
Gross Value Added					
Employment		national			
Wages and Salaries					
Aquaculture					
Establishment Count					site
Gross Output Value					national
Gross Value Added					
Employment					
Wages and Salaries					
Water-based Leisure					
Establishment Count					
Gross Output Value					national
Gross Value Added					
Employment					national
Wages and Salaries					

* Not including utilities

** All analysis of off-shore fishing is excluded in this study consistent with the scope of the WFD

In order to optimise the economic impact assessment reporting for parameter uniformity and comprehensiveness, in a manner that prevents substantial omission of the most recent estimates of critical impact parameters, specific years for economic impact assessment reporting for each sector and subsector were selected, as shown in **Table 2-6**.

Table 2-6: Economic Impact Assessment Reporting by Sector/Subsector, Parameters Reported, and Year

Sector/Subsector	Parameter(s)	Year
Agricultural	Establishment Count Gross Output Value Gross Value Added Employment Wages and Salaries	2002
Agricultural/Cattle & Sheep Subsectors	Gross Output Value	2002
Agricultural Potato Subsector	Gross Output Value	2002
Industrial/Industrial Subsectors (not including utilities)	Establishment Count Gross Output Value Gross Value Added Employment Wages and Salaries	2001
Thermoelectric Power Generation	Gross Output Value Employment Wages and Salaries	2003
Hydroelectric Power Generation	Gross Output Value Employment Wages and Salaries	2003

Table 2-6: Economic Impact Assessment Reporting by Sector/Subsector, Parameters Reported, and Year (Cont.)

Sector/Subsector	Parameter(s)	Year
Forestry	Employment Wages and Salaries	2002
Inland Commercial Fishing	Gross Output Value	2002
Seaweed Harvesting	Establishment Count Gross Output Value	2003
Aquaculture	Gross Output Value	2003
Water-based Leisure	Gross Output Value Employment	2003

Available data were utilised as described in **Table 2-7** to report the economic impact parameters for the key water-using sectors and subsectors at the RBD level. For the agricultural sector, CSO geographic information system (GIS) polygon data were utilised to distribute farms, livestock units, and potato hectares to the RBDs.

Table 2-7: Methodologies for RBD Distributions of Economic Impact Assessment Parameter Estimates by Sector/Subsector

Sector/Subsector	Methodology Employed to Distribute Parameters to RBDs
Agricultural	Year 2000 farm counts from CSO 2001 GIS polygon data are summed for each RBD and percentages of national farms are determined for each RBD. The percentages of farms for each RBD are multiplied by the 2002 national estimates for farm counts, gross output value, gross value added, employment, and wages and salaries to derive estimates of these parameters for each RBD.
Agricultural/Cattle & Sheep (respectively)	Year 2000 cattle and sheep counts (respectively) from CSO 2001 GIS polygon data are summed for each RBD and percentages of national cattle and sheep are determined for each RBD. The percentages of cattle and sheep for each RBD are multiplied by the 2002 national estimates of cattle and sheep farming gross output value and gross value added to derive respective estimates of these cattle and sheep farming parameters for each RBD.
Agricultural/Potatoes	Year 2000 potato crop hectareage estimates from CSO 2001 polygon data are summed for each RBD and percentages of national potato crop hectareages are determined for each RBD. The percentages of potato crop hectareages for each RBD are multiplied by the 2002 national estimate of potato crop farming gross output value and gross value added to derive estimates of these parameters for potato crop farming for each RBD.
Industrial/Subsectors (excluding utilities)	Year 2000 local unit counts by selected NACE categories and counties are summed for each RBD-bound county, and numbers of local units in each NACE category for counties that lie in >1 RBD are distributed to RBDs based on percentages of their populations in each RBD. Estimates of year 2000 total local units by NACE categories for each RBD are thus derived by summations of local units in RBD-bound counties and percentage estimates of county local units in each RBD, allowing percentages of the 2000 national total of local units by NACE for each RBD to be estimated. Year 2001 national local units (establishment counts), gross output values, gross values added, employment, and wages and salaries are multiplied by these percentages to derive estimates of these parameters for each RBD.

Table 2-7: Methodologies for RBD Distributions of Economic Impact Assessment Parameter Estimates by Sector/Subsector (Cont.)

Sector/Subsector	Methodology Employed to Distribute Parameters to RBDs
Hydroelectric and Thermoelectric Power Generation	Year 2003 national gross output values, employment, and wages and salaries estimates for hydroelectric and non-hydroelectric power generation (generalised to thermoelectric) were supplied by ESB. Percentages of gigawatt hour production in each RBD are determined by mapping each utility. These percentages were multiplied by the national gross output value, employment, and wages and salaries estimates to derive estimates of these parameters for each RBD.
Inland Commercial Fishing	The year 2002 national gross output value for inland commercial fishing was multiplied by the percentage of total collective numbers of salmon caught in the national tagging scheme in each RBD.
Seaweed Harvesting	The directory of Ireland's seaweed harvesters, with 36 addresses of operations in the Republic of Ireland, was used to distribute seaweed harvesting enterprises to RBDs. Year 2003 gross output value and year 2001 employment were multiplied by the percentages of seaweed enterprises in each RBD to arrive at RBD-level estimates of these two parameters.
Aquaculture	Sites licensed for aquaculture are mapped for allocation to RBDs. The year 2002 national output value for aquaculture is multiplied by the percentages of sites in each RBD to derive estimates of aquaculture output values for each RBD.
Water-based Leisure	Year 2003 national willingness to pay values and employment counts are distributed to RBDs by percents of populations in each RBD.

With one exception, the economic impacts estimated in this report are all direct impacts, meaning that gross output values, gross value added estimates, employment, and wages and salaries are those associated with establishments primarily engaged in the activities of their respective subsector classifications. The water-based leisure output value and employment estimates include, to some degree, output values and employment incidental to water-based leisure.

2.1.2 Water Use Valuations

Detailed below are methodologies for valuating three categories of water uses: abstractive uses, in-stream uses, and other. Water uses for which no valuation data were identified are also discussed.

Abstractive Use Valuations

Volumes of annual water use for the selected key water-using subsectors in the agricultural and industrial subsectors and the domestic sector were determined on a per-unit basis.

Agricultural water use for the potato-growing subsector was determined for each RBD by multiplying a per hectare irrigation value by total hectares of potatoes and then by the scheme-weighted average volumetric water rate for that RBD. Cattle and sheep water use values were similarly derived by multiplying per unit use estimates obtained from Teagasc (Teagasc, 2004) by animal counts in each RBD, and then by multiplying those numbers by the estimated agricultural scheme-weighted average water rate for each RBD. The agricultural scheme-weighted average water rate was derived from original rate data obtained via a survey of each local authority. See **Appendix B-10** for a summary of the findings of the survey of cost recovery practices of each local authority. The local authority rate applied in the agricultural subsector calculations was €2.92 per 1,000 gallons, which is the metered water charge for agricultural customers in County Leitrim – the only local authority that provided a metered agricultural charge rate in the rate survey that was conducted.

Industrial and domestic water use valuations were also done a per unit use basis.

Employment for each NACE category in each RBD was multiplied by a volume of water consumption per employee coefficient for the industrial subsectors taken from a comprehensive study of North American non-domestic water users (Planning and Management Consultants 1995). These numbers were then multiplied by a scheme-weighted average based on percentages of populations in each local authority (for which rate data had been obtained) that lie in each RBD.

The domestic water use valuations were done by utilising a per capita consumption rate for each RBD that was derived from the National Water Study (W.S. Atkins Ireland, 2003) based on the per capita consumption rates estimated for each local authority. Census 2002 population data were obtained and used as unit multipliers for the domestic water use valuations.

In-stream Use Valuations

Recreational Fishing, Boating, Beach Visitation, and Other Water-Based Leisure Use Valuations

National estimates of expenditures for using Ireland's recreational fisheries, navigable waters, beaches, and other marine amenities have been made available from a forthcoming publication by the Economic and Social Research Institute via the Marine Institute (Williams, 2004 forthcoming). Figures from this study serve as estimates of the partial value people who engage in water-based leisure activities in Ireland place on the water bodies that support these uses. Uniquely, the estimates also simultaneously provide an economic impact assessment parameter - an output value - for the water-based leisure "sector". What is unique in this sense about water-based leisure uses is that a relatively small proportion of value is added to these water uses from physical capital and labour. This is typically not the case with uses such as inshore commercial fishing, aquaculture, and hydroelectric power generation.

While it is true that the cumulative willingness to pay for these water-based leisure activities may in fact be higher due to the fact that those who value these leisure activities in excess of their reported expenditures are not accounted for in the study, it is also the case that significant expenditures represented in the study are incidental to water-based leisure. The extent to which these estimates represent over-estimations or under-estimations of the actual value of water-based leisure resources is indeterminable.

Other Valuations

Wetlands and Special Riparian Areas Valuations

The estimates of the values of wetlands and other aquatic-based lands recognized as having uniquely valuable environmental attributes in Ireland were derived from a literature review of applicable North American and Northern European valuation studies. No quantitative estimates of the values of these types of lands were identified from literature on Ireland-based studies, so studies in countries with geography, demography, and socioeconomics similar to Ireland were reviewed. This was done because each of these attributes has been shown, via meta-analytical studies of water resources benefit estimation work, to be a determinant of valuation results.

The uniquely valuable environmental functions of Ireland's wetlands include flood control, water quality protection, ground water recharge, and habitat for aquatic and terrestrial species (Otte, 2003). Other lands with wetland or surface water components that have been officially recognized as having uniquely valuable environmental functions - including National Heritage Areas, Special Protection Areas, and Special Areas of Conservation - are for the purposes of this study, collectively referred to as "Special Riparian Areas" (SRAs).

The literature review eventually focused on contingent valuation willingness-to-pay studies, including, in particular, a series of wetland valuation studies in England and a series of valuation studies of Environmentally Sensitive Areas in Scotland. The Environmentally Sensitive Area designation in the United Kingdom has many of the same categorization criteria as an SRA in Ireland.

Contingent valuation studies concentrate on the non-use value of habitat protection provided by these areas. The values are obtained either from mailed surveys to residents or on-site surveys of visitors. As such, the transfer values found in the contingent valuation studies listed in **Tables 2-8** and **2-9** were chosen for application in this study.

Table 2-8: Willingness to Pay per Person per Hectare per Year for Wetland Non Uses

Site	Area (ha.)	WTP – person / ha.
Caithness and Sutherland, Scotland 1991	202,000	0.0000613 euros
Norfolk Broads, England 1995	30,300	0.00024240 euros
Donau Auen, Austria 1993	38,500	0.00062160 euros

Table 2-9: Willingness to Pay per Person per Hectare per Year for Scottish ESA Non Uses

Site	Area (ha.)	WTP -person	Year of Study
River Bladnoch	300.20	0.0006139 euros	2004
Sands of Forvie	734.05	0.001305 euros	2004
Machair - Western Isles	15,166.00	0.0006528 euros	1996
Loch Lomond	37,000	0.0004103 euros	1998

In transferring the wetlands and SRA valuations to the applicable areas and populations in Ireland, the €/year/person/ha transfer coefficients were multiplied by the numbers of hectares of wetlands and SRAs, respectively, and then multiplied again by the populations in the district electoral divisions (DEDs) that harbour these respective areas. This methodology – ascribing willingness-to-pay only to persons in close proximity to these lands and only valuating a portion of their beneficial attributes – produces conservative, partial estimates of the values of these lands, and should be interpreted as such.

Where wetlands were found to lie within SRAs, the wetland hectareage was applied for that component of the SRA rather than the SRA hectareage. The example diagram (**Figure 2-1**) and calculation below **Table 2-10** illustrate the methodology applied to the wetland and SRA transfer valuations. The following figures have no factual basis. They are provided for ease of illustration.

Figure 2-1: Example Diagram for Wetlands & SRA Valuation Calculations

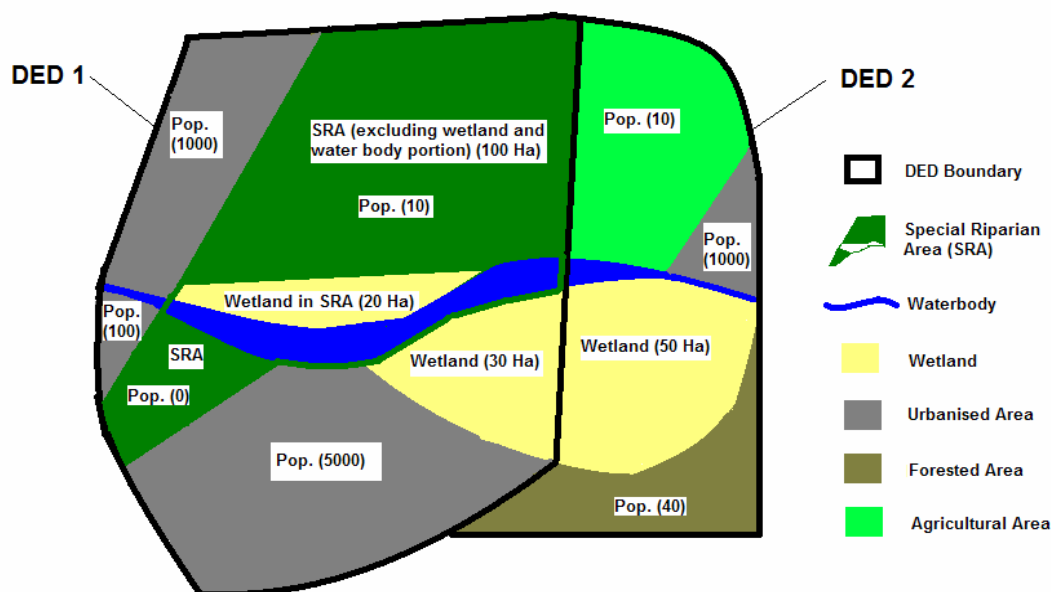


Table 2-10: Population and Wetlands & SRA Hectarage by DED – Example Only*

DED 1	DED 2
Population = 6,110	Population = 1,050
Wetlands = 50 hectares	Wetlands = 50 hectares
SRA = 100 hectares	SRA = 0 hectares

Wetlands Transfer Coefficient = € 0.0006216 /year/person/ha

SRA Transfer Coefficient = € 0.0013050 /year/person/ha

Estimated Wetland Non Use Value for DED 1 =

(€ 0.0006216 /year/person/ha wetlands) x (6,100 persons) x
(50 ha wetlands) = € 190/year*

Estimated SRA Non Use Value for DED 1 =

(€ 0.0013050 /year/person/ha SRA) x (6,100 persons) x
(100 ha SRA) = € 796/year*

Estimated Wetland Non Use Value for DED 2 =

(€ 0.0006216 /year/person/ha wetlands) x (1,050 persons) x
(50 ha wetlands) = € 33/year*

Estimated SRA Non Use Value for DED 2 =

(€ 0.0013050 /year/person/ha SRA) x (1,050 persons) x
(0 ha SRA) = €0/year*

* Values are for illustrative purposes only. RBD wetland and SRA non use values are obtained in this study by summing values for all DEDs in each RBD.

Water resources are known to have value to the following water users, but estimates of these values are not obtainable for reporting in 2004.

- Inshore Commercial Fishing Operations
- Aquaculture Operations
- Hydroelectric and Thermoelectric Power Generation Facilities
- Inland Water Transport Enterprises
- Forestry, Logging, and Other Related Activities
- Riparian and Coastal Property Owners

While the monetary value of the water resources from which each of these water users benefit is not technically equal to the total gross output values or even gross values added, it is true that there would be no inland commercial fishing, aquaculture, hydroelectric power, water transport, etc. without the water resources that support them. The absence of reportable values for these subsectors and categories should not be interpreted as a reflection of their collective or respective insignificance to the national and RBD economies. In fact, what information is known regarding the values associated with these miscellaneous water uses indicates that the partial collective national gross output value associated with these uses is an estimated €557 million annually.

2.2 Estimation of Water Services Costs

The following is a detailed description of the available information identified to report on the financial costs and costs recovery associated with providing water services and the environmental/resource costs associated with excessive water pollution. As this information is available at either the national or water service provider level, also included is an explanation of how these estimates were distributed for RBD level reporting.

2.2.1 Estimation of Costs and Costs Recovery of Water Services

Data on capital and receipts and expenditure for water and wastewater infrastructure is provided under Programme Group 3 information for local authorities by the Local Government Finance Section of DEHLG. The information provided contains totalled amounts for both expenditure and receipts under the following sub headings:

- Programme Sub Group 3.1 - Public Water Schemes
- Programme Sub Group 3.2 - Public Sewerage Schemes
- Programme Sub Group 3.3 - Private Installations
- Programme Sub Group 3.8 - Administration and Miscellaneous

The following describes the data obtained on potable water and wastewater services (i.e., Programme Group 3).

Data Sources

The data on current expenditure and receipts and investment in water and wastewater services was derived primarily from two publication series:

- Local Authorities Annual Budgets
- Local Authorities Annual Financial Statements

The Local Authorities Annual Budgets are prepared in December for the following year. The Local Authority Annual Budgets present current receipts and expenditure only. They represent the budgeted income and expenditure estimates for local authorities for the following year. These Local Authority Budgets are identical to the “Account Estimates” to which many local authorities still refer.

Annual Financial Statements are audited Local Authority Accounts which are prepared at the end of the financial year. These set out the entire capital and current expenditure and income of the local authorities. The latest Annual Financial Statements available are for 2002, as it involves a lengthy process of verification between the local authority, the local authority auditors and the DEHLG prior to their completion. A new Financial Management System (FMS) is being implemented by local authorities throughout Ireland. On completion of this, it is envisaged that this delay in preparation of financial statements will be reduced.

Investment Programmes

The majority of capital funding comes directly from central government, with the remainder from local authorities or industry based on cost recovery pursuant to the polluter pays principle. As a result, applicable information with regard to capital spending comes from central government in the form of expenditure breakdowns for the Water Services Investment Programme (WSIP) and the Rural Water Programme (RWP) for the period 2000 to 2003. The WSIP data is broken down by Local Authority. The rural nature of the RWP is reflected in its decomposition by County Council only.

The WSIP is designed to address Ireland’s water and sewerage infrastructural deficit. The RWP is administered by Local Authorities with the goal of addressing deficiencies in:

- Group Water Schemes (GWS),
- Small water and sewerage schemes in rural villages,
- Private individual supplies where an alternative group or public supply is not available.

Total local authority capital expenditure on Programme 3 is detailed in the Local Authority Annual Financial Statements. However, this data is only available to 2002. The consolidated capital account data contained in the Annual Financial Statements does not match with the combined WSIP and RWP expenditure data. This is due to all capital expenditure by Local Authorities not being directly funded by the DEHLG through the RWP and WSIP. It can be provided through local government borrowing, polluter pays receipts, and development levies - or a combination of each of these.

Water Production and Supply

The DEHLG prepares a report annually examining the funding needs of local authorities for the following financial year. These reports examine:

- The current expenditure needs of local authorities for the year

- The likely revenues accruing to local authorities over that period
- The net funding requirement of local authorities.

As part of this process, the volume of and cost of water production is projected. It is assumed that a total of 711 million m³ of water is produced on an annual basis in Ireland. Of this, 52.6% is apportioned to domestic use and 47.4% to non-domestic use. This would indicate that in the order of over 339 million m³ of water is produced for non-domestic purposes. However, according to returns prepared by the DEHLG, it is estimated that, in 2003 approximately 200 million m³ of water was supplied to non-domestic users. Part of the discrepancy in these figures may be attributable to unaccounted for water. On that basis, in 2003, approximately 28% of the water produced was supplied to non-domestic users. It is envisaged that non-domestic users would be charged for the production costs of this water, including the marginal capital costs associated with its provision.

Local Authority Consultations and Rate Survey

Five local authorities thought to collectively be representative of water service providers in Ireland were consulted regarding costs of providing water services, the recovery of these costs, and the system utilised to account for and report on expenditures and customer and government receipts.

In addition, in an effort to obtain some level of understanding of cost recovery mechanisms in each RBD, a comprehensive rate survey was administered with each local authority. All but seven of the local authorities responded. Responses were adequate to derive scheme-weighted average water rates for each RBD as well as provide a partial description of the rate structures in each RBD.

Omissions in Water Use Costs Estimates

It is noteworthy that expenditures for wastewater treatment and direct water abstractions which are external to the local authority reporting system are not accounted for in these estimates. No estimates of these costs were available for evaluation.

2.2.2 Estimation of Environmental/Resource Costs

The following programmes in Ireland are aimed in large part at achieving the goal of “good” water status for Ireland’s surface and ground waters by the year 2015.

Programmes Related to WFD Compliance

- Urban Wastewater Treatment Directive (91/271/EEC)
- Sewage Sludge Directive (86/278/EEC)
- Bathing Waters Directive (76/160/EEC)
- Freshwater Fish Directive (78/659/EEC)
- Habitats Directive (92/43/EEC)
- Groundwater Directive (80/68/EEC)
- IPPC Directive (96/61/EC)
- Shellfish Directive (79/932/EEC)
- Abstraction Directive (75/440/EEC)
- Drinking Water Directive (76/160/EEC)
- Nitrates Directive (91/676/EEC)
- Phosphorous Regulations (SI 258 of 1998)
- Rural Environmental Protection Scheme

Each of these programmes was researched with respect to planned or projected expenditures made pursuant to them. The summation of identified future expenditures pursuant to these programmes was to serve as a highly coarse and conservative estimate of the costs of achieving the WFD's good water status goal. This was to be done because no other data to estimate environmental/resource costs are known to be available.

More specifically, one means of estimating the water resources benefits foregone due to waters that fail the meet "good" status is to equate the value of benefits foregone (environmental/resource costs) to the costs of preserving or restoring these benefits. This methodology holds in theory given one fundamental assumption:

*The value of the water resources **marginal benefits preserved or recovered** - due to the application and attainment of the numeric and/or narrative criteria that are set or are to be set for the physical, chemical, and biological characteristics of surface and ground waters pursuant to the "good" water status goal - **approximate, on balance nationally or in any river basin district, the marginal costs of achieving the water resources benefits preservation or recovery.***

But, availability of these costs data for Directives, both at the Irish national level and at the EU level, was minimal. Furthermore, no reported planned expenditures data carried with them a reasonable basis for allocation to river basin districts.

It was determined that a superior source of data on the expenditures needed to achieve good water status was the Water Services Investment Programme Reports on wastewater treatment. These reports were solicited from each local authority, and reporting information for all but one county was acquired. County Donegal, Cavan, and Kerry were only able to provide reports for 2004-2006, while the others provided reports for 2004-2006 and 2007-2012. Estimates associated with local authorities split by RBDs were distributed based on their population distributions in each RBD.

2.3 Projections of Demand, Supply, and Costs of Water Services

Projections for the demand and supply capacity of potable water were available from an existing study (W.S. Atkins Ireland, 2000), as were projections of wastewater treatment capacity (DEHLG, 2004). Estimates of the projected costs of providing water services are derived via trend analysis of WSIP and RWP time series data. RBD level reporting of these local authority and scheme-level datasets was achieved by proportioning estimates applicable to more than one RBD by population.

2.3.1 Projections of Demand for Potable Water

A series of reports published as components of the National Water Study (W.S. Atkins Ireland 2000) was reviewed and the water demand projections included in those reports for the years 2003, 2008, 2013, and 2018 for the agricultural, industrial, commercial, and domestic sectors were collated for 28 local authorities. These data are contained in Section 8.4 of the series of reports. The projections were distributed to RBDs based on percents of local authority populations in each RBD. Water demand forecasts for the additional four local authorities in the Greater Dublin Area were derived from the 1999 demand estimate taken from the Water Services Investment Programme Assessment of Needs publications for South Dublin County Council (SDCC, 2003) and Dublin City Council (DCC, 2003) and the 2004 demand estimate obtained from DEHLG and DCC. Estimates of unaccounted for water for non-Dublin local authorities for the year 1997, found in Section 9.3 of the National Water Study series, were also collated for each RBD. Projections of unaccounted water for these areas were made assuming the proportion of unaccounted for water to total water demand would have a linear

decline to 20% in urban areas and 25% in rural areas by the year 2015. These projections are based on DEHLG Conservation Programme estimates.

Through simple linear interpolation, estimates of potable water demand by customer category for all years between 2003 and 2015 were derived for these local authority service areas for each RBD.

For most local authorities, water demand is divided between the agricultural, commercial, industrial, domestic, and municipal categories in the National Water Study. For other local authorities, this level of detail was not available. For this reason the non-domestic category overlaps the agricultural, commercial, industrial, and municipal categories.

Domestic demand was estimated in the National Water Study by monitoring the water use of a sample of households and multiplying that figure by the number of households in the service area.

A review of water transfers between water authorities revealed only one inter-basin water transfer greater than 1 megalitre per day. Other water transfers between local authorities and to group water schemes did not extend beyond RBD boundaries.

Aside from the population in the four local authorities of the Greater Dublin Area, a significant portion of the population of each RBD was not included in the National Water Study projections. This “off scheme” population is either connected to water schemes which were below the threshold for inclusion in the National Water Study or is self supplied. The National Water Study did provide estimates of per capita domestic demand for the rural, “off scheme” population. This per capita demand was multiplied by the “off-scheme” population for each county to estimate “off-scheme” domestic demand. These domestic demand projections were adjusted to account for the most recent county population projections from the CSO, which have a 2002 baseline. This was done by simple proportioning, as follows:

$$\text{on-scheme population 1997} / \text{county population 1997} =$$

$$x / \text{county population 2002}$$

where;

$$x = \text{on-scheme population 2002.}$$

Off scheme population for 2002 and beyond was then determined by subtracting 2002 on-scheme population from 2002 county population.

Year 2002 baseline off-scheme commercial and industrial water demands were made by proportioning them to off-scheme 2002 population, as follows:

$$\text{on-scheme population 1997} / \text{on-scheme commercial (industrial) demand 1997} = \text{off-scheme population 2002} / x$$

where;

$$x = \text{off-scheme commercial (industrial) demand 2002.}$$

Agricultural water use is an inverse function of population, so no estimates for off-scheme agricultural water use could be made in a similar fashion.

2.3.2 Projections of the Supply Capacity for Water Services

Potable Water Supply Capacity Projections

A series of 31 studies published as components of the National Water Study (W.S. Atkins Ireland, 2000) were reviewed, and the information in Table 5.1 of each of these studies provides water source yields estimates at the public water scheme level. Narrative characterisations of the status of future water supply are summarised by RBD. Estimates associated with service areas split by RBDs were distributed based on population distributions in each RBD.

Wastewater Treatment Capacity Projections

Datasets from the National Urban Waste Water Study for base year 2002 were reviewed. Reported information for year 2022 wastewater treatment capacity for each wastewater scheme analysed in the study were collated at the RBD level. A scoring sheet summarising the available information on projected treatment capacity in each RBD is presented.

2.3.3 Projections of the Costs of Water Services

Time series data from 2000 - 2003 on WSIP and RWP expenditures were utilised to derive trends in the costs of providing water services. Projections through to 2015 were made by applying growth rate trends. It is noteworthy that expenditures for wastewater treatment and direct water abstractions which are external to the local authority reporting system are not accounted for in these estimates. No estimates of these costs were available for evaluation.

Section 3

Discussion of Results

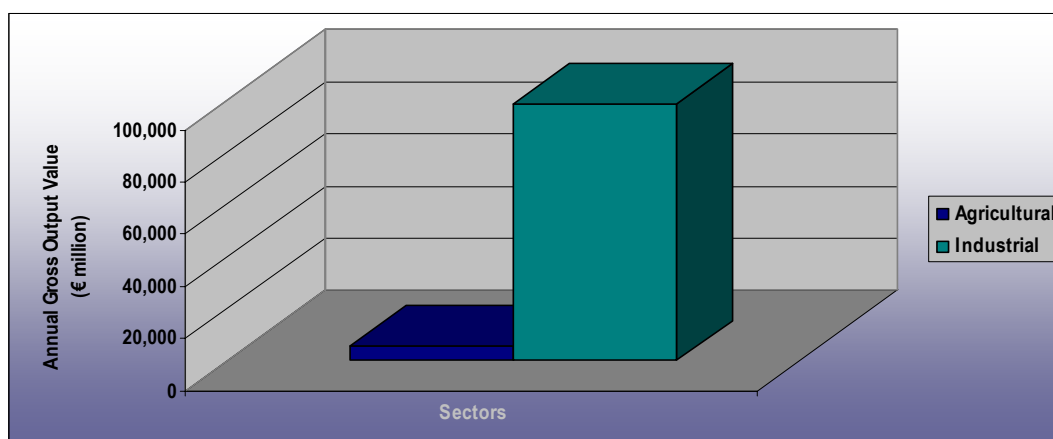
The results of this study are presented at the national level and at the RBD level. For both, estimates of the water use benefits and costs and costs recovery, and projections of the demand, supply capacity, and costs of water services are provided.

3.1 National Profile

The following national profile consists of estimates of the quantifiable benefits, costs, and projections related to the utilisation of Ireland's water resources.

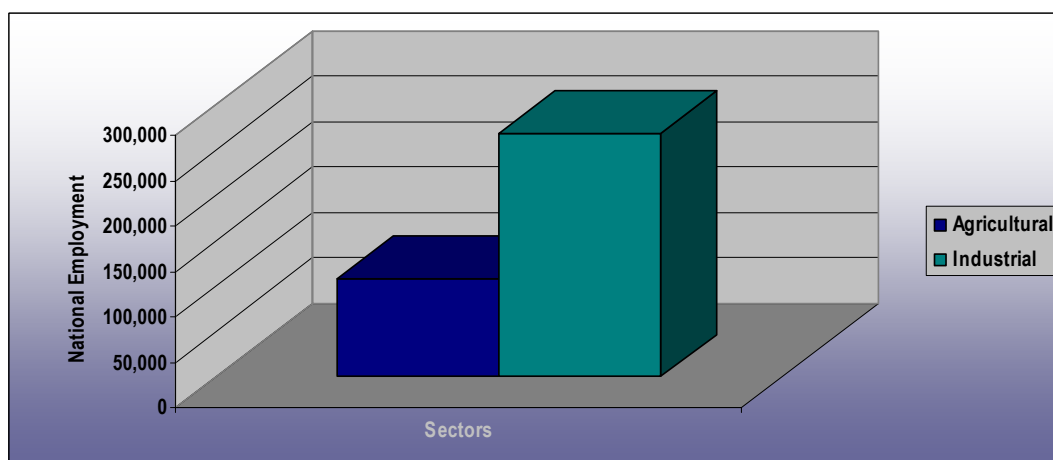
3.1.1 Estimates of Water Use Benefits

Figures 3-1 through 3-3 provide a picture of how the agricultural and industrial sectors respectively impact the Irish economy in terms of both output and employment.



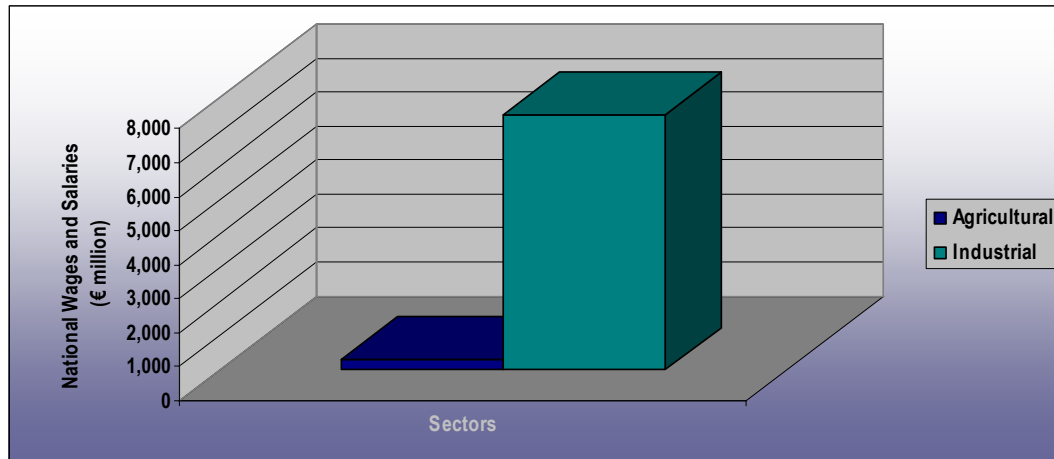
Source: Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) and CSO, Statistical Yearbook of Ireland, 2003

Figure 3-1: Estimated National Annual Gross Output Values: Agricultural (2002) and Industrial (2001) Sectors



Source: Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) and Department of Agriculture and Food

Figure 3-2: Estimated National Employment: Agricultural (2002) and Industrial (2001) Sectors

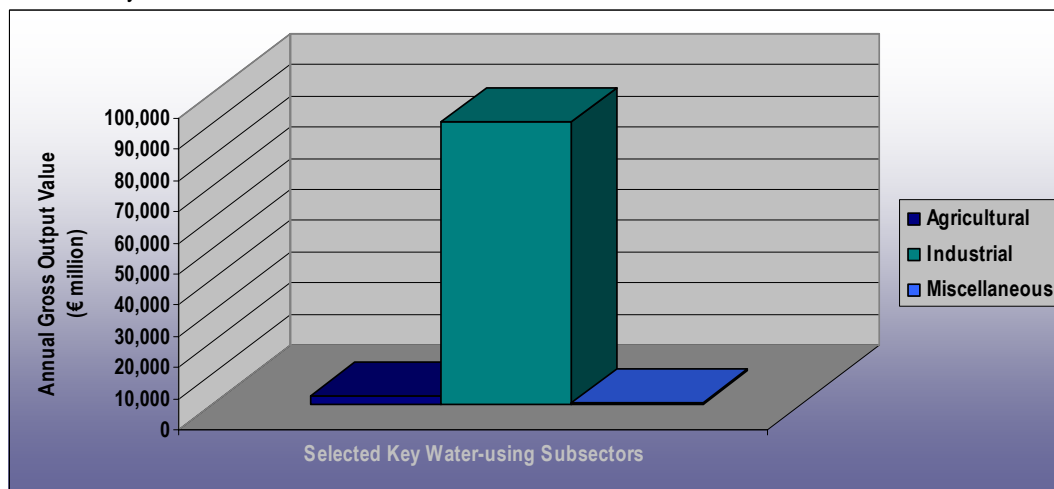


Source: Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) and Teagasc, Management Data for Farm Planning, 2003.

Figure 3-3: Estimated National Wages and Salaries: Agricultural (2002) and Industrial (2001) Sectors

Figure 3-4 is a comparison of the gross output values of selected key water-using subsectors in the agricultural and industrial sectors and miscellaneous other key water-using subsectors, including seaweed harvesting, inland commercial fishing, aquaculture, and water-based leisure activities. The selected key agricultural subsectors include the cattle and cattle products and sheep and sheep products subsectors, as well as the potato subsector. Key water-using industrial subsectors selected for analysis here are:

- Mining and Quarrying Subsector
- Food Products and Beverages Manufacturing Subsector
- Pulp, Paper, and Paper Products Manufacturing Subsector
- Chemical and Chemical Products Manufacturing Subsector
- Basic Metals Manufacturing Subsector
- Machinery and Equipment n.e.c. Manufacturing Subsector
- Electrical and Optical Equipment Manufacturing Subsector
- Transport Equipment Manufacturing Subsector
- Thermoelectric Power Generation Subsector
- Hydroelectric Power Generation Subsector



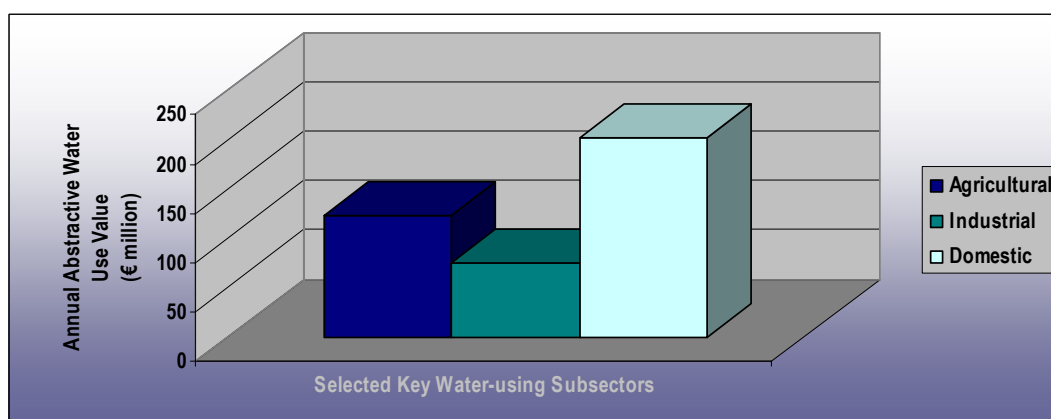
Source: Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) and CSO, Statistical Yearbook of Ireland, 2003
Multiple sources for miscellaneous categories – see Appendix B-1.

Figure 3-4: Estimated National Annual Gross Output Values in Selected Key Water-using Agricultural (2002), Industrial (2001), and Miscellaneous (2002, 2003) Subsectors

While the gross output values depicted in **Figures 3-1 and 3-4** are important measures of economic impact, at least equally critical to understanding the relative significance of water resources to the various key water-using sectors and subsectors is the value each places on its water use. Although multiplying consumption estimates by water charge rates can only provide very rough estimates of each subsector's willingness to pay for water (i.e., values), these estimates do provide information that economic impact assessment parameters do not. They provide insight into the value added to the final water-dependent outputs that is attributable exclusively to the water resource (i.e., not inclusive of labour and other capital).

In the case of the domestic sector, these water use valuations may provide some insight into the value households place on potable water services.

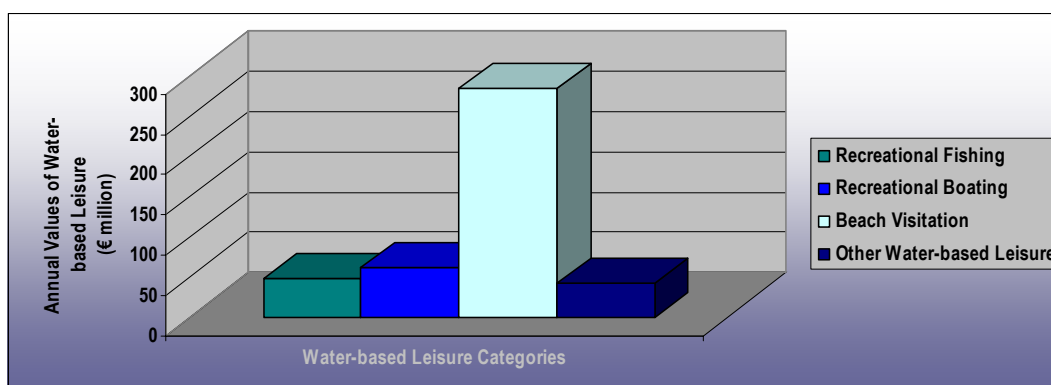
Figure 3-5 shows selected abstractive water use values for the selected key agricultural and industrial subsectors and for the domestic sector.



Source: Derived by multiplying unit use estimates by numbers of units (e.g., person, employees, livestock units) and water rates. See Appendix B-9.

Figure 3-5: Estimated National Annual Abstractive Water-use Values of Selected Key Water-using Subsectors (2001 Industrial, 2002 Agricultural) and the Domestic Sector (2003)

The nature of water-based leisure activities are unique in that water is not used as a factor of production the way it is in, for instance, livestock watering or optical equipment rinsing, nor do relatively significant levels of other capital and labour contribute to the gross output values associated with these economic activities. As such, the gross output values associated with the water-based leisure categories listed in **Figure 3-6** are also presented here as rough estimates of the actual use values of the water resources that support these uses.



Source: Williams, J. and B. Ryan, Participation in Marine-Based Leisure Activities in Ireland, 2003, Economic and Social Research Institute, 2004 forthcoming.

Figure 3-6: Estimated National Annual Values of Water-based Leisure (2003)

A multitude of additional information regarding Ireland's national economic profile as it relates to its water resources is provided in **Appendix B1** along with a breakdown of this national information at the RBD level, which is included in **Appendices B2 – B8**.

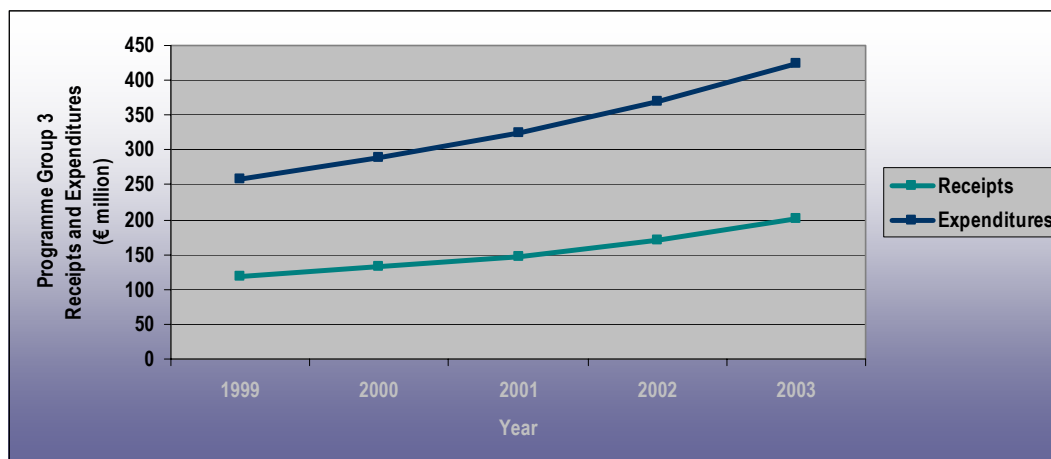
3.1.2 Estimates of Water Services Costs and Costs Recovery

The trends in current receipts and expenditures for water services in Ireland are outlined in **Table 3-1** and **Figure 3-7** below. Total Programme Group 3 current expenditure rose by 64.7% over the period 1999 to 2003 to reach a figure in excess of €424 million by 2003. Current receipt growth grew by 70.1%, a faster pace, during the same period. However, monetary terms, the current budget shortfall for Programme 3 increased from €140 million in 1999 to €224.16 million in 2003.

Table 3-1: Programme Group 3 Current Receipt and Expenditure Growth (€ millions)

Programme Groups	Sub	1999	2000	2001	2002	2003	Total
Receipts		117.74	133.58	145.72	169.37	200.22	766.43
Expenditure		257.74	288.18	325.41	370.53	424.38	1,666.04
Shortfall		(140.00)	(154.60)	(179.69)	(201.16)	(224.16)	(899.61)

Source: Local Authority Budgets 1999 - 2003



Source: DEHLG Local Authority Budgets 1999 – 2003

Figure 3-7: National Programme Group 3 Receipts and Expenditures Trends (1999-2003)

The overall current account trends can be further analysed in a sub group context. **Table 3-2** on the next page outlines current expenditure growth. Significant growth is experienced across all sub groups, with sub group 3.3 (Private Installations) posting the largest increase of over 122%, albeit it from a relatively low base. However, in real terms, the largest components of current expenditure remain sub groups 3.1 (Public Water Schemes) and 3.2 (Public Sewerage Schemes). It should be noted that just under €82 million of current expenditure is categorised as Administration and Miscellaneous (3.8). The DEHLG advises that this includes an allocation of central costs of the local authorities towards the provision of water services. It was also proposed that this cost could be apportioned on a pro rata basis amongst the other sub groups.

Table 3-2 Programme Group 3 by Sub Group Current Expenditure Growth (€ millions)

Programme Sub Groups	1999 € million	2000 € million	2001 € million	2002 € million	2003 € million	% Growth 99-03
3.1 Public Water Schemes	139.97	152.11	167.99	182.32	199.95	42.9
3.2 Public Sewerage Schemes	67.63	80.18	90.90	108.96	132.72	96.2
3.3 Private Installations	4.43	4.76	6.37	8.70	9.85	122.5
3.8 Admin & Misc.	45.71	51.13	60.15	70.5	81.86	79.1
Total	257.74	288.18	325.41	370.53	424.37	64.7

Source: Local Authority Budgets 1999 - 2003

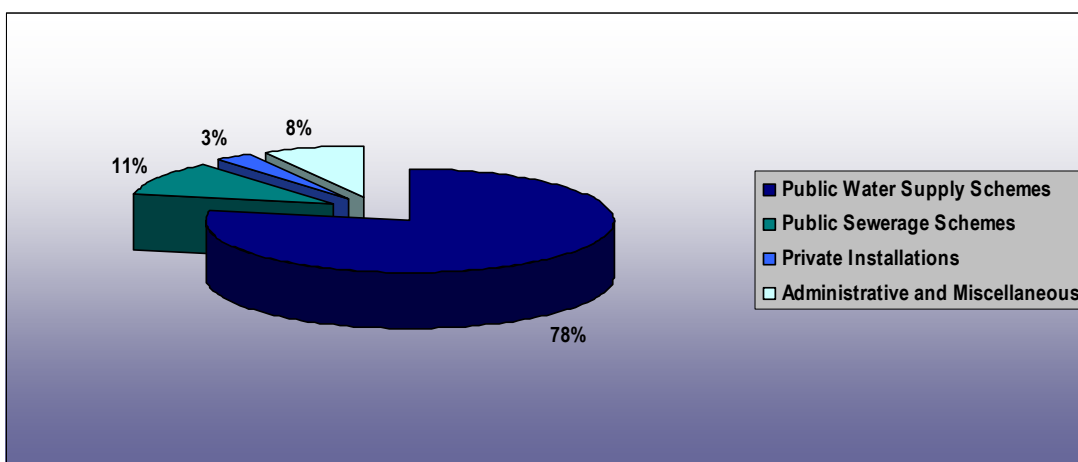
Table 3-3 below considers current receipt growth for the same period. A comparatively high rise in sub group 3.3 (Private Installations) receipts mirrors the very large expenditure growth for the same sub group, both rising from a relatively low base. Public Water Schemes (3.1) remain the dominant source of current receipts for Local Authorities. The 181% rise in receipts derived from Public Sewerage Schemes may be attributable to increased usage by non domestic customers and by the implementation of more comprehensive cost recovery mechanisms for such customers.

Table 3-3: Programme Group 3 by Sub Group Current Receipt Growth (€ millions)

Programme Sub Groups	1999 € million	2000 € million	2001 € million	2002 € million	2003 € million	% Growth 99-
3.1 Public Water Supply	91.65	100.52	107.63	120.25	141.57	54.5
3.2 Public Sewerage Schemes	13.18	17.17	19.99	25.41	37.03	181.1
3.3 Private Installations	3.03	4.34	5.21	7.92	9.42	210.5
3.8 Admin & Misc.	9.88	11.55	12.89	15.79	12.20	23.5
Total	117.74	133.58	145.72	169.37	200.22	70.1

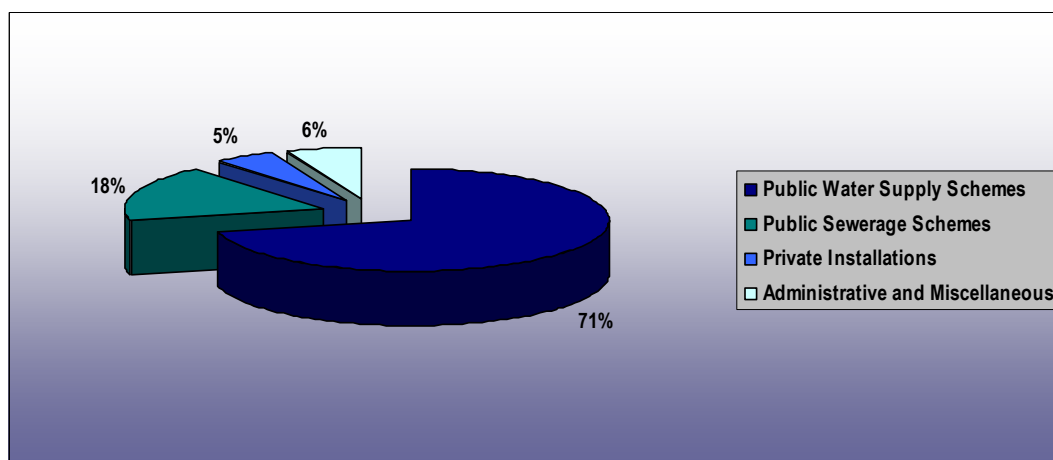
Source: Local Authority Budgets 1999 - 2003

Figures 3-8 to 3-11 below outline each sub group as a percentage of total current expenditure and receipts for the years 1999 and 2003. With regard to current receipts, the proportion derived from Public Water Schemes has declined from 78% in 1999 to 71% in 2003. Similar trends are identifiable in relation to current expenditure. The proportion expended on Public Water Schemes fell from 54% in 1999 to 47% in 2003. This rise is mirrored by an increase in the proportionate expenditures on Public Sewerage Schemes which stands at 31% in 2003.



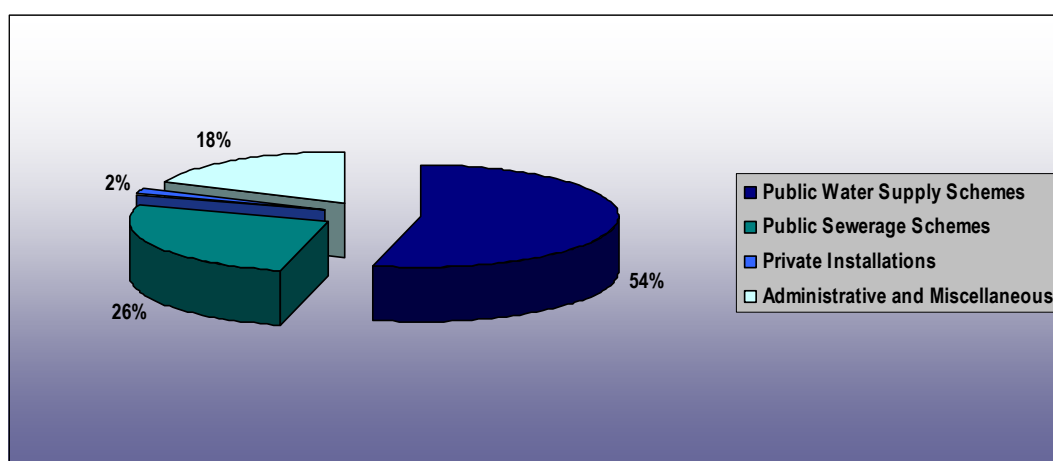
Source: DEHLG Local Authority Budgets 1999

Figure 3-8: Programme Group 3 Current Receipt Composition (1999)



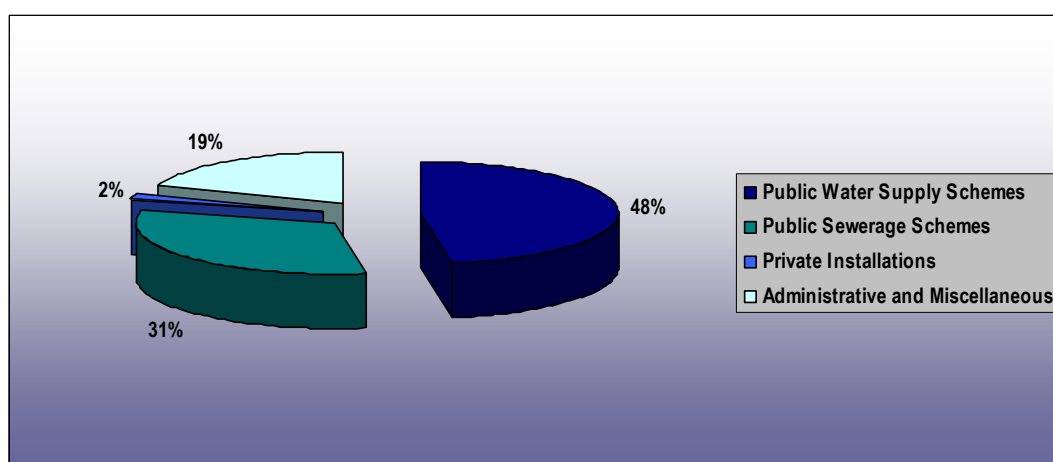
Source: DEHLG Local Authority Budgets 2003

Figure 3-9: National Programme Group 3 Current Receipt Composition (2003)



Source: DEHLG Local Authority Budgets 1999

Figure 3-10: National Programme Group 3 Current Expenditure Composition (1999)



Source: DEHLG Local Authority Budgets 2003

Figure 3-11: National Programme Group 3 Current Expenditure Composition (2003)

Overall, the current account data identifies a significant shortfall across all sub groups with the exception of Private Installations (3.3). The small shortfall for this sub group indicates the relatively neutral current cost to Local Authorities of providing grants to group water schemes. The current budget shortfall of Public Water Schemes (3.1) has widened from €48.3 million in 1999 to €58.3 million in 2003. This trend is even more clearly identifiable with regard to Public Sewerage Schemes (3.2), where the current budget shortfall increased from €54.4 million in 1999 to €95 million in 2003.

The proportionate breakdown of each sub group's share of total current expenditure illustrates the following trends. There are declines in the proportionate expenditures on Public Water Schemes and rises in the proportionate spend on Public Sewerage Schemes. The proportion of current expenditure categorised as Administration and Miscellaneous remained largely constant, up to 19% in 2003 from 18% in 1999.

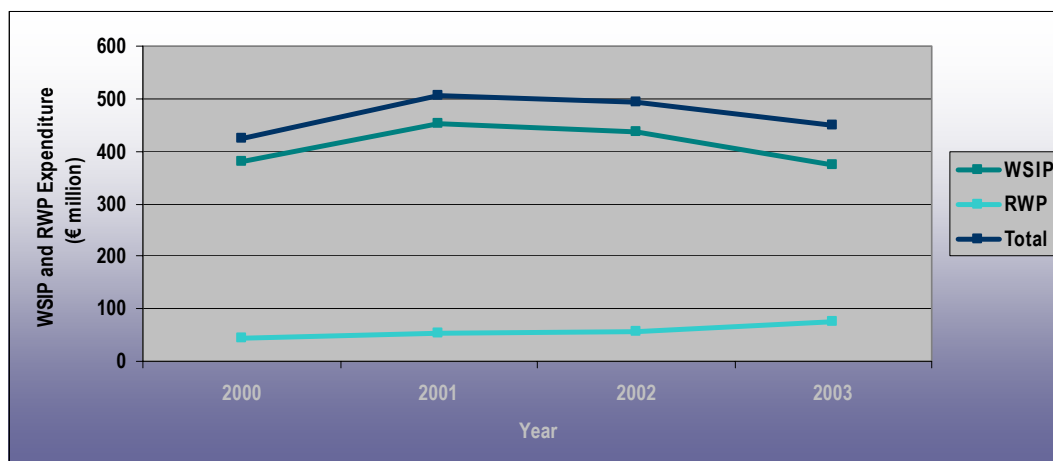
Capital Account Trends

The National Development Plan 2000 – 2006 (NDP) sets out the investment priorities for the State. It is estimated that, over that period, a total of €3.85 billion will be invested under the Environmental Infrastructure Priority 2000 – 2006. This is broken down as follows:

Wastewater	€1.67 billion
Water Supply	€0.58 billion
Management & Rehab of Infrastructure	€0.86 billion
Infrastructural Support	€0.70 billion
Coastal Erosion	€0.05 billion

Table 3-4 presents the progress on this expenditure to date. It should be noted that the RWP data excludes expenditure allocated to the Local Government Fund (LGF) for the years 2002 and 2003. The data highlights that investment under the WSIP reached a high level at over €453 million in 2001. Investment under this programme in 2003 totalled €374.8 million. We are advised that the Government/DEHLG do not intend to reduce capital investment under the water programmes. However, the emphasis on the nature expenditure may change to reflect Government/EU policies.

Expenditure under the Rural Water Programme has shown a constant upward trend in the period under consideration. Expenditure under this programme rose from €44.9 million in 2000 to €74.8 million in 2003. The combined RWP and WSIP expenditure for the years 2000 and 2001 can be compared with the capital expenditure data contained in the Local Authority Annual Financial Statements. This data illustrates that in the region of 70% to 80% of Local Authority capital expenditure was financed through either the Water Services Investment Programme or the Rural Water Programme in the years 2000 and 2002, with the remaining through other sources, either borrowing or through polluter pays principle receipts, and potentially recouped from non-domestic sources. This corresponds with the volume of water supplied to non-domestic users as a proportion of that produced (28%) as estimated above. However, there may be investments in the water services infrastructure funded by the Local Government Fund of which we would not be aware.



Source: DEHLG Water Services Expenditure 2000 - 2003

Figure 3-12: WSIP and RWP Expenditure (2000 – 2003)

Table 3-4: WSIP, RWP and Local Authority Capital Expenditure 2000 – 2003 (€ millions)

Expenditure	2000 € million	2001 € million	2002 € million	2003 € million	Total € million
WSIP	380.3	453.1	436.4	374.8	1,644.6
RWP	44.9	53.5	57.2	74.8	230.4
Total RWP and WSIP	425.2	506.6	493.6	449.6	1,875.0
Total Local Authority Capital Expend.	529.1	705.8	627.8	n/a	n/a
Proportion WSIP/RWP of Total	80.4%	71.8%	78.6%	n/a	n/a

Source: DEHLG Water Services Expenditure 2000-2003, Local Authority Annual Financial Statements 2000 and 2001

Non-domestic Costs and Costs Recovery

It is Government Policy to recover the cost of providing water services from the users of these services with the exception of water services for domestic/household purposes. It is estimated by the DEHLG that in 2003 there was a total of 183,650 non-domestic users of public water and wastewater services in Ireland. Of these:

- 34% are paying a metered charge;
- 43% are paying a flat charge;
- 22% are not directly charged for water/wastewater services;
- 14% are charged on a water-in / water-out basis; and
- 18% are paying on a consolidated basis.

These percentages do not add up to 100%, as there may be dual methods of charging for water services. The local authorities seem confident of implementing universal metering of water for non-domestic

services, based on a transparent identification of costs and cost allocation. However, the 2003 figures confirm that there remains considerable work to achieve this policy objective.

In 2003 the average actual charge per m³ across all local authorities was €0.96. There was a considerable variance in this charge, with local authorities such as Longford and Wexford charging €1.82 and €1.70 per m³ respectively, whilst authorities such as Waterford City charging €0.63 per m³ and Carlow as little as €0.66 m³.

The local authorities charging the most per m³ are not necessarily those experiencing the highest average cost of producing water to non-domestic users. It is estimated that the average cost is €1.02 per m³. It is noteworthy, though, that the City and County Managers Association provide a template to be used by all local authorities to identify all average operational costs for water and wastewater services, and that this template has been demonstrated to be an effective and transparent cost accounting mechanism.

Domestic Cost Recovery

Whilst local authorities are in the process of transparently identifying the cost of delivering water and wastewater services to domestic users, Government policy prohibits direct charges for domestic use. As is evident in **Table 3-1**, there is a significant annual shortfall in expenditure over receipts in relation to the provision of these services. According to DEHLG representatives, the funding for this deficit is the General Purposes Payments made to Local Authorities as part of the Local Government Fund.

The Local Government Fund & General Purpose Payments

The Local Government Fund was established by the Local Government Act 1998. The fund is sourced from a combination of Motor Tax net of local authority expenses, and an Exchequer contribution. Exchequer contribution for 1999 was set in the Local Government Act 1998 at €270 million. This contribution must be increased by inflation each year, and in some instances the increase in Exchequer contribution has been greater than inflation. By 2004 the Exchequer contribution to local authorities is €751.6 million, or 121% greater than the 1997 allocation and the total Local Government Fund is €1.2 billion.

The fund provides local authorities with the finance for general funding for their day to day activities, non-national roads and funding for certain local government initiatives.

The most recent year for which accounts are available for the Local Government Fund is 2002, when the fund totalled over €1 billion. Of this, almost €592 million was allocated for General Purposes Payments, an increase from almost €557 million in 2001. In allocating the General Purpose Payments, the DEHLG acknowledges the autonomy of local authorities.

Since 2001, the main determinant of the General Purpose Payments allocations has been the Needs and Resources Model as presented above. In addition to the amount provided through the model, an element of 'across the board' increase is included in the General Purpose grants. So in 2004 every local authority got an increase in the order of 10% to 25%. This increase recognises that the costs of running local authorities throughout Ireland increased significantly in 2004, which is due to a number of factors, but primarily the implementation of the pay increases agreed under the national pay agreement 'Sustaining Progress'.

Considering the level of non-domestic users not charged or undercharged for water services the use of the General Purpose Payments may, in instances, be used to fund this shortfall.

Other Funding Sources

The Planning Development Act 2000 allows for the imposition of levies to development schemes commonly known as development levies. All local authorities have adopted a development levy scheme, which applies a levy on per square metre of development, dependent on the local authority. This contributes towards infrastructural costs of the development of the administrative area.

In addition the Public Bodies Act 2002 verifies the right of local authorities to enter into public private partnership arrangements. Some environmental projects have using the public private partnership mechanism. It is noteworthy that one of the local authorities consulted is using the Design Build Operate public private partnership mechanism to meter non-domestic water services.

Findings of Survey of Ireland's Local Authority Water Services Cost Recovery Practices

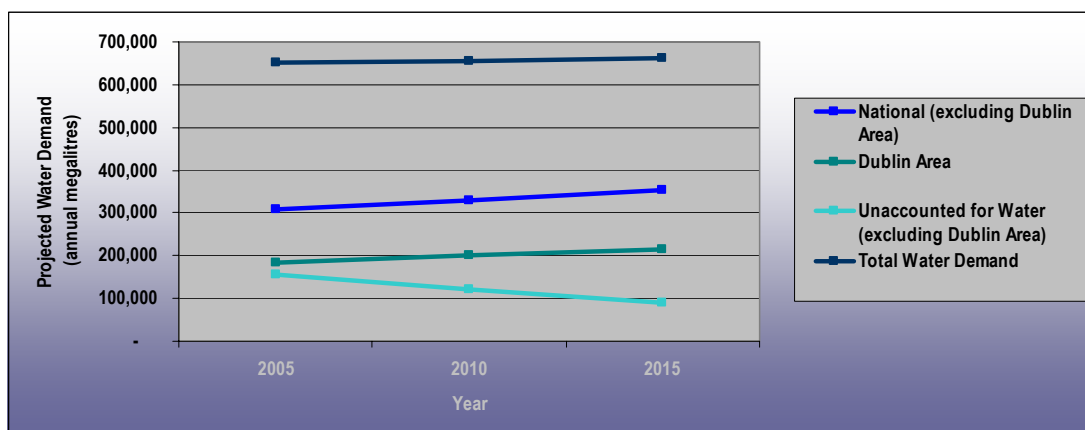
The results of the comprehensive cost recovery practices survey conducted to gain adequate information to derive RBD-level water rate estimates and to arrive at general conclusions regarding cost recovery mechanisms in each RBD is provided in **Appendix B-10**. Each local authority is sorted by primary RBD location, where local authorities in greater than one RBD are listed as a primary local authority in the RBD where it has its largest percent population.

3.1.3 Estimates of Environmental/Resource Costs

The only known projection of wastewater treatment financial needs is that provided by local authorities in their WSIP reports. Hence, as explained in Section 2, these estimates serve as the only obtainable estimates of the values of foregone water resources benefits due to excessive pollution. The national estimate of the public environmental/resource costs, excluding one county, is thus the national total reported in the WSIP Assessment of Needs reports. This figure is €4,380,887,402 for the period between 2004 and 2012.

3.1.4 Projections of Demand, Supply, and Costs of Water Services

Figure 3-13 shows national potable water demand and unaccounted for water. The demand projections for the local authorities in the Greater Dublin Area were done independent of the other local authorities in Ireland (i.e., not included in the National Water Study). Hence, due to this and its relative magnitude, the Dublin demand forecast for all customer classes is included as an independent projection in **Figure 3-13**.



Source: Based on National Water Study (W.S. Atkins Ireland 2000) demand modified for Census 2002 population estimates, unaccounted for water projections provided by DEHLG, and Dublin area demand projections from Dublin City Council

Figure 3-13: Projected Annual Water Demand and Unaccounted for Water: 2005 - 2015

National level conclusions regarding potable water future supply capacity cannot be made, although tables included in **Appendices B2 – B8** provide a qualitative overview for each RBD.

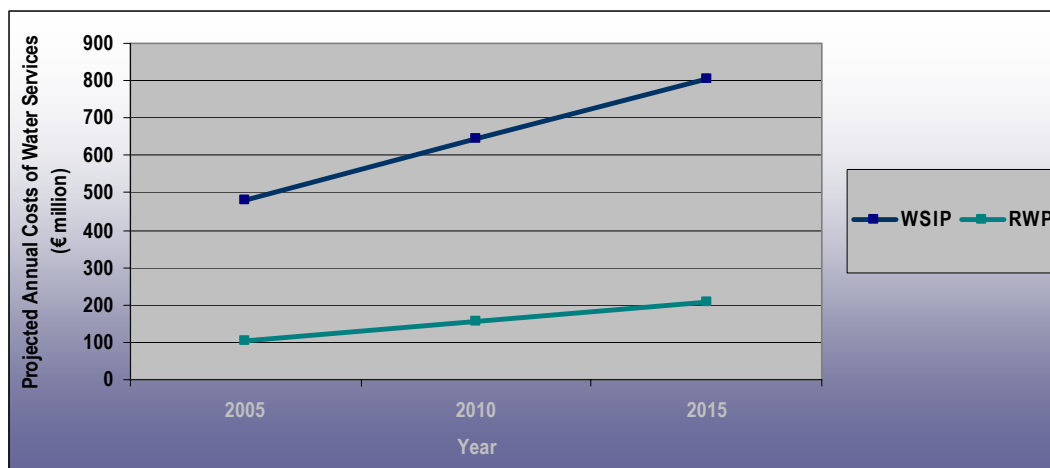
Table 3-5 is the only available information on the supply capacity for wastewater treatment services, which is contained in the National Urban Waste Water Study (DEHLG, 2004 forthcoming). The Study provides a characterisation both in terms of the adequacy of current treatment facilities to treat future projected loadings and the current assimilative capacities of receiving waters.

Table 3-5: Supply Capacity of Wastewater Treatment Services

	Relative Treatment Capacity of Wastewater Treatment Plants in 2022 (projected loadings under current design capacity)			Relative Assimilative Capacity of Receiving Waters in 2002 (receiving waters in each assimilate capacity category)	
Classification	Adequate	Under Capacity	Not Known	Restricted	Unrestricted
Percent	48%	49%	3%	85%	15%

Source: DEHLG, National Urban Waste Water Study, 2004.

The projected costs of water services through to 2015, estimated via simple trend analysis of Water Services Investment Programme and Rural Water Programme data for 2000 – 2003, is provided in **Figure 3-14** below.



Source: Derived via trend analysis from DEHLG WSIP and RWP data for 2000- 2003

Figure 3-14: Projected National Annual Costs of Water Services - Water Services Investment Programme (WSIP) and Rural Water Programme (RWP) Water and Sewerage Costs

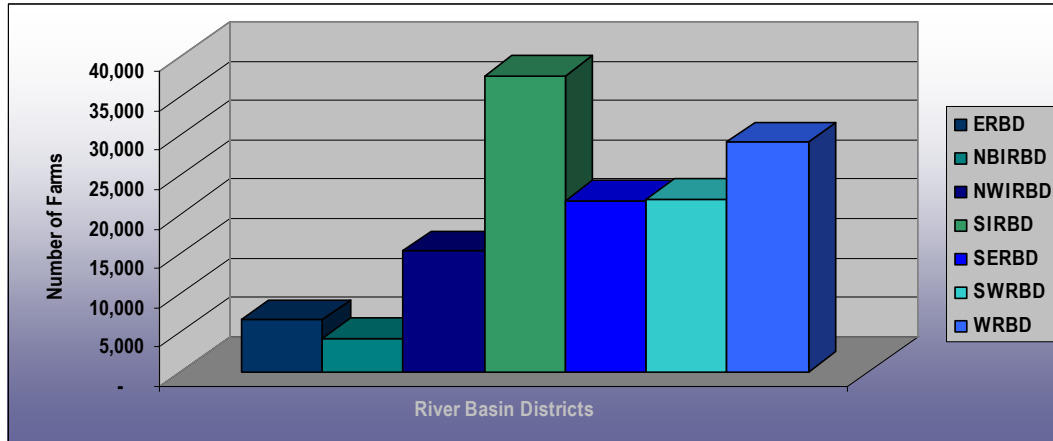
3.2 River Basin District Profiles

All numerical results from this study at the RBD level are listed in **Appendices B-2** through **B-8**. Derivations of national figures for RBD-level reporting were derived via multiple methodologies and sources, as noted in **Section 2** and **Appendix B-9**.

Some graphical comparisons among RBDs of benefits estimates, costs and costs recovery estimates for water services and environmental/resource costs, and projections of demand, supply, and costs of water services are made below.

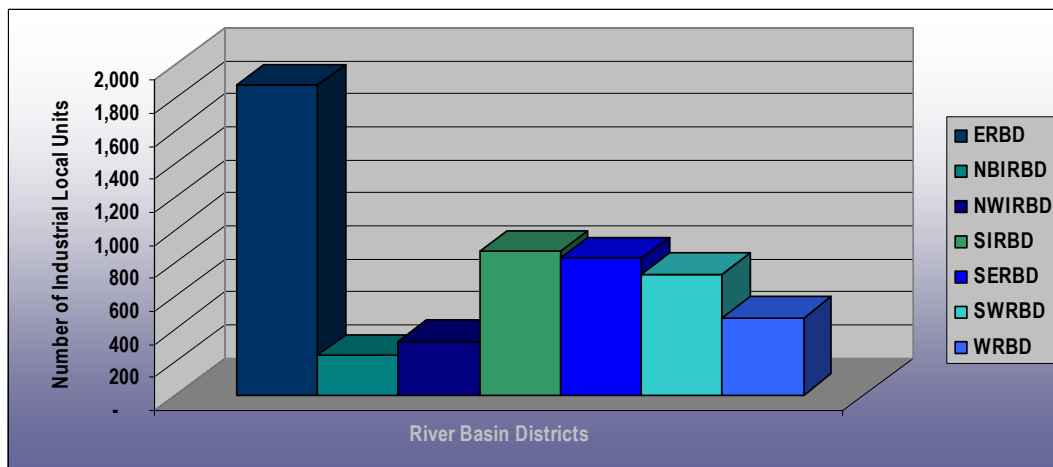
3.2.1 Estimates of Water Use Benefits

Figures 3-15 and 3-16 show estimated counts of farms and industrial local units in each RBD.



Source: Derived from national estimates in CSO, Statistical Yearbook of Ireland, 2003 and Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

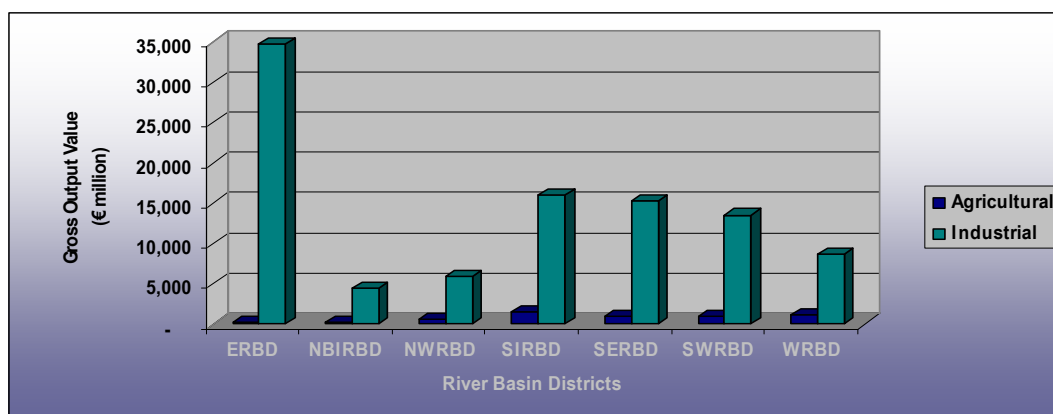
Figure 3-15: Estimated Number of Farms in River Basin Districts (2002)



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

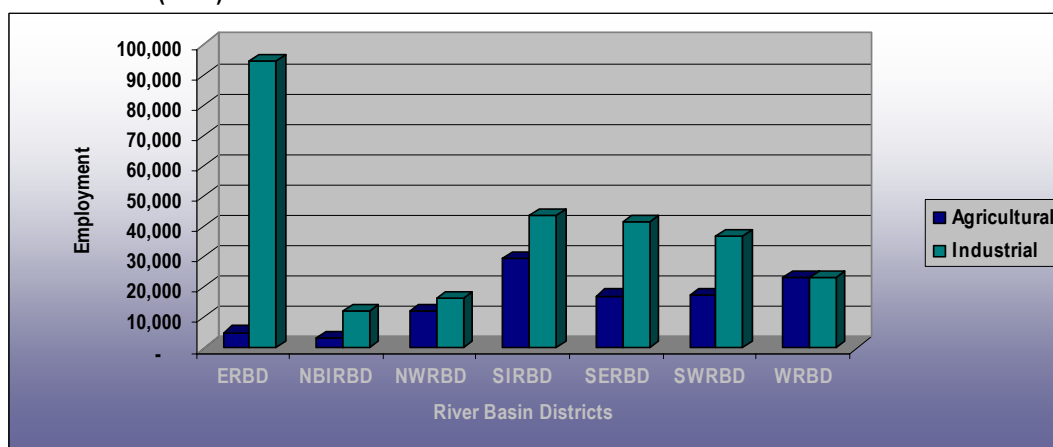
Figure 3-16: Estimated Number of Industrial Local Units in River Basin Districts (2001)

Figures 3-17 through 3-19 detail for each RBD the gross output values, employment, and wages and salaries associated with the agricultural and industrial sectors.



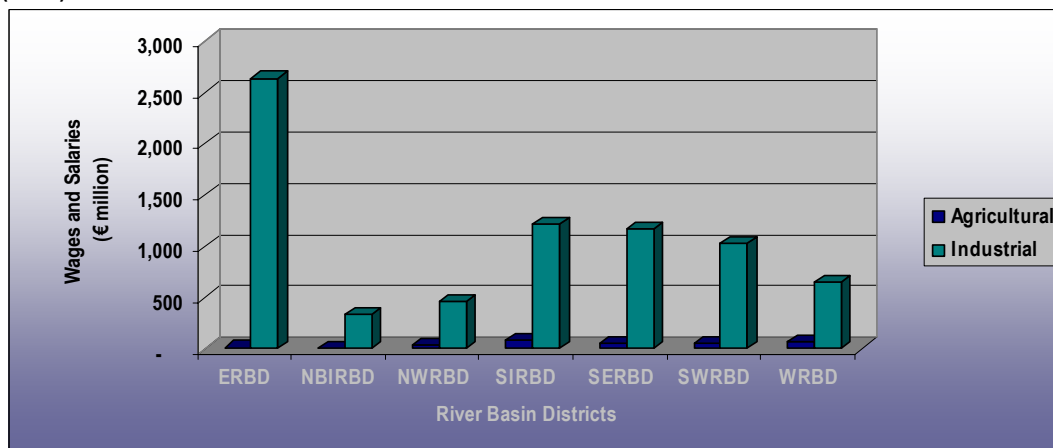
Source: Derived from national estimates in CSO, Statistical Yearbook of Ireland, 2003 and Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

Figure 3-17: Estimated Annual Gross Output Values in River Basin Districts - Agricultural (2002) and Industrial (2001) Sectors



Source: Derived from national estimates in CSO, Statistical Yearbook of Ireland, 2003

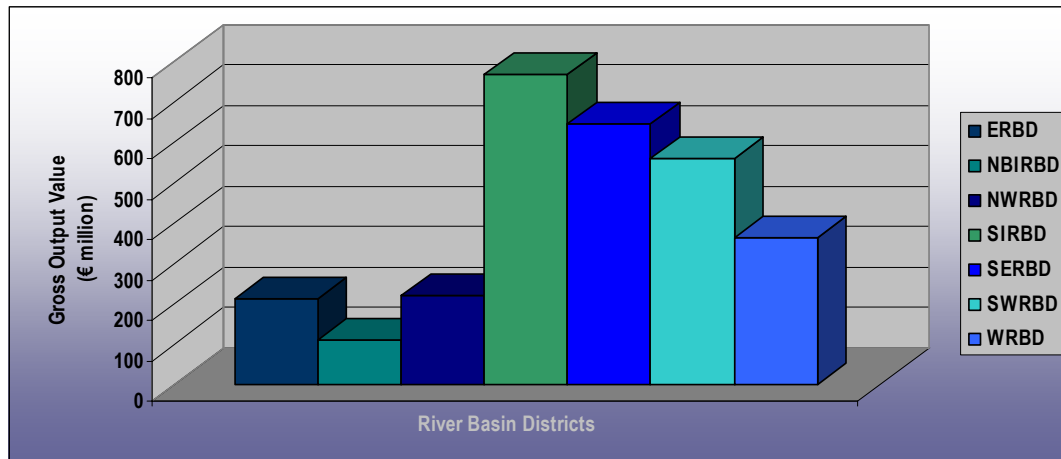
Figure 3-18: Estimated Employment in River Basin Districts - Agricultural (2002) and Industrial (2001) Sectors



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates and Teagasc, Management Data for Farm Planning, 2003.

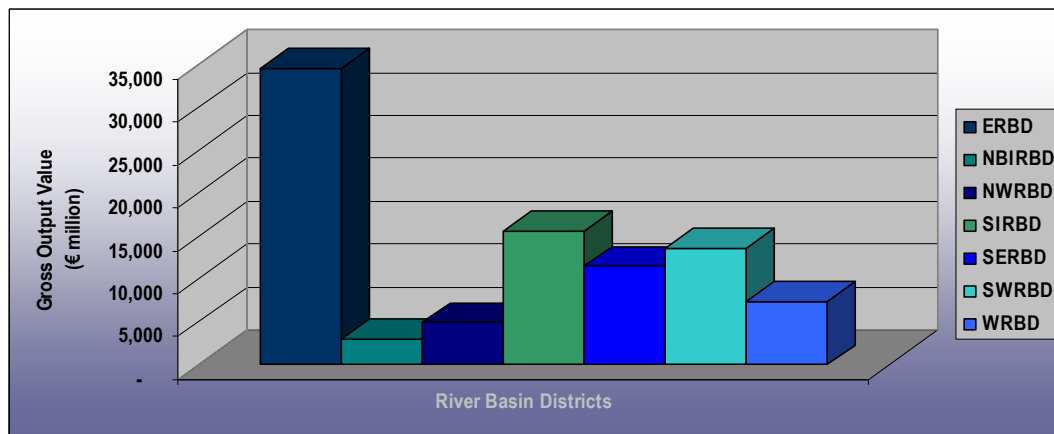
Figure 3-19: Estimated Annual Wages and Salaries in River Basin Districts - Agricultural (2002) and Industrial (2001) Sectors

Figures 3-20 and 3-21 provide a picture of the gross output values of the selected key water-using agricultural and industrial subsectors.



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates and Teagasc, Management Data for Farm Planning, 2003.

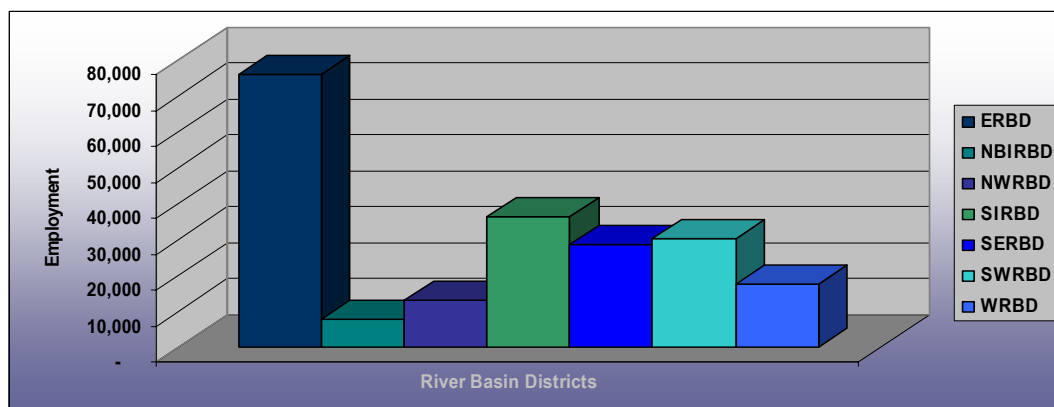
Figure 3-20: Estimated Annual Gross Output Values of Selected Key Water-using Agricultural Subsectors in River Basin Districts (2002)



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

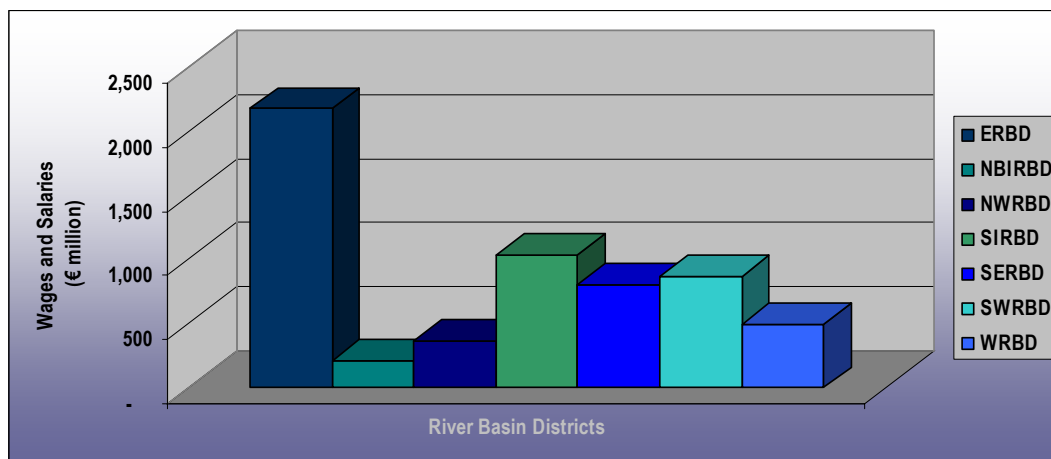
Figure 3-21: Estimated Annual Gross Output Values of Selected Key Water-using Industrial Subsectors in River Basin Districts (2001)

Figures 3-22 and 3-23 illustrate the employment and wages and salaries associated with the selected key water-using industrial subsectors.



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

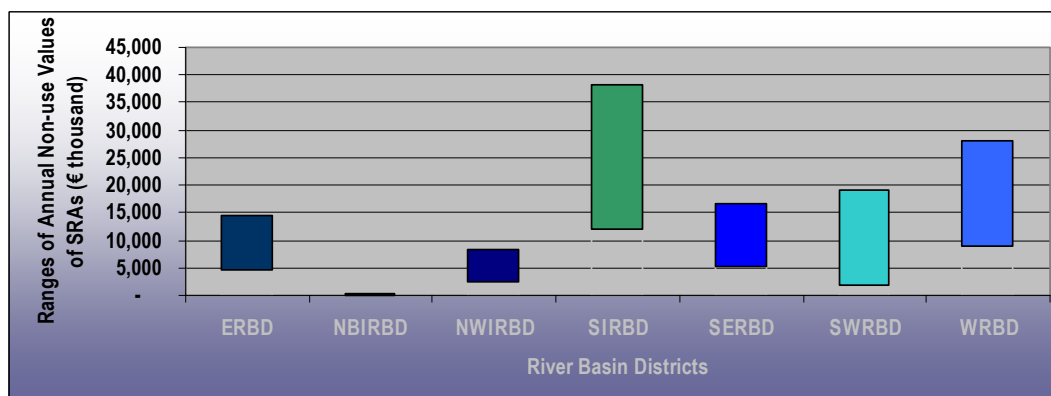
Figure 3-22: Estimated Employment in Selected Key Water-using Industrial Subsectors in River Basin Districts (2001)



Source: Derived from CSO Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie>) national estimates

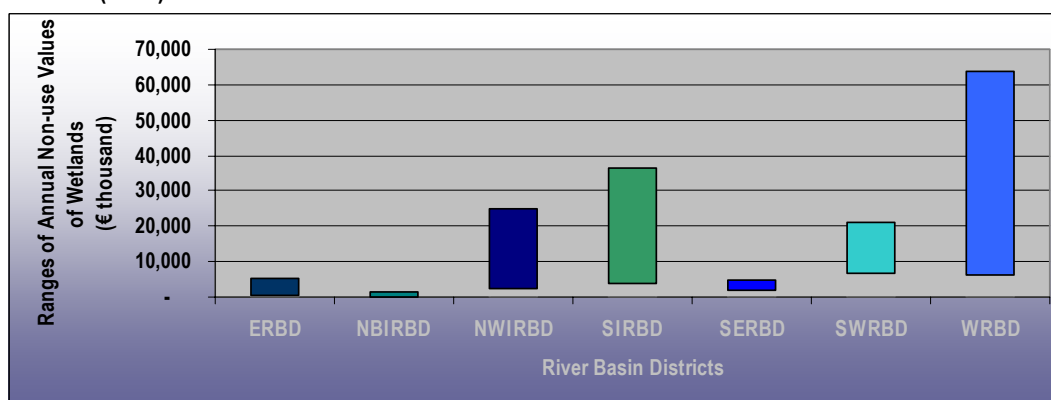
Figure 3-23: Estimated Annual Wages and Salaries in Selected Key Water-using Industrial Subsectors in River Basin Districts (2001)

Figures 3-24 and 3-25 show the ranges of estimates of non-use values of Special Riparian Areas and Wetlands in each RBD.



Source: Derived in part by transferring values from Scotland. See Appendix B.

Figure 3-24: Estimated Ranges of Annual Non-Use Values of Special Riparian Areas in River Basin Districts (2004)

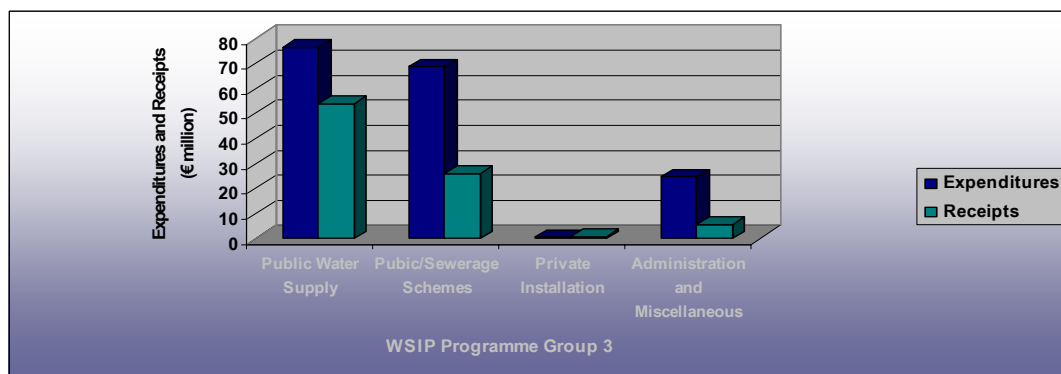


Source: Derived in part by transferring values from studies in England, Scotland, and Austria. See Appendix B.

Figure 3-25: Estimated Ranges of Annual Non-Use Values of Wetlands in River Basin Districts (2004)

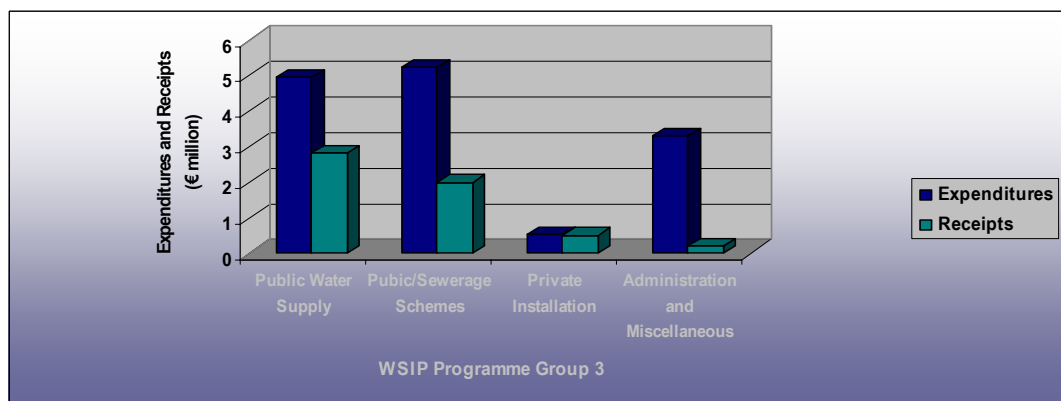
3.2.2 Estimates of Water Services Costs and Costs Recovery

Figures 3-26 through 3-32 detail the 2003 expenditures and receipts associated with Water Services Investment Programme - Programme 3 costs in each RBD. Figure 3-33 is a recap of the national level expenditures and receipts estimates.



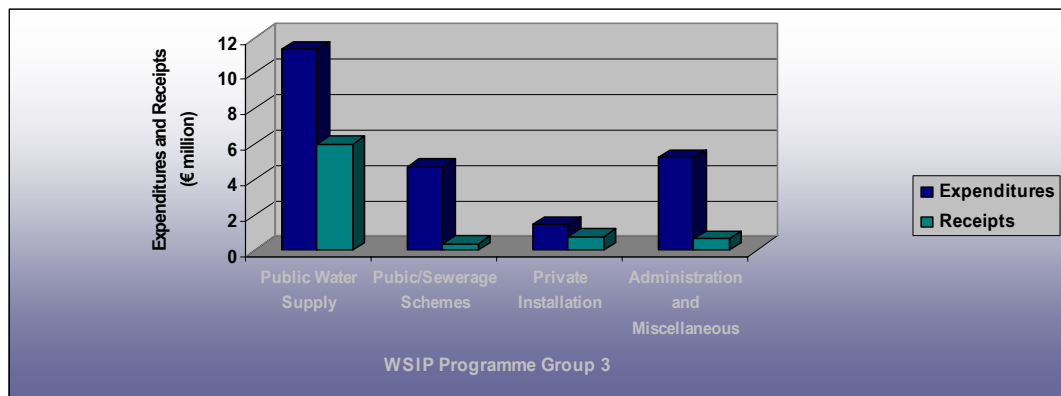
Source: Derived from DEHLG WSIP dataset

Figure 3-26: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - Eastern River Basin District



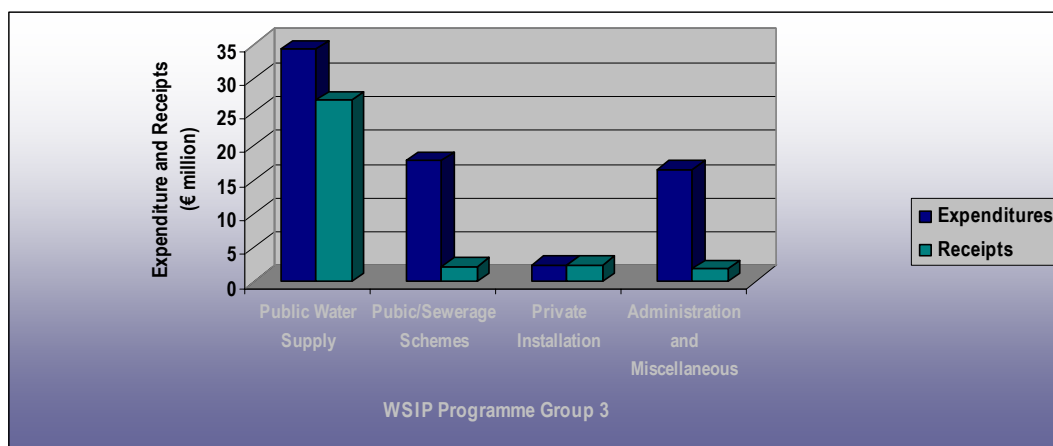
Source: Derived from DEHLG WSIP dataset

Figure 3-27: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - Neagh Bann International River Basin District



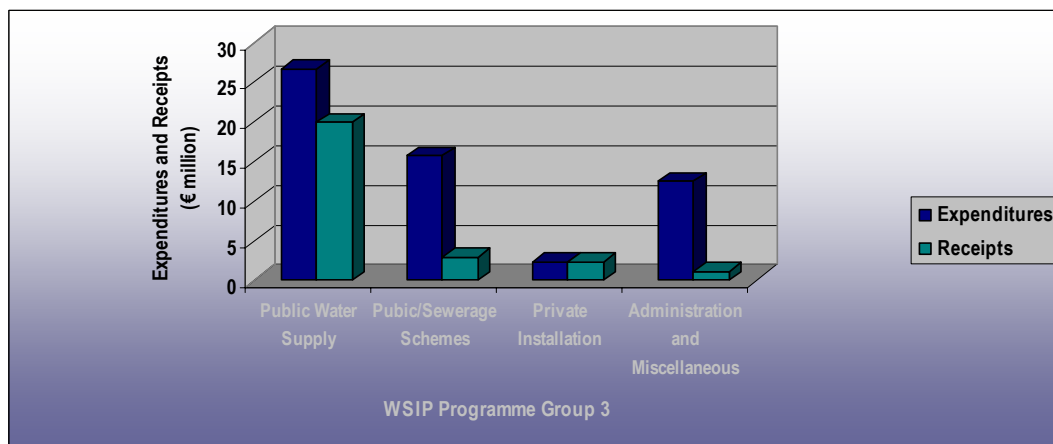
Source: Derived from DEHLG WSIP dataset

Figure 3-28: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - North Western International River Basin District



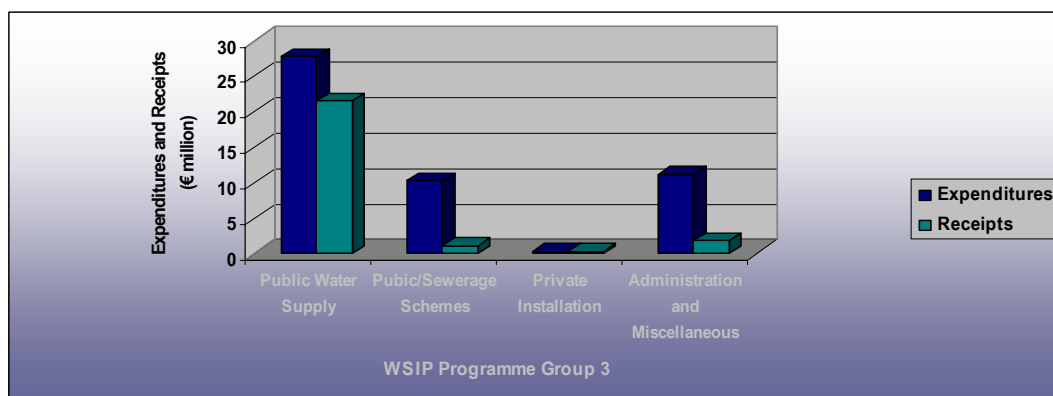
Source: Derived from DEHLG WSIP dataset

Figure 3-29: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - Shannon International River Basin District



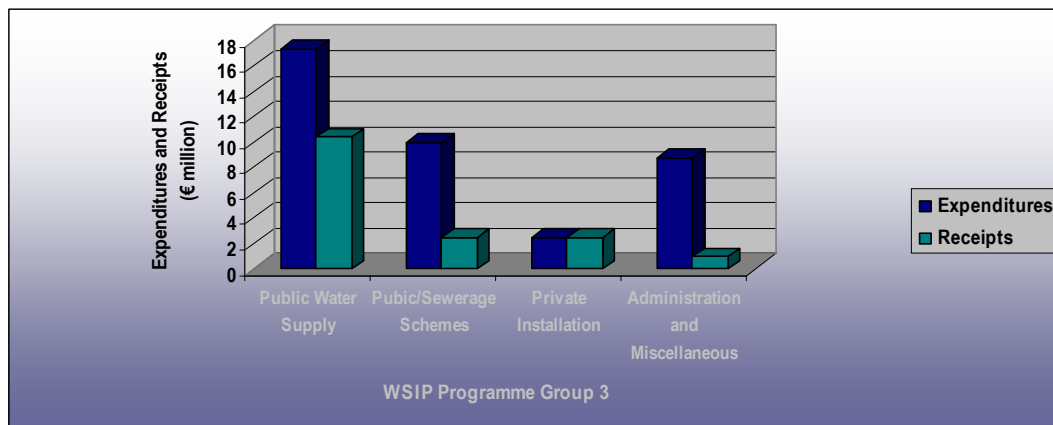
Source: Derived from DEHLG WSIP dataset

Figure 3-30: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - South Eastern River Basin District



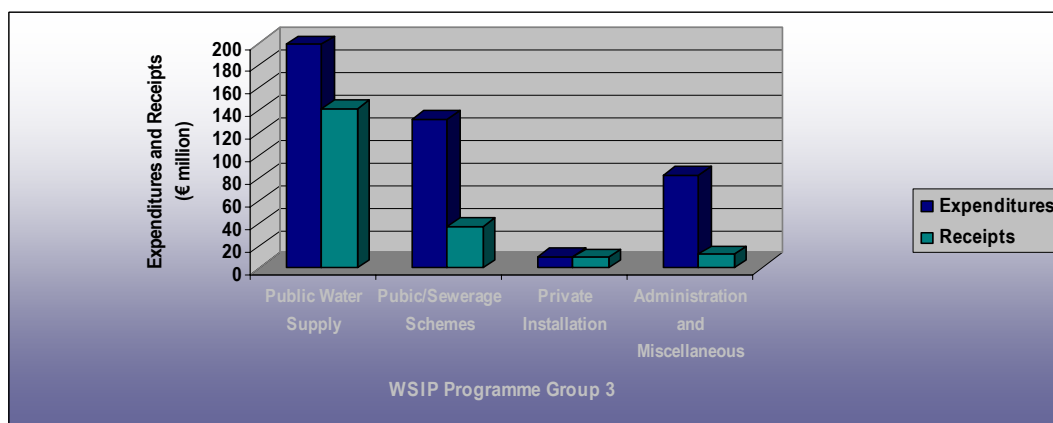
Source: Derived from DEHLG WSIP dataset

Figure 3-31: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - South Western River Basin District



Source: Derived from DEHLG WSIP dataset

Figure 3-32: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - Western River Basin District

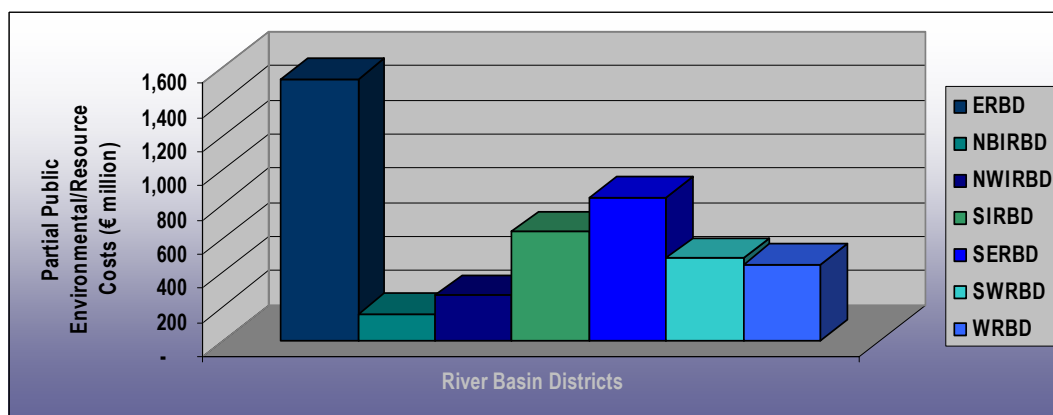


Source: DEHLG

Figure 3-33: Estimated Costs and Costs Recovery of Water Services (2003): Water Services Investment Programme Group 3 - National Totals

3.2.3 Estimates of Environmental/Resource Costs

Environmental/Resource cost estimates are derived from wastewater treatment financial needs estimates provided by each local authority. **Figure 3-34** illustrates these cost estimations.

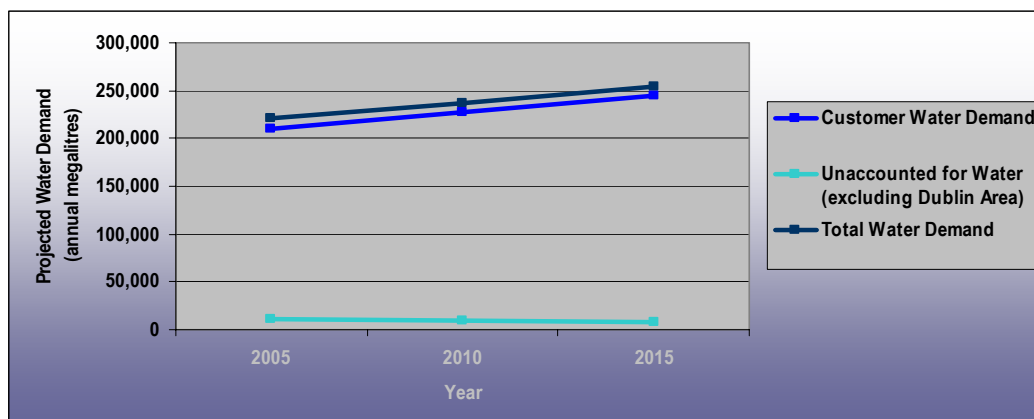


Source: Derived from local authority Water Services Investment Programme Assessment of Needs reports

Figure 3-34 – Estimated Partial Public Environmental/Resource Costs: 2004 – 2012 (if the marginal costs of these wastewater treatment expenditures are less than or equal to the marginal benefits preserved or restored due to these expenditures)

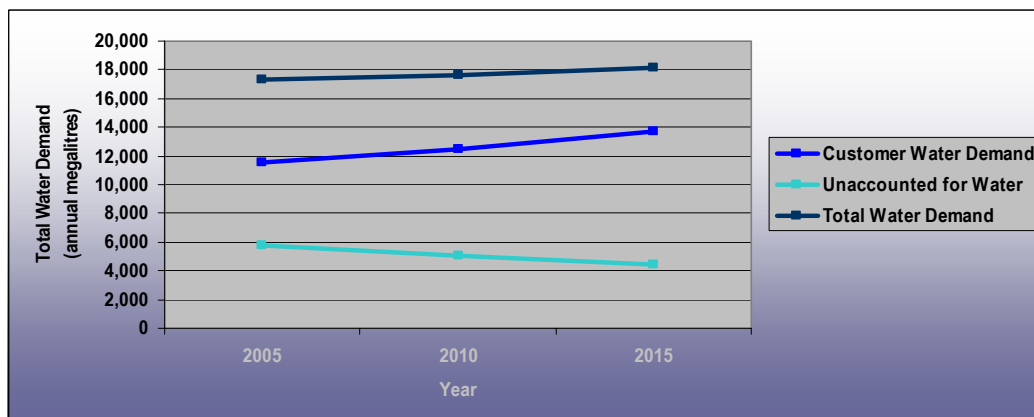
3.2.4 Projections of Demand, Supply, and Costs of Water Services

Figures 3-35 to 3-41 show the estimated demand for potable water supply through to 2015 for each RBD.



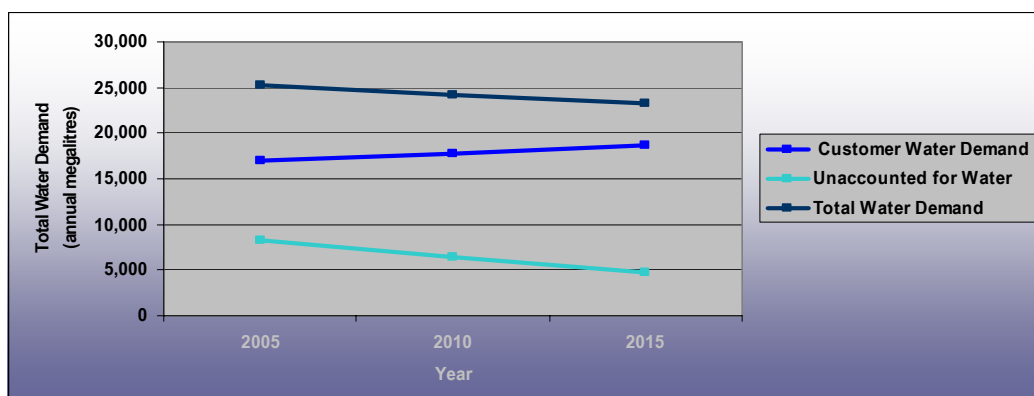
Source: Based on National Water Study (W.S. Atkins Ireland, 2000) demand modified for Census 2002 population estimates, unaccounted for water projections provided by DEHLG, and Greater Dublin Area demand projections derived from estimates obtained from DEHLG and Dublin City Council

Figure 3-35: Eastern River Basin District Projected Water Demand and Unaccounted for Water



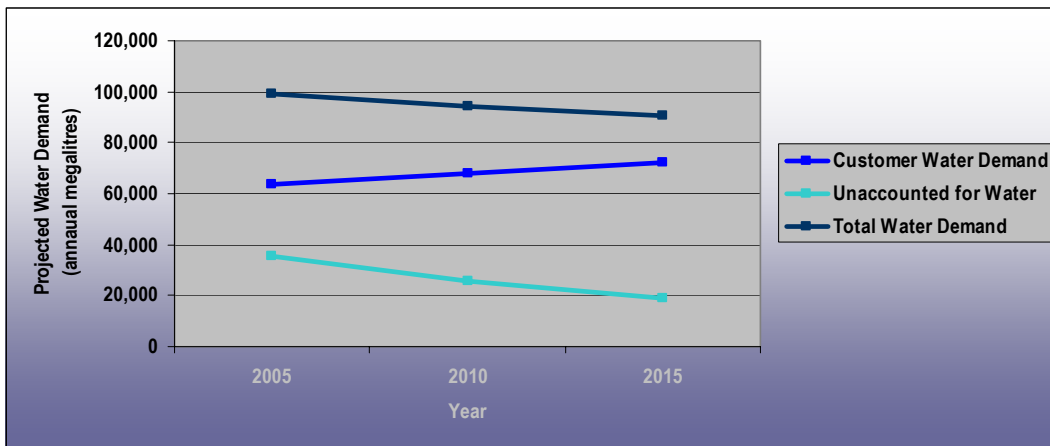
Source: Based on National Water Study (W.S. Atkins Ireland, 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-36: Neagh Bann International River Basin District Projected Water Demand and Unaccounted for Water



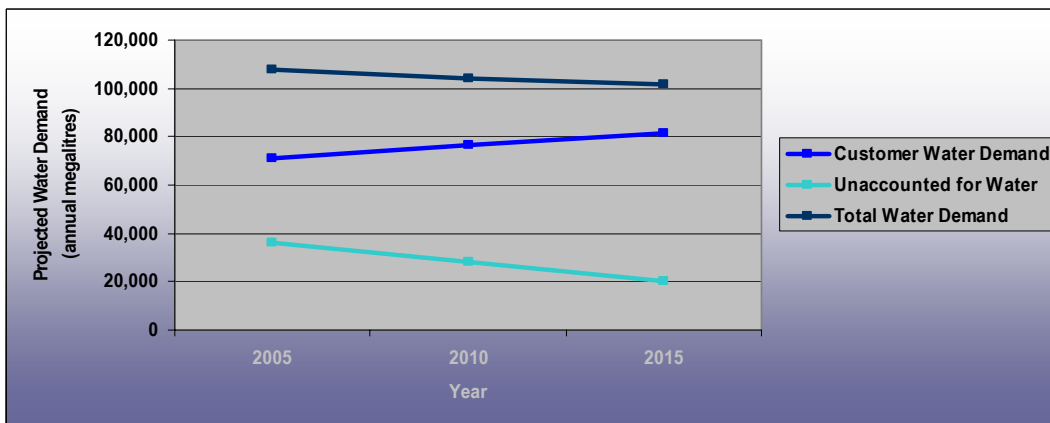
Source: Based on National Water Study (W.S. Atkins Ireland, 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-37: North Western International River Basin District Projected Water Demand and Unaccounted for Water



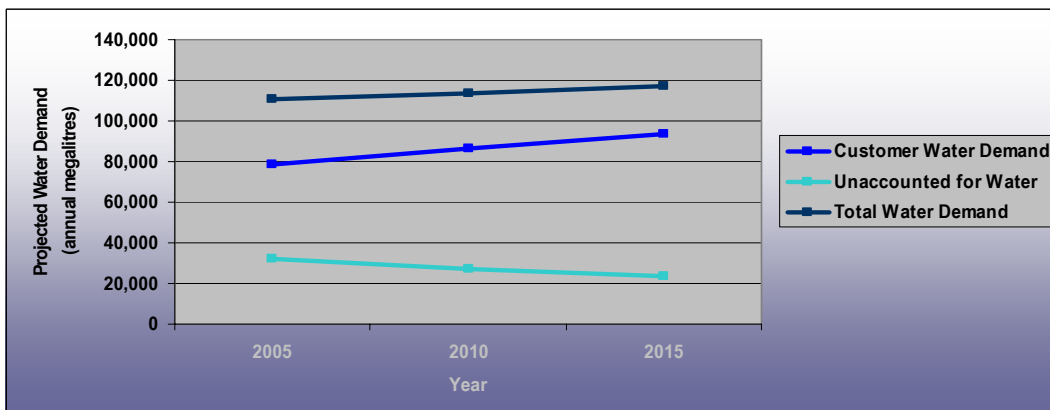
Source: Based on National Water Study (W.S. Atkins Ireland, 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-38: Shannon International River Basin District Projected Water Demand and Unaccounted for Water



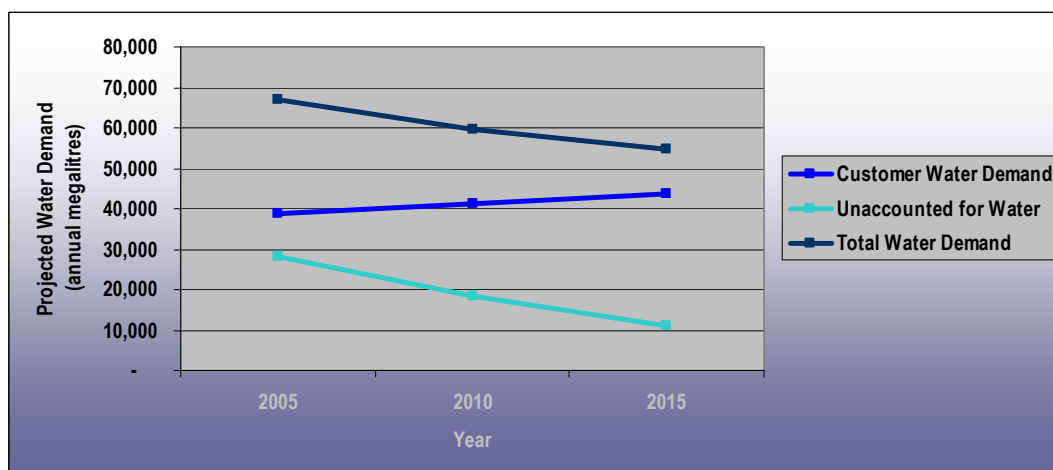
Source: Based on National Water Study (W.S. Atkins Ireland 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-39: South Eastern River Basin District Projected Water Demand and Unaccounted for Water



Source: Based on National Water Study (W.S. Atkins Ireland 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-40: South Western River Basin District Projected Water Demand and Unaccounted for Water

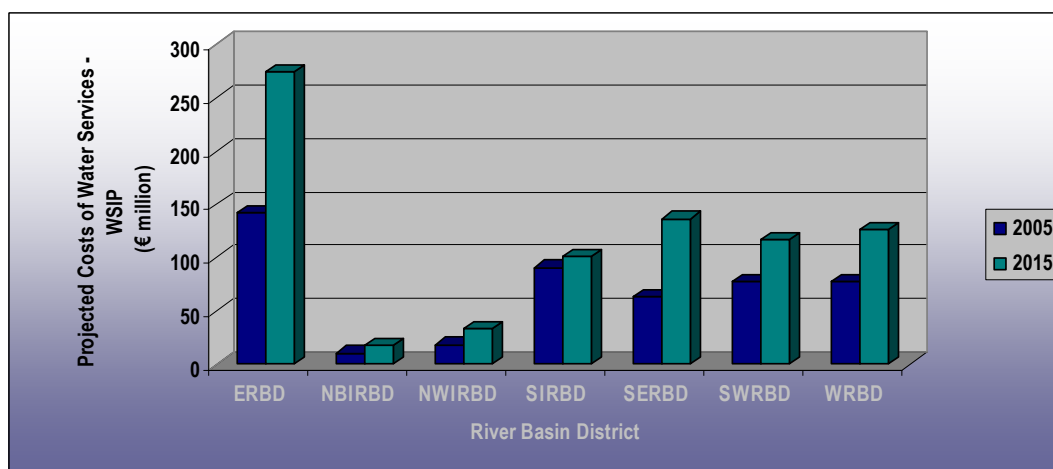


Source: Based on National Water Study (W.S. Atkins Ireland 2000) demand modified for Census 2002 population estimates and unaccounted for water projections provided by DEHLG

Figure 3-41: Western River Basin District Projected Water Demand and Unaccounted for Water

Appendices B-2 through B-8 include summary information on future potable water supply capacity estimates from the National Water Study series.

The projected costs of water services for each RBD through to 2015, estimated via simple trend analysis of Water Services Investment Programme and Rural Water Programme data on Water and Sewerage Costs for 2000 – 2003, are provided in **Appendices B-2 through B-8**. **Figure 3-42** below illustrates the projected change in WSIP costs between 2005 and 2015.



Source: Derived via trend analysis from DEHLG WSIP data for 2000-2003

Figure 3-42: Projected Costs of Water Services by River Basin District - WSIP Water and Sewerage Costs

Section 4

Toward the Post-2004 Integration of Economic Analysis into the WFD Planning Process

4.1 Introduction

The study results discussed in **Section 3** and detailed in **Appendix B** meet the 2004 reporting requirements of the WFD in that they:

- Provide a baseline characterisation of Ireland's national and RBD economies as they relate to water resources;
- Detail at the national and RBD levels the costs of water services and the means by and extents to which water service providers recover the costs of providing their services; and
- Communicate the best available existing estimates of the demand for and supply and costs of water services through to 2015.

Pursuant to meeting these objectives, also produced in this study is a state-of-the-knowledge report on information currently available to conduct the economic analysis necessary to meet future WFD reporting requirements. Based on the findings of this study, it is concluded that the remaining economic information needed to implement the WFD with respect to its economic analysis reporting requirements is extensive. This is due to the facts that, for this report:

- Baseline water use characterisation information generally had to be derived from national or relatively coarse regional estimates;
- Almost all costs and costs recovery of water services datasets included no information about costs and costs recovery associated with individual key water-using subsectors or categories; and
- Projections of the future demand and supply of water services are believed to lack the accuracy needed for effective planning at optimal geographic scales.

In general, the data gaps related to the future economic analysis requirements of the WFD are mostly related to geographical scale and subsector/water user category detail. **Table 4-1** is an illustration of the information gaps associated with complete economic characterisation reporting requirements under the WFD and its economic reporting guidance documents.

In terms of the economic analysis itself, implementation of the WFD requires application of more refined analytical tools and procedures such as cost effectiveness analysis, and in certain circumstances, cost benefit analysis and incidence analysis (i.e., determining who actually pays rather than who nominally pays). In general, future economic analyses will need to be less focused on collation and derivation of

information on national and RBD water resources impacts and water services costs and more focused on developing information for the evaluation of potential alternatives within a systematic and transparent planning process.

In other words, **a gap in characterisation reporting information does not necessarily equate to a priority information need**. For example, the values of foregone water resource uses due to water pollution need not be determined in subcatchments in which no derogations are likely to be proposed, and for which only a cost-effectiveness analysis of alternative programmes of measures will be conducted. Making this distinction between characterisation information gaps and priority information needs early in the WFD implementation planning process will lead to a much more efficient use of the administrative resources Ireland allocates to the effort of complying with the WFD. Stated even more directly, the costs of completing the economic reporting requirements of the WFD in such a fashion as to ‘fill in the gaps’ in **Table 4.1** is likely cost prohibitive given the current absence of existing applicable data in Ireland. Thus, the subtasks associated with the task of meeting the WFD economic analysis reporting requirements will need to be prioritised in a process of extensive joint planning between RBDs, central government, and the economic analysis reporting team(s).

It is recognised here that although an information gap identified in this report does not necessarily equate to an information need in the context of WFD reporting, filling this gap may be a high priority. For instance, estimates of the economic impact of foreign water-based tourism and leisure in Ireland were not available for reporting at the national or RBD levels. It may be that this information is a significant incentive to the public to maintain or achieve ‘good’ or higher ecological status for water bodies, and as such may be an information *need* outside of the direct context of WFD reporting requirements.

Given these contingencies of economic analysis priorities, it is recommended that a process of intensive consultations between the future economic reporting team(s) and the central government and RBD authorities be undertaken to establish economic reporting priorities. Given the timeline for developing programmes of measures, it is recommended that this process commence immediately.

The WFD has been framed in such a way as to demand this new holistic planning approach to the management of water resources. The decisions made regarding WFD implementation will have both political and social repercussions and will have to be made subsequent to active public consultation. By adopting a transparent and consistent methodology to the development of the programmes of measures (PoMs), RBDs can ensure efficient implementation of the WFD while encouraging the development of a positive public response.

The following is a discussion of how the future economic analysis of water use will need to be applied in the overarching planning context of WFD implementation. The objective of our discussion is to support an operational planning framework and to describe how economic analysis is integrated into all of the WFD’s major elements, and at the optimal geographic scale. More specifically, our discussion in this section aims to:

- Explain how work from the economic and biophysical characterisations, which was produced for the 2004 reporting milestone, can be continued and integrated into a unified WFD implementation planning process; and,
- Prescribe activities, in sequenced order of priority, that are pursuant to initiating a unified WFD implementation planning process, and detail the resources needed to accomplish these activities.

4.2 A Planning Model for WFD Implementation

Planning for implementation of the WFD is not fundamentally different than planning for any large water resources investment. The planning strategy involves applying a vision of a generally predetermined end state, and producing alternative strategies achieving the vision.

It is critical for projects of large size and consequence, such as the WFD, to be planned in a deliberate and sequential fashion. The adoption of, and adherence to, a basic planning framework will reduce the chances of ad hoc development or haphazard application of management measures which will inevitably be less cost effective in the long term. It will also add necessary transparency to the implementation process, which is meaningful to the interested and affected public.

Figure 4-1 illustrates a planning model that depicts the flow of major planning and evaluation activities and provides a context for the major elements involved in preparing for implementation of the WFD. Here we describe each of the main elements of this standard planning model and how the elements connect and integrate with both the EAWU study, and the overall process of WFD implementation.

1. Water Resources Supply and Demand (Pressures)

The EAWU study largely inventories water resource uses and the relative economic significance of those uses to Ireland's national and RBD economies. Ongoing bio-physical characterisations concurrently establish a baseline inventory of water supply sources, water quality status, and corresponding pressures. The goals of these two respective efforts, which are to become integrated in the future, are to ensure that:

- There is no deterioration to Ireland's highest quality waters, and
- All waters in Ireland achieve at least "good" status by 2015.

For water bodies in which good status is unobtainable by 2015 due to the costs of PoMs that are disproportionate to the benefits associated, a factual justification that good status is not cost beneficial must be produced, as well as an alternative plan of action for the future attainment of good status.

2. Problems, Opportunities, Planning Objectives

It is important to note that at any particular, smaller spatial scale, local problems with water quality are unique, and specific opportunities for achieving good status will help define the planning objective in more concrete and precise terms. For a given water body, a planning objective may involve, for example, a reduction in average daily biochemical oxygen demand (BOD) pursuant to a numeric dissolved oxygen standard.

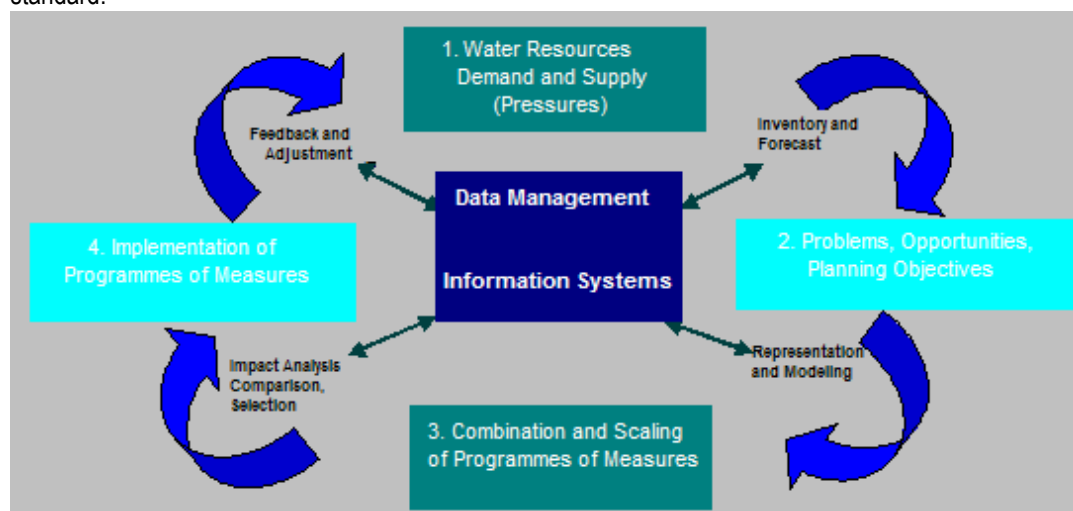


Figure 4-1: WFD Implementation Applying Classic Planning Model with Data System Support

Before one may adequately address such problems, it is necessary to understand the circumstances that have led to the current status of any particular water body. Representation and modelling efforts of both the physical and socio-economic systems will define the cause-effect relationships that have led to the water quality problems and the subsequent planning objective(s). Sequentially then, management measures are formulated that specifically address the planning objective; in this example, the desired reduction in BOD.

3. Combination and Scaling of Programmes of Measures

Typically, several measures may exist that can be used to achieve the planning objective. In most cases, one or more of these measures can be combined, each to a varying degree, as a set of plans or programmes that can be scaled in terms of investment and/or spatial extent to meet the specific problem.

Achieving the planning objective (desired water quality improvements) will come at a cost and will have direct and indirect impacts on both the physical and socioeconomic environments. Various analyses will need to be undertaken to express the degree to which alternative measures achieve the planning objective — the direct benefit or output of any programme — and at what financial and economic cost. Decision criteria are necessary to provide a rational basis for narrowing the set of alternative programmes to those that can be afforded and which most effectively achieve the planning objective. Decision criteria may be solely economic, but additional factors, such as cultural and aesthetic impacts, are normally considered together with monetary, or financial, effects and political considerations.

Alternative programmes will be evaluated, compared and prioritised along the decision criteria to arrive at set of programmes that are recommended for implementation.

4. Implementation of Programmes of Measures

Implementation is followed by monitoring to verify that the implemented programmes are indeed meeting the goals of the planning process and to confirm adjustments that need to be made to the programmes, if any. Finally, all stages of this process require data collection, processing, and analysis. Therefore, data management processes and development of supporting information systems become fundamental requirements.

4.2.1 Blending Economic and Environmental Considerations into a Single Framework

The WFD states that economic considerations should be blended with technical planning as EU member states undertake the water management and planning activities associated with the Directive. Currently, economic planning, in the context of water services, is conducted under the authority of DEHLG, and environmental planning is managed by the local authorities, in cooperation with DEHLG, the Environmental Protection Agency (EPA), and the RBDs. The RBDs are primarily responsible for water management planning in general under the WFD, however it is widely recognised that there are efficiency gains associated with a consistent approach that might best be developed at the national level.

To date, the two efforts have been progressing along parallel paths, and an opportunity exists to blend the output of work to date into a comprehensive planning approach for Ireland. Under DEHLG oversight, the RBDs' analysis of the economic value of water, and particularly, of clean water, in multiple sectors of the Irish economy has been conducted. Simultaneously, work by local authorities in the context of RBD projects throughout the country has yielded extensive insight into the environmental quality of all water bodies in Ireland. In particular, this work has identified which water bodies are at risk of failing to achieve WFD objectives for good water quality and sustainability as natural resources.

In its simplest interpretation, the WFD requires that both the Environmental Risk Assessment and the Economic Analysis of Water Use form the basis for developing and prioritising the PoM. The PoM, effectively, should be a combination of policies and management actions aimed at preventing deterioration of water quality and achieving at least good water status at the lowest cost. The most useful metrics of alternative measures that may be compared are reduced environmental risk, from the RBD projects, and economic output from this economic analysis of water use. These relationships are shown diagrammatically in **Figure 4-2**.

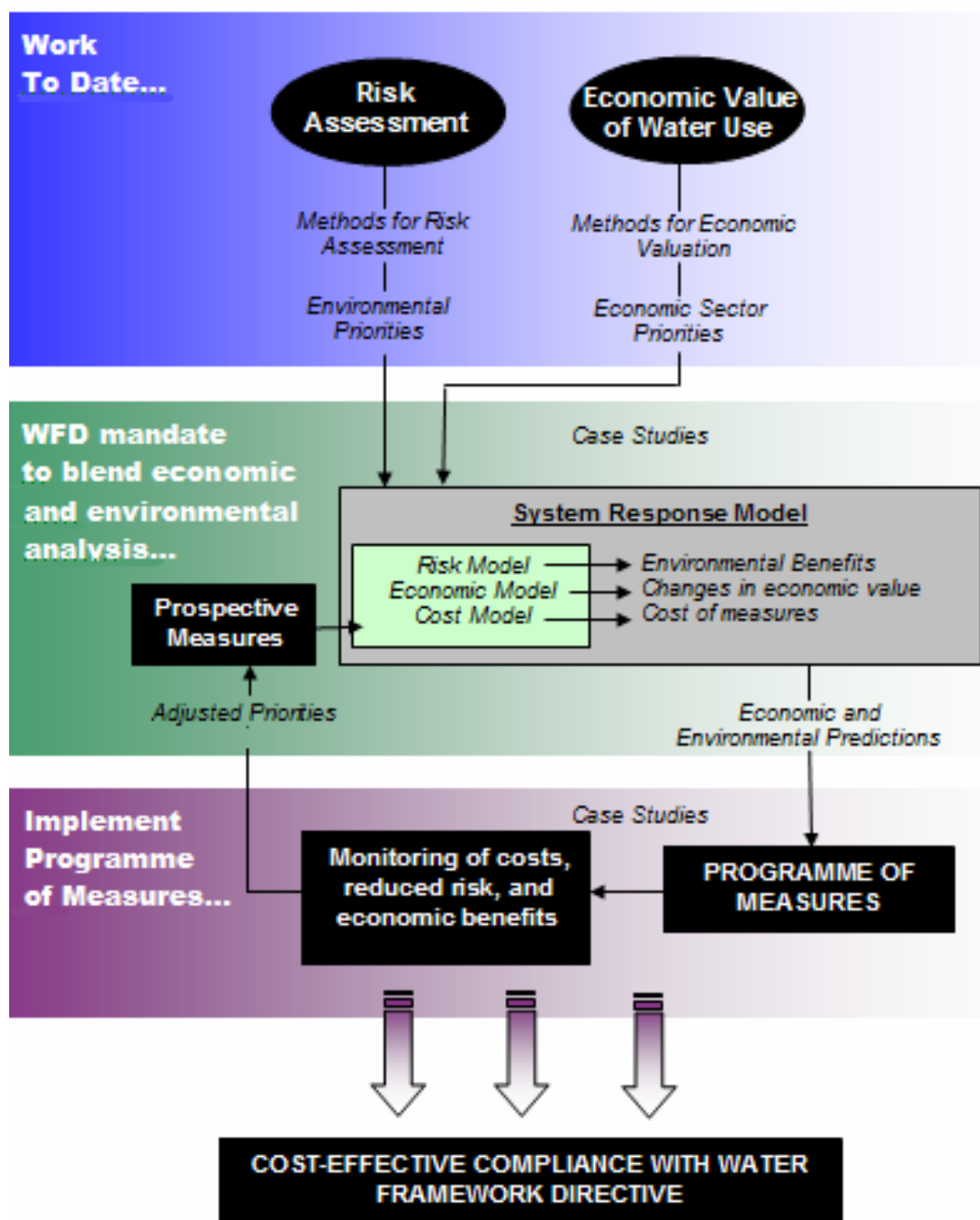


Figure 4-2: Lifecycle Implementation of System Response Model (SRM)

As a result of the work that has been conducted to date by the river basin district project methodologies exist to evaluate the likely effectiveness of alternative measures, at least in broad terms. However, while reducing risk in an inland recreational lake and reducing risk along a coastal estuary may carry equal weight in an environmental context, the net economic impact must be factored into the prioritisation of policies and investments. Neither environmental improvements nor economic costs and benefits can be analysed in isolation without risking a PoM that is unbalanced or inefficient. A PoM will not be simply a list of recommended actions, but an established set of priorities to guide policy decisions over time. As such, it is imperative that economic and environmental analysis be conducted not just simultaneously, but conjunctively.

The WFD requires this approach explicitly, and the Wateco guidance documents interpret the WFD requirements very clearly:

“Economics is only one of the parameters that inform decision-making, and needs to be integrated with other expertise and analyses in supporting the development of river basin management plans. Integration needs to start as early as possible, for example for the characterisation of river basins where pressures, impacts, and the economic importance of pressures/uses need to be analysed jointly.”

4.3 Recommended Steps for Advancing WFD Implementation

This study has collated and analysed numerous water related data sets to address the needs of the RBD characterisation reporting requirements. As shown in **Figure 4-2**, the migration from this stage of the WFD process to successful implementation requires the development of detailed PoM to address the problems identified in the water environment. The PoM, in turn, will need to be developed in a rational, consistent and efficient manner.

There are several actions that should be initiated now to prepare for the transition from initial characterisation to planning for implementation (see **Figure 4-3**). Some of these activities are readily identifiable and revolve around adding structure to the decision-making environment and anticipating analytical and data management needs. The following represent recommended initial steps for moving forward into the implementation phase of the WFD.

4.3.1 Coordinate with EU Countries

All EU states are to apply the WFD, and all will be responsible for integrating economic analysis with biophysical information to develop cost effective PoMs. Whilst it is important that Ireland recognises its own needs, it is equally important that the approach adopted be in line with the philosophy of other states. It is therefore recommended that continued and strengthened coordination with the Department of Environment in Northern Ireland and the UK generally is pursued and that information from other EU states and international workshops be monitored as the WFD implementation proceeds.

4.3.2 Define Planning Objectives

The translation of the broad objective of achieving good water status into a set of operational planning objectives is fundamentally crucial for implementing the WFD. RBDs, in cooperation with EPA and DEHLG, should:

- Complete the identification and selection of water quality parameters that will represent measurable indicators for maintaining current levels of water integrity and for achieving at least good status for lower quality waters; and,

- Begin making efforts to determine the optimal geographic scale(s) at which these indicators should be measured.

It may very well be the case that management measures are developed to apply at national, RBD, subcatchment, stream, and stream segment scales. Therefore, it will be important that the RBDs elaborate to the public how differences in planning objectives and how success will be measured and at what geographic scales. RBDs will clearly benefit from lessons learned from similar efforts in other EU countries to help establish measurable and reasonably achievable planning objectives, as well as monitoring strategies.

4.3.3 Prioritise Improving Water Status

The results of the water body characterisations will provide important information for development of water environment indicators, meaningful spatial scales, and related planning objectives. The results will hopefully portray the extent of water resource problems and the scope of opportunities for achieving the objectives of the WFD. It is probable that water bodies identified as being at risk of failing to meet the objectives of the WFD are widespread and as a result there will be a practical need to prioritise and phase the implementation of the WFD. RBDs should examine the results of the physical characterisations holistically and develop criteria for prioritising project-level efforts for WFD implementation. Prioritisation criteria may include considerations of:

- a. Severity of problems in the water environment
- b. Spatial extent
- c. Pressures
- d. Economic considerations
- e. Political issues.

4.3.4 Construct Menu of Technically Feasible Management Measures and Identify Implementation Methods

RBDs should research the management measures that have a potential of being implemented to improve water quality status. The development of the menu of possible measures should be consistent with the polluter-pays and user-pays principles embodied in the WFD, but should not limit the identification of any measure that can possibly help achieve good water status. In general, it is advisable to begin by categorising available, measurable, and constructible solutions according to general type and then by spatial qualities (see **Figure 4-3**).

In general, the 'menu' of measures should contain a mix of policy approaches, ranging from regulatory to market-based, that induce changes in behaviours, whether via technology application or simple education. As the menu of options is developed, RBDs should, by means of literature review or consultation with experts, establish how measures can be used to influence water status and identify success factors and practical constraints associated with their implementation.

4.3.5 Identify Decision-Support Methodologies and Criteria

Decision support techniques will be required to support evaluation and comparison of alternative measures and programmes. Hydrologic and pollution transport modelling may play a fundamental role within such a system to simulate the physical impacts of management measures.

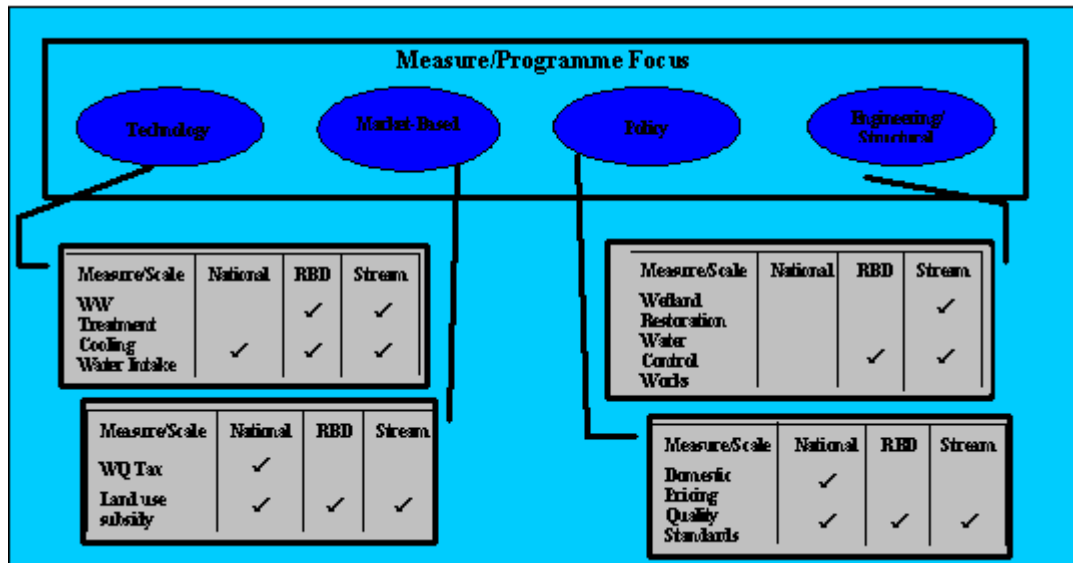


Figure 4-3: Organising Prospective Management Measures by Type and Spatial Applicability

Meanwhile, economic analysis tools will likely support measure evaluation and the formulation of decision criteria related to:

- Analysis of direct and indirect economic impacts (e.g., derivation of employment and income multipliers, estimation of industry linkages, defining ripple effects from tax/subsidy);
- Monetisation of environmental outputs (e.g., assigning a marginal benefits value to a unit of potable water, wetland, habitat or water quality improvement);
- Cost-effectiveness analysis of alternative programmes of measures (e.g., estimation of unit costs of a improvement);
- Cost incidence analysis (e.g., identifying impacted sectors, estimation of price elasticity of demand and supply in affected economic sectors, evaluation of inter-basin and inter-Union subsidies).

RBDs should compile and review examples of decision-support methodologies that blend these economic factors with environmental management to better understand data requirements and embedded assumptions that might affect how and what point they can be used in the implementation process.

It is likely that multi-criteria approaches will be more flexible and robust with respect to comparing programmes. As suggested above, these approaches may use parameters and results from economic analyses as decision criteria. Ranking, scoring, and weighting procedures used in the context of similar environmental planning projects should be reviewed. To highlight the benefits and pitfalls of various decision criteria that have been used in similar situations the review should also reveal the types of automated software tools that have been developed, whether they are available for purchase, and if they can be customised for use by RBDs.

4.3.6 Conduct Case Studies of Planning and Implementation

The generalised planning framework described in this section should be tested by real application of its major principles. Given that many opportunities will exist to improve water status in support of the WFD planning objective it is in the interest of RBDs to engage in four or five case studies of cases where water quality problems are known to exist.

The case studies would effectively:

- Initiate the RBD monitoring programmes;
- Provide test applications of the integrated planning process; and,
- Demonstrate, with much more precision, the analytical and informational requirements of establishing measurable planning objectives, formulating and comparing measures and programmes, and making subsequent decisions on the most beneficial actions to take.

The case studies should exemplify a diverse and representative range of water body types, water environment problems, economic environments and spatial scales. One major benefit would be the identification of gaps in economic data (e.g. local scale data) which would need to be developed before widespread development of PoMs could be initiated. This would enable RBDs to commission the generation of such data, and then be in a position to anticipate schedule and cost implications of meeting the 2015 status requirements for all of its waters. The case studies should be selected to address as many of the criteria listed in **Table 4-2** as possible. This matrix shows some of the combinations of scenarios that might be addressed via case studies.

It is recommended that four small-scale case studies be initiated, addressing different facets that will be experienced when developing PoMs throughout the country. The first four might best be limited to cost-effectiveness analysis of PoMs. This might entail collecting marginal pollution control cost estimates from various categories of dischargers or land users that impact water resources. The fifth case study would be a larger effort applying cost benefit, cost effectiveness and incidence analysis. This would likely be appropriate in situations where derogations are being proposed due to claims of disproportionate costs and where water pricing issues are beginning to emerge in the political arena.

The case studies will help identify what economic data is needed for development of the PoMs, especially the degree of detail at a local level. Following this work, the gaps in the existing data sets can be better defined and then addressed by a programme of survey and data refinement. The end objective would be the development of a menu of economic evaluations that could be used within the decision support system on a nationwide basis.

Table 4-2: Criteria to be Addressed During Performance of the Case Studies

Criteria	Case Study Number				
	1	2	3	4	5
Geographic Scale					
- Subcatchment	x				
- County		x			
- RBD			x	x	
- National					x
River Basin District					
- Eastern	x				x
- Western		x			x
- Southern			x		x
- International				x	x

Table 4-2: Criteria to be Addressed During Performance of the Case Studies (Cont.)

Criteria	Case Study Number				
	1	2	3	4	5
Water Body Category					
- Lake	x				x
- Coastal		x			x
- Transitional			x		x
- River				x	x
Predominant Surrounding Land Use					
- Agricultural	x				x
- Industrial		x			x
- Domestic			x		x
- Undeveloped				x	x
Expected Water Body Designation					
- Derogation	x				x
- Heavily Modified		x			x
- Artificial Water Body			x		x
- Good Status by 2015				x	x
Existing Information Level					
- Ongoing Study with Applicable Findings	x				x
- Previous Study with Applicable Findings		x			x
- Planned Study with Applicable Findings			x		x
- No Existing Applicable Information				x	x

4.3.7 Scope, Design and Develop a River Basin Management System – Decision Support System (RBM-DSS)

Implementation of the WFD will extend over many years. A data-driven, information management and decision-support tool would support implementation in many ways by making the PoM analysis and selection:

- Consistent,
- Defensible, and
- Transparent.

The RBM-DSS system should be incrementally developed to ensure correct functionality and design. Several major steps are essential for the successful development of such a system:

1. Requirements analysis – to identify what the system is required to deliver and to whom;
2. Business Process modelling – to determine how it would be used;
3. System design – prior to initiation of development;
4. Development of the data model – to ensure that data relationships are fully understood;
5. Development of the data warehouse – repository for all economic and bio-physical data;
6. GIS - Continuing application in the RBD projects and integration into the RBM DSS;
7. User Interface development – to ensure usability and permissions for all potential users;
8. Testing – to ensure a robust system prior to widespread use; and,
9. Documentation – for continuing development, support and user assistance.

In addition to this formal development program, the system itself should be developed, tested and implemented incrementally so that new knowledge can contribute to later development stages.

4.3.8 Public Participation and Consultation

Extensive communications with stakeholders at all levels (governmental, interested bodies and public) will be necessary as the WFD programme progresses. This will require careful presentation of thoughts and findings as they are developed at early stages and refined as the implementation progresses.

4.3.9 Programme Management

The implementation of the WFD will require dedication of a high level of resources over a period of several years. Programme management will also be required for managing and integrating economic and scientific information and communicating this information to all levels of society. This will be a continuing activity throughout the implementation of the WFD and will necessitate full-time resources.

4.4 Schedule

The tasks identified in this section are numerous and extensive, and although several aspects of the WFD are implemented over lengthy periods, it is imperative that RBDs take a proactive approach to preparing each phase of implementation. A suggested programme of work is presented in **Figure 4-4** and budget resources associated with each task is provided in **Section 4.5**.

4.5 Resources

The level of resources for this work will be considerable, and planning and management will be required from the outset. It is likely that RBDs, with the support of DEHLG and EPA, do not have sufficient staff to resource all of the various activities and it may be necessary to outsource certain tasks. However, there will still be the necessity for the Department to take an active role, particularly on matters of policy and politics. **Table 4-3** below provides budget estimates of resources for each task identified in **Figure 4-4**. The column titled RBD is the level of effort (in man months) that we believe is the absolute minimum input from internal resources (note also that 4 tasks are assumed to be EPA responsibility for which no resource levels have been identified). The column titled 'potentially outsourced' contains the resources (in Euros) that would be needed if the majority of the work is contracted. It should be noted that these resources are indicative only and that more accurate estimates and detailed scopes should be developed.

Table 4-3: Budget Estimates for Each Project Task

Activity	Man Months	Potentially Outsourced (€)
EU Coordination	1	€57,500
Good Status Planning	0	€38,333
Planning Objectives	6	€115,000
Problem Prioritisation	9	€565,417
DSS Methodologies	0	€38,333
Pilot Projects	12	€728,333
RBM-DSS Development V.1	5	€900,833
RBM-DSS Development V.2	2	€517,500
Public Participation	6	€230,000
Programme Management	2	€690,000
Project Management	4	€575,000
TOTAL	47	€4,456,250
Surveys		€1,000,000
TOTAL		€5,456,250

N.B. The amount allocated for surveys is intended to cover data generation needs which would be contracted to specialist market survey companies.

Section 5

Conclusions

Based on the findings of this study, it is concluded that the remaining economic information needed to implement the WFD with respect to its economic analysis reporting requirements is extensive. As such, it is critical that information generation for the evaluation of potential alternative programmes of measures, water body derogations, and pricing policies pursuant to user/polluter pays principles are prioritised in a systematic, transparent, and coherent planning process. It is suggested that critical to this planning process will be the immediate development of an RBD information management system. Included in Section 4 is a recommended strategy to pursue a series of case studies upon which to begin to build this system and upon which decisions regarding the relative importance of information generation needs should begin to be made.

As identification of information gaps is an intrinsic element of the characterisation process, these gaps are summarised in **Section 4**. This gap analysis serves as a preliminary guide to the formation of future economic analysis strategies.

However, one of the more significant conclusions of this analysis is that a gap in characterisation reporting information does not necessarily equate to a priority information need. For example, the values of foregone water resource uses due to water pollution need not be determined in subcatchments in which no derogations are likely to be proposed, and for which only a cost-effectiveness analysis of alternative programmes of measures will be conducted. It is suggested that making this distinction between characterisation information gaps and priority information needs early in the WFD implementation planning process will lead to a much more efficient use of the administrative resources Ireland allocates to the effort of complying with the WFD.

It is also recognised here that although an information gap identified in this Report does not necessarily equate to an information need in the context of WFD reporting, filling this gap may remain a priority. For instance, estimates of the economic impact of foreign water-based tourism and leisure in Ireland were not available for reporting at the national or RBD levels. It may be that this information is a significant incentive to the public to maintain or achieve 'good' or higher ecological status for water bodies, and as such may be an information *need* outside of the direct context of WFD reporting requirements.

Finally, it is recommended that intensive consultation between central government authorities, RBD authorities, and those conducting future economic analysis is a necessary prerequisite to the development of economic analysis priorities, and thus critical to the efficient and successful implementation of the WFD in Ireland. Given the timeline for development of programmes of measures, it is further recommended that the case studies, the development of the information management system, and this consultation process be underwritten and undertaken immediately.

Section 6

References

- Alvarez B., Hanley, N., Wright, R. and MacMillan, D, (1999). "Estimating the Benefits of Agri-environmental Policy: Econometric Issues in Open-ended Contingent Valuation Studies", Journal of Environmental Planning and Management, 42(1), 23-43.
- Barbier, Edward B., Acreman, Mike, and Knowler, Duncan (1997). *Economic Valuation of Wetlands A Guide for Policy Makers and Planners*, Ramsar Convention Bureau, Gland, Switzerland.
- Bateman, I.J. and Langford, I.H. (1997). *Non-user's willingness to pay for a national park: an application and critique of the contingent valuation method*. Regional Studies, 31 (6): 571-582.
- Bateman, I.J., Willis, K.G., Garrod, G.D., Doktor, P., Langford, I.H. and Turner, R.K. (1992). *Recreation and environmental preservation value of the Norfolk Broads: a contingent valuation study*. Environmental Appraisal Group, University of East Anglia.
- Board Iascaigh Mhara, (2003). *Annual Review*.
- Bord Iascaigh Mhara, personal contact, June 2004.
- Brouwer, Roy, and Bateman, Ian. *The Temporal Stability of Contingent WTP Values*, CSERGE Working Paper GEC 20000-14, Centre for Social and Economic Research on the Global Environment, University of East Anglia and University College London.
- Central Statistics Office, (2000). *Ireland's Census of Industrial Production*.
- Central Statistics Office, (2000). *Ireland's Census of Agriculture*.
- Central Statistics Office's Eire Stat Spreadsheet Service (<http://www.eirestat.cso.ie/>) datasets on agriculture, fishing, and manufacturing.
- Central Statistics Office, (2003), *Statistical Yearbook of Ireland*.
- Department of Agriculture and Food website: <http://www.agriculture.gov.ie>.
- Department of Environment, Heritage, and Local Government, (2004 forthcoming). *National Urban Waste Water Study*.
- Department of Finance, Budget and Economic Statistics, March 2004.
- Drennan, M.J., (2004). *Water Requirements of Animals for Beef Production*. Teagasc, Grange Research Centre, Co. Meath, Ireland.
- Dublin City Council, (2003). *Water Services Investment Programme – Assessment of Needs: 2007-2012*.
- Dziegielewski, B., et al. (September 2000). *Commercial and Institutional End Uses of Water 2000*. Published by AWWA Research Foundation and American Water Works Association with Cooperation of the U.S. Bureau of Reclamation, Denver, Colorado. Catalogue No.90806. 264 pp. ISBN 1-58321-035-0.
- Dziegielewski, B., personal contact, July 2004.

Electricity Supply Board, personal contact, July 2004.

Environment Group Research Report (2004). *An Economic Assessment of the Costs and Benefits of Natura (2000) Sites in Scotland*. Available at Scottish Executive Publications.
<http://www.scotland.gov.uk/library5/environment/ean2k-00.asp>

Flanagan, S., (2004). *Water Usage for Sheep Production*. Teagasc Research Centre, Co. Galway, Ireland.

Government of Ireland, (2003). *Ireland's Economic Review and Outlook*.

Irish Hydropower Association website: <http://www.irish-hydropower.org>

Irish Seaweed Centre, personal contacts, June 2004.

Ohno and Crithchley, eds. (forthcoming in 2004), *Seaweed Resources of the World*.

Otte, Marinus L., ed. (2003). *Wetlands of Ireland: Distribution, Ecology, Uses and Economic Value*. University College Dublin Press. Dublin, Ireland.

Planning and Management Consultants, Ltd. (1995). IWR-MAIN 6.1: User's Manual and System Description. Appendix D.

Schuyt, Kirsten and Brander, Luke. (January 2004). WWF-International, *The Economic Value of the Worlds Wetlands*. WWF-International, Gland, Switzerland / Amsterdam, Netherlands.

Scottish Executive, Environment Group Research Report 2004/05 (2004), *An Economic Assessment of the Costs and Benefits of Natura 2000 Sites in Scotland*. Available at Scottish Executive Publications.
<http://www.scotland.gov.uk/library5/environment/ean2k-00.asp>.

South Dublin County Council, (2003). *Draft Water Services Investment Programme – Assessment of Needs: 2007-2012*.

Sweeny, J. et al., prepared for Environmental Protection Agency. (2002). *Climate Change – Indicators for Ireland: Final Report*.

Teagasc, (2003). *Management Data for Farm Planning*.

Teagasc, personal contacts, June 2004.

Ten Brink, B.J.E., van Vliet, A.J.H., Heunks, C., Pearce, D.W. and Howarth, A. (May 2000). *Technical Report on Biodiversity in Europe: an integrated economic and environmental assessment*, RIVM Report 481505019, National Institute of Public Health and the Environment, Bilthoven, Netherlands.

Wateco, (2002). *The Implementation Challenge of the Water Framework Directive*.

Williams, J. and B. Ryan (2003, forthcoming in 2004). *Participation in Marine-Based Leisure Activities in Ireland*. Economic and Social Research Institute.

W.S. Atkins Ireland (March 2000). *National Water Study Ireland*.

(Year unknown), *National Seaweed Forum Report*.

(1996), *Valuation of the Conservation Benefits of Environmentally Sensitive Areas*. Executive Summary, Macaulay Land Use Research Institute Economic and Policy Series No. 2, Craigiebuckler, Aberdeen, U.K.

Appendix A

Consultations with Five Local Authorities Regarding Water Services Costs and Costs Recovery

Introduction

Five Local Authorities were consulted to: (1) provide insight into issues pertaining to the delivery and cost recovery of water and wastewater services in a mix of rural, urban and mixed rural-urban areas throughout Ireland; and, (2) advise how expansion of primary urban centres, such as Dublin City and Galway City, have impacted upon predominantly rural surrounding areas with regard to the provision of water and wastewater services. Consultations were conducted with the following Local Authorities:

- **Kilkenny County Council** – landlocked, predominantly rural Local Authority whose geographical location is directly influenced by the Rivers Nore, Barrow and Suir;
- **Galway County Council** – bounded to the West by the Atlantic Ocean, this primarily rural area is increasingly influenced by the high levels of population growth in the Galway City Area;
- **Kildare County Council** – traditionally rural Local Authority now experiencing very high population growth rates and urbanisation due to its proximity and resultant influence of Dublin;
- **Donegal County Council** – predominantly rural Local Authority where the provision of water and waste water services is influenced by the existence of the border with Northern Ireland; and,
- **Dublin City Council** – Ireland’s capital city. Completely urban local authority bounded to the East by Dublin Bay.

The respective findings of the five consultations follow in **Appendices A-1** through **A-5**. Collective conclusions are made in **Appendix A-6**.

Appendix A-1

Kilkenny County Council

County Kilkenny is located in the South East Region of Ireland. It contains an area of 207,289 hectares, 160,464 hectares of which are under agricultural use. County Kilkenny shares boundaries with counties Laois, Carlow, Wexford, Waterford and Tipperary. The county has no direct access to the sea. The River Nore intersects Kilkenny in a broad north/south direction, while the Rivers Suir and Barrow form a portion of Kilkenny’s border with Waterford and Carlow respectively.

Kilkenny City is by far the largest population centre within the County. Outside of Kilkenny City, the population distribution of the County is characterised as predominantly rural with four urban centres of approximately 1,500 inhabitants. **Table A.1-1** outlines the population growth of County Kilkenny and Kilkenny City for the period 1996 – 2002.

Table A.1-1: Population Growth Kilkenny City and County (1996 – 2002)

Location	1996	2002	% Pop Growth ('96-'02)
Kilkenny County	75,336	80,339	6.6%
Kilkenny City/Environs	18,696	20,735	10.9%

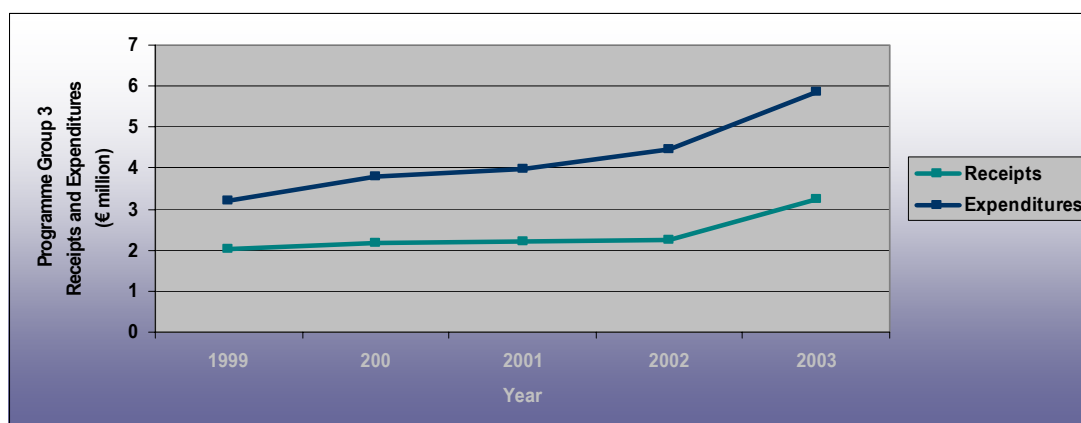
Source: CSO Census (2002)

The population density of County Kilkenny increased from 0.36 people per hectare in 1996 to 0.39 in 2002. In 2001, the most recent year for which income data is available, average disposable income stood at €13,834 in County Kilkenny, representing 84.7% of the average for the State.

A.1.1 Kilkenny County Council Programme Group 3 (Water/Sewerage) Receipts and Expenditures

Current Account

Programme Group 3 Current Account Receipt and Expenditure has been collated for the years 1999 to 2003. This data has been obtained from the Local Government Finance Section of the DEHLG. The data is derived from the DEHLG publication "Local Authority Budgets" for the years in question. The overall trends in Programme Group 3 Current Receipts and Expenditures are illustrated in **Figure A-1**, while **Table A.1-2** highlights these trends in a comparative context with national growth rates.



Source: DEHLG Local Authority Budgets 1999-2003

Figure A.1-1: Kilkenny County Council Programme Group 3 Receipts and Expenditures (1999-2003)**Table A.1-2: Programme Group 3, Receipts and Expenditures, Kilkenny County Council and National Comparison 1999 - 2003**

Programme 3	1999	2000	2001	2002	2003	% Growth 99-03
Kilkenny Receipts	2,011,392	2,187,251	2,227,248	2,251,500	3,239,000	61.0%
Kilkenny Expenditures	3,221,345	3,776,582	3,976,312	4,455,891	5,855,200	81.8%
National Receipts	117,735,712	133,581,378	145,719,429	169,369,806	200,223,288	70.1%
National Expenditures	257,743,603	288,180,996	325,412,542	370,534,741	424,378,325	64.7%

Source: DEHLG Local Authority Budgets 1999-2003

As can be seen from the data above, growth in current receipts was largely flat in the period 2000 through 2002 with the vast bulk of the growth occurring during 2003. With receipt growth of 61% between 1999 and 2003, Kilkenny County Council remained below the national average growth rate of 70.1%.

Over the same period, current expenditure by Kilkenny County Council under Programme Group 3 grew by 81.8%. This compares to a national average of 64.7% over the same period. Thus, between 1999 and 2003, the current budget shortfall for Programme Group 3 widened for Kilkenny County Council from over €1.2 million to €2.6 million. To analyse these figures more comprehensively, it is necessary to consider Current Receipt and Expenditures on a sub group level. **Table A.1-3** and **Table A.1-4** outline this information.

Table A.1-3: Kilkenny County Council Programme Group Current Receipt Growth

Programme 3 Sub Group	1999	2000	2001	2002	2003	% Growth '99-'03
Public Water (3.1)	920,560	965,001	1,072,929	1,117,370	1,185,000	28.7%
Public Sewerage (3.2)	571,382	533,290	419,014	380,921	480,000	-16.0%
Private Installations (3.3)	444,408	609,474	645,281	653,915	1,453,000	226.9%
Admin/Miscellaneous (3.8)	75,042	79,486	90,024	99,294	121,000	61.2%

Source: DEHLG Local Authority Budgets 1999-2003

The data above illustrates the uneven nature of receipt growth by sub group. Sub Group 3.3 (Private Installations) rose by over 225%. Sub Group 3.2 (Public Sewerage) witnessed a 16% drop on 1999 levels indicating a net decline in public sewerage scheme current receipts. In 2003, Sub Groups 3.3 (Private Installations) and 3.1 (Public Water) were the largest sources of current income accounting for 81.4% of total current receipts.

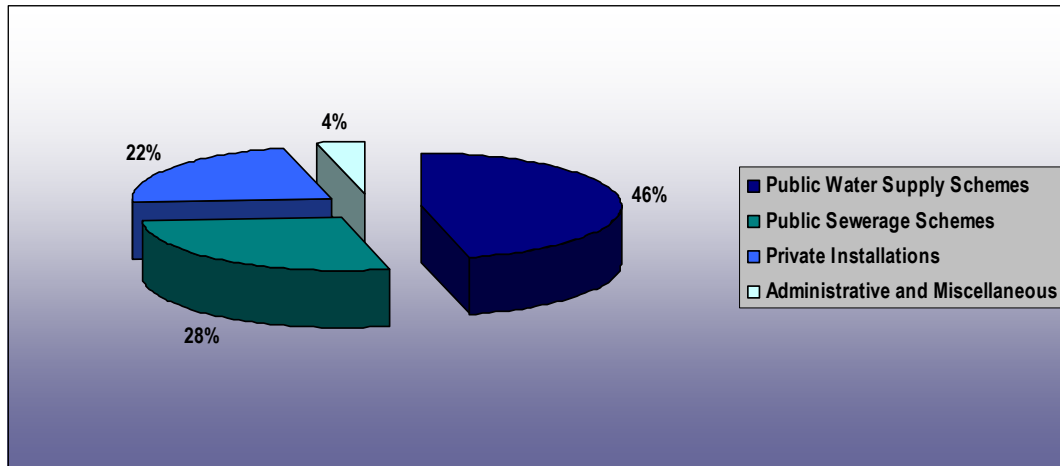
Table A.1-4: Kilkenny County Council Programme Group Current Expenditure Growth

Programme 3 Sub Group	1999	2000	2001	2002	2003	% Growth '99-'03
Public Water (3.1)	1,283,705	1,539,557	1,614,091	1,885,307	2,100,000	63.6%
Public Sewerage (3.2)	937,321	1,013,505	1,052,232	1,161,683	1,508,000	60.9%
Private Installations (3.3)	444,408	609,474	645,281	653,915	1,453,000	226.9%
Admin/Miscellaneous (3.8)	555,910	614,045	664,708	754,986	794,200	42.9%

Source: DEHLG Local Authority Budgets 1999-2003

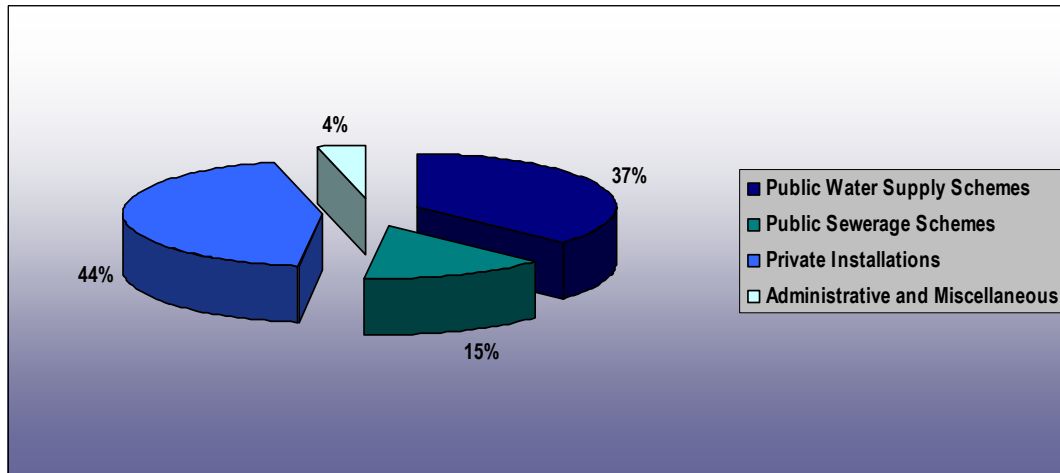
Current expenditure growth, as outlined above, has experienced a relatively linear rise, with the exception of Sub Group 3.3 (Private Installations) which posted a rise of over 225%. Sub Group 3.3 (Private Installations) receipt and expenditure levels of growth are identical, indicating the net neutral cost of grants to group water schemes. The 60.9% growth in Sub Group 3.2 (Public Sewerage) current expenditure is balanced against a 16% drop in its current receipts over the same period. In real terms, current deficits have increased in all sub groups, with the exception of Sub Group 3.3 (Private Installations).

Figures A.1-2 to A.1-5 below outline the percentage composition of current receipts and expenditures for the years 1999 and 2003. They provide an illustrative overview of the sub group trends in relation to overall current receipts and expenditures.



Source: DEHLG Local Authority Budgets 1999

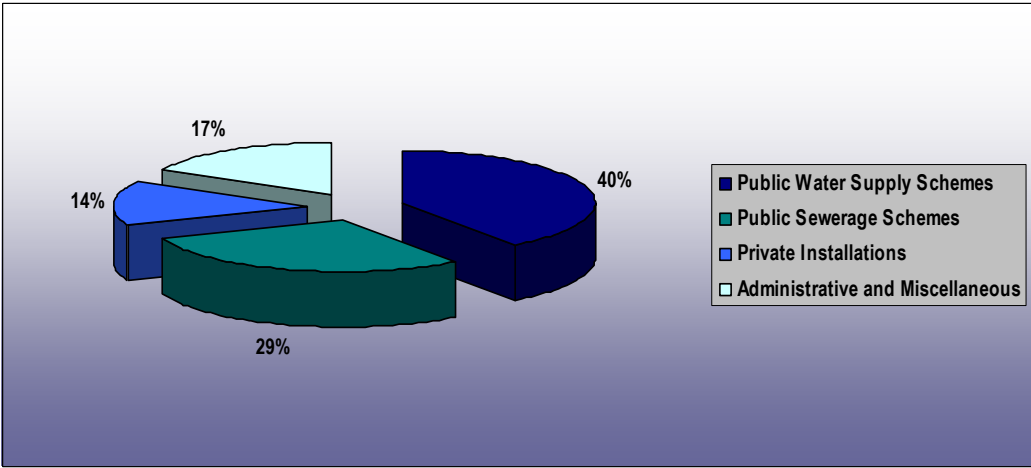
Figure A.1-2: Kilkenny County Council Programme Group 3 Receipt Composition (1999)



Source: DEHLG Local Authority Budgets 2003

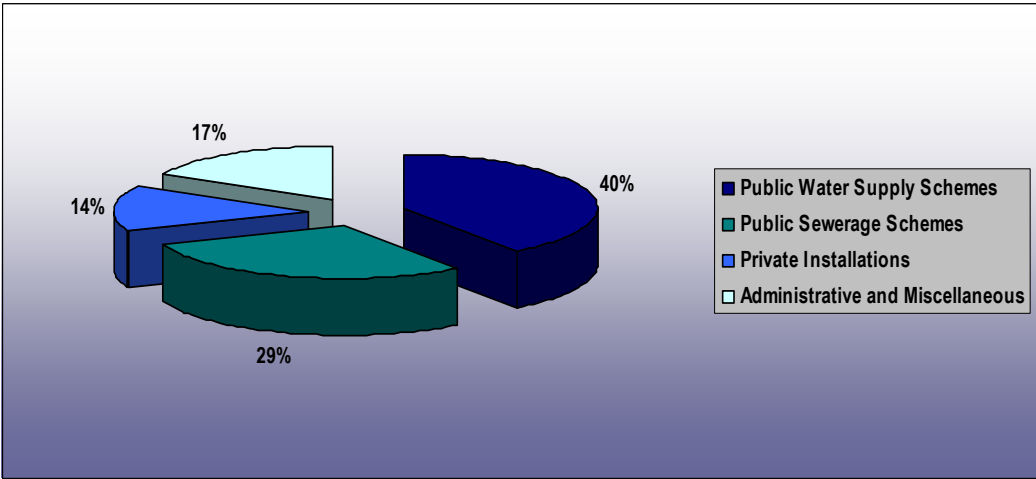
Figure A.1-3: Kilkenny County Council Programme Group 3 Receipt Composition (2003)

The proportions of income derived from Sub Group 3.1 (Public Water) and Sub Group 3.2 (Public Sewerage) have declined substantially, from a combined 74% of total current receipts in 1999 to 52% in 2003. These decreases have been offset by a doubling of the currents receipts generated from Sub Group 3.3 (Private Installations), highlighting the increased investment in group water schemes in the county. The decline in the proportion of receipts generated from Sub Group 3.2 (Public Sewerage) from 28% in 1999 to 15% in 2003 may reflect the prevalent sewerage treatment issues in the county associated with lack of treatment capacity.



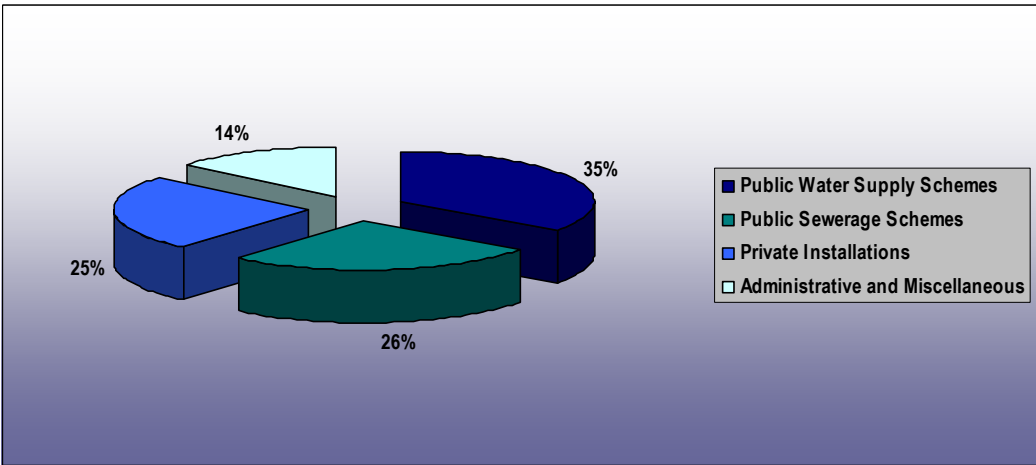
Source: DEHLG Local Authority Budgets 1999

Figure A.1-4: Kilkeny County Council Programme Group 3 Expenditure Composition 1999



Source: DEHLG Local Authority Budgets 1999

Figure A.1-4: Kilkeny County Council Programme Group 3 Expenditure Composition 1999



Source: DEHLG Local Authority Budgets 2003

Figure A.1-5: Kilkeny County Council Programme Group 3 Expenditure Composition (2003)

Trends with regard to current expenditure are broadly in line with those evident in current receipts. Sub Group 3.1 (Public Water) and Sub Group 3.2 (Public Sewerage) both post small percentage declines as a proportion of total current expenditure. These trends are again offset by a proportional rise in Sub Group 3.3 (Private Installations) which now accounts for one quarter of all current expenditures. This data may be attributed to increased operational costs associated with upgraded group schemes. It also illustrates that, while current expenditure on Sub Group 3.1 (Public Water) and Sub Group 3.2 (Public Sewerage) have increased in real money terms, as a proportion of total current expenditure, they have both decreased in the period 1999 to 2003.

Capital Account

Information with regard to capital accounts is limited to expenditure datasets for the RWP and the WSIP for the period 2000 to 2003. These represent the DEHLG's capital expenditure on Programme Group 3 projects under these two schemes only, and should not be considered as the final amount of capital expenditure carried out by Local Authorities. Further financing for capital investment may come from industrial users, Local Authority borrowing, and utilisation of elements of the Local Government Fund allocations for capital purposes.

Table A.1-5 below illustrates the levels of RWP and WSIP expenditure in Kilkenny for the period 2000 to 2003. Comparative figures are also provided for National expenditure levels under these programs. The data illustrates uneven expenditure patterns of the WSIP in Kilkenny indicating the project led nature of this investment. The data also highlights the largely linear increase provided through the RWP and the continuing importance of this funding mechanism for predominantly rural counties such as Kilkenny.

Table A.1-5: Kilkenny WSIP and RWP Capital Expenditure (2000 – 2003)

Expenditure	2000	2001	2002	2003	Total '00 – '03
Kilkenny WSIP	709,677	4,103,737	3,229,801	1,070,956	9,114,171
Kilkenny RWP	1,209,042	1,099,181	1,246,218	1,475,795	5,030,236
Total Kilkenny	1,918,719	5,202,918	4,476,019	2,546,751	14,144,407
National WSIP	380,270,432	453,149,206	436,385,204	374,779,837	1,644,584,679
National RWP	44,950,497	53,456,033	57,231,364	74,827,846	230,465,740

SOURCE: DEHLG LOCAL AUTHORITY BUDGETS 2000-2003

Appendix A-2

Galway County Council

County Galway is located on the West coast of Ireland. A traditionally rural county, County Galway is experiencing significant change due to high levels of growth experienced by the primary urban centre of the County, Galway City. The County is bordered to the West by the Atlantic Ocean.

County Galway shares borders with Counties Mayo, Roscommon, Offaly, Tipperary and Clare. It covers an area of 614,877 hectares, 335,833 of which are under agricultural use. Galway City is the primary population centre of the county. **Table A.2-1** illustrates the population growth of Galway County and City, for the period 1996 to 2002.

Table A.2-1: Population Growth Galway City and County (1996 – 2002)

County	1996	2002	% Pop Growth ('96-'02)
Galway County	131,613	143,245	8.8%
Galway City/Environs	57,241	65,832	15.0%

Source: CSO Census (2002)

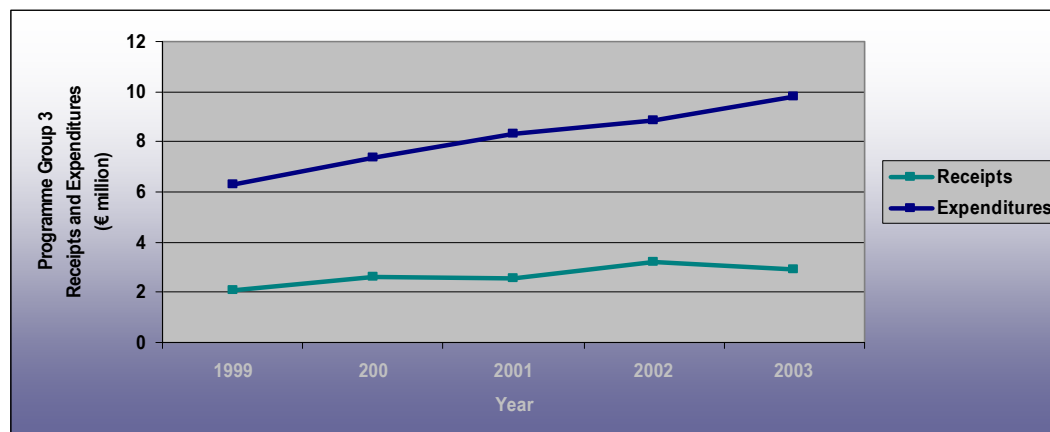
The population density for County Galway has increased from 0.21 people per hectare in 1996 to 0.23 in 2002. In 2001, the most recent year for which income data is available, average disposable income stood at €15,744 in County Galway, representing 98.7% of the average for the State.

A.2.1 Programme Group 3 (Water/Sewerage) Receipts and Expenditures

Current Account

Programme Group 3 Current Account Receipts and Expenditure has been collated for the years 1999 to 2003. This data has been obtained from the Local Government Finance Section of the DEHLG. The data is derived from the DEHLG publication "Local Authority Budgets."

The overall trends in Programme 3 Current Receipts and Expenditures are illustrated in **Figure A.2-1**, while **Table A.2-2** highlights these trends in a comparative context with national growth rates.



Source: DEHLG Local Authority Budgets 1999-2003

Figure A.2-1: Galway County Council Programme Group 3 Receipts and Expenditures (1999-2003)

Table A.2-2: Programme Group 3 Receipts and Expenditure Galway County Council and National Comparison

Prog 3	1999	2000	2001	2002	2003	% Growth '99-'03
Galway Receipts	2,049,719	2,631,526	2,573,778	3,191,278	2,939,461	43.4%
Galway Expenditures	6,323,543	7,370,468	8,314,207	8,861,839	9,783,085	54.7%
National Receipts	117,735,712	133,581,378	145,719,429	169,369,806	200,223,288	70.1%
National Expenditures	257,743,603	288,180,996	325,412,542	370,534,741	424,378,325	64.7%

DEHLG Local Authority Budgets 1999- 2003

The data above illustrates the linear current expenditure growth for Galway County Council which increased by just under 55% in the period 1999 to 2003. This rise was well below the national average increase of 70% over the same period. Total current receipts rose by over 43% in the period under consideration; however this rise contained actual decreases in the periods 2000 to 2001 and 2002 to 2003. The rise of 43.4% was below the national average of 64.7% for the same period. **Table A.2-3** and **Table A.2-4** disaggregate this information by sub group.

Table A.2-3: Galway County Council Programme Group 3 Current Receipt Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth '99-'03
Public Water (3.1)	916,116	1,228,726	1,169,010	1,703,043	1,475,000	61.0%
Public Sewerage (3.2)	31,743	38,092	63,487	101,579	120,000	278.0%
Private Installations (3.3)	799,935	990,396	952,304	1,009,442	934,848	16.9%
Admin and Miscellaneous (3.8)	301,925	374,312	388,978	377,214	409,613	35.7%

Source: DEHLG Local Authority Budgets 1999 - 2003

The data above highlights again the uneven nature of current receipt growth which varied from a rise of under 16.9% in Sub Group 3.3 (Private Installations) to a rise of 278% in Sub Group 3.2 (Public Sewerage). Although, it must be pointed out that the receipts of Sub Group 3.2 (Public Sewerage) commenced in 1999 from a very low starting base of just over €31,000 and in 2003 remains a very small percentage of overall Programme Group 3 current income.

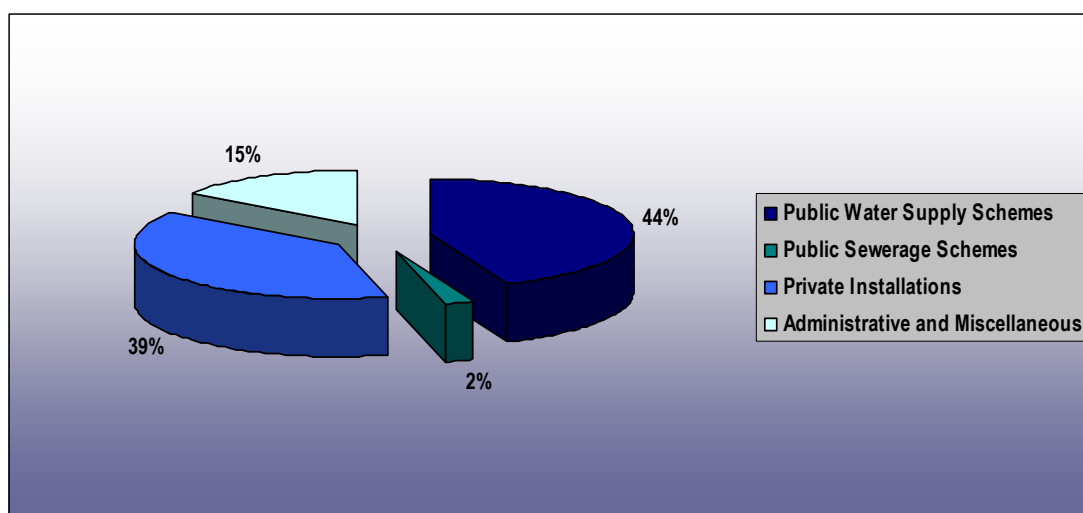
Table A.2-4: Galway County Council Programme Group 3 Expenditure Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth
						'99-'03
Public Water (3.1)	2,779,031	3,227,973	3,488,789	4,076,456	4,466,886	60.7%
Public Sewerage (3.2)	784,698	936,241	1,133,622	1,196,093	1,530,000	95.0%
Private Installations (3.3)	768,801	955,948	952,304	952,304	900,000	17.1%
Admin and Miscellaneous (3.8)	1,991,013	2,250,306	2,739,492	2,636,986	2,886,199	45.0%

Source: DEHLG Local Authority Budgets 1999 - 2003

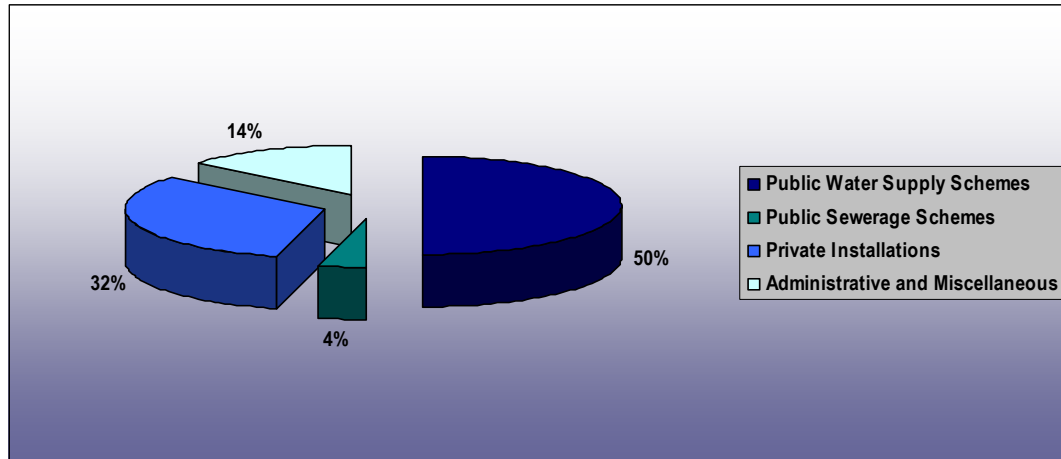
Current expenditure growth across all sub groups grew steadily, with Sub Group 3.2 (Public Sewerage) posting a 95% rise over the period considered. This may represent increased operational costs arising from investment in new sewerage-related fixed assets. Across all sub groups, with the exception of Sub Group 3.3 (Private Installations), a significant current shortfall exists. Also noteworthy is the 45% rise in current expenditure for Sub Group 3.8 (Administration and Miscellaneous).

Figures A.2-2 to A.2-5 illustrate the percentage composition of current receipts and expenditures by sub groups for the period 1999 to 2003. These figures provide an overview of sub group trends in relation to overall receipts and expenditures. Sub Group 3.1 (Public Water) accounted for 50% of total current receipts in 2003, up from 44% in 1999. This may indicate a higher level of operational cost recovery from non domestic users. This rise is offset by a decline in Private Installations, from 39% to 32%, over the same period. The miniscule proportion of current receipts derived from Sub Group 3.2 (Public Sewerage) reflects the predominantly domestic use of these facilities in the County.



Source: DEHLG Local Authority Budgets 1999

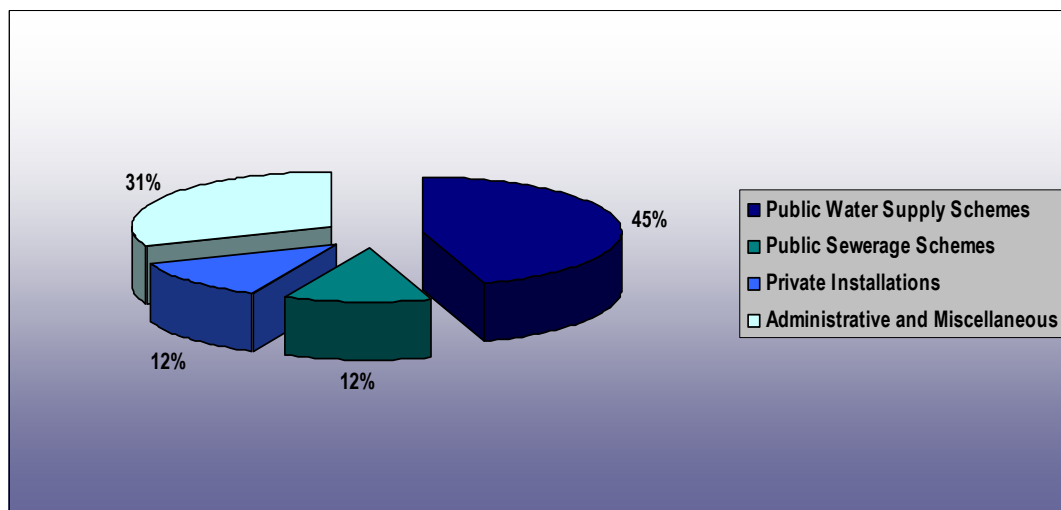
Figure A.2-2: Galway County Council Programme Group 3 Receipt Composition (1999)



Source: DEHLG Local Authority Budgets 2003

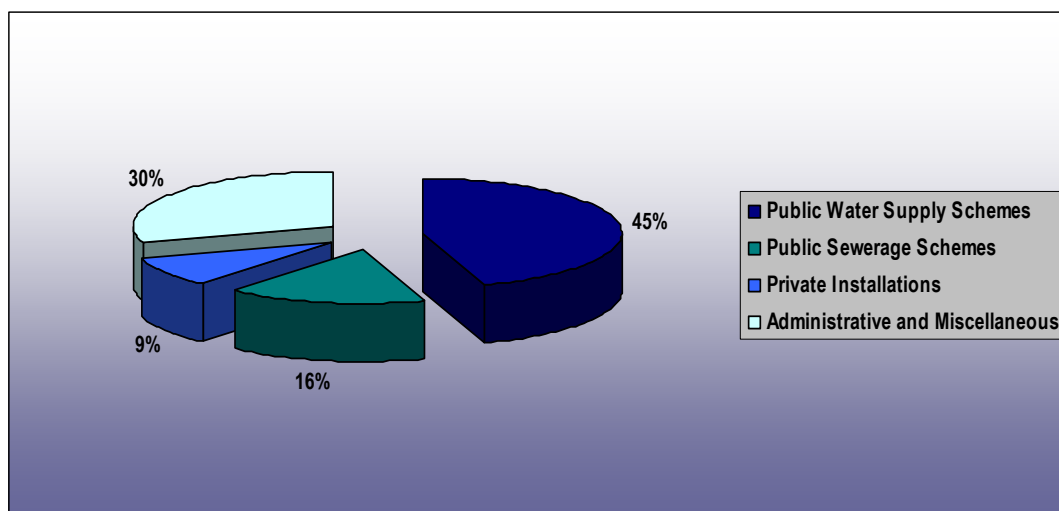
Figure A.2-3: Galway County Council Programme Group 3 Receipt Composition (2003)

The current expenditure profiles for Galway County Council, as outlined below in **Figures A.2-4 and A.2-5** are practically identical for 1999 and 2003, the only variations being a small rise in Sub Group 3.2 (Public Sewerage) expenditure being directly offset by small rises in Sub Group 3.3 (Private Installations) and Sub Group 3.8 (Administration and Miscellaneous) expenditure. The increase in the proportion of current expenditure allocated to Public Sewerage Schemes is significant, considering the low level of current receipts generated from this sub group. The current budget shortfall for this sub group was in excess of €1.4 million in 2003.



Source: DEHLG Local Authority Budgets 1999

Figure A.2-4: Galway County Council Programme Group 3 Expenditure Composition (1999)



Source: DEHLG Local Authority Budgets 2003

Figure A.2-5: Galway County Council Programme Group 3 Expenditure Composition (2003)

Capital Account

Information with regard to capital accounts is limited to expenditure datasets for the RWP and the WSIP, for the period 2000 to 2003. These represent the DEHLG's capital expenditure on Programme 3 under these two schemes only and should not be considered as the final amount of capital expenditure carried out by Local Authorities, due to some Local Authority Capital Investment not being 100% financed by the central government. Additional Local Authority funding may be sourced from industrial users, borrowings, or the utilisation of elements of the Local Government Fund for capital purposes.

Table A.2-5 illustrates levels of RWP and WSIP expenditure in Galway for the period 2000 to 2003. Comparative figures are also provided for National expenditure levels on the RWP and the WSIP. The project-led nature of the WSIP is highlighted by the uneven allocations under this scheme. Allocations under the RWP have remained in the €4 to €5 million range for the period under consideration, and reflect the extent and importance of rural water schemes in County Galway.

Table A.2-5: Galway WSIP and RWP Capital Expenditure 2000 – 2003

Expenditure	2000	2001	2002	2003	Total '00 – '03
Galway WSIP	28,518,468	18,537,755	9,703,639	9,605,697	66,365,559
Galway RWP	5,094,119	4,191,260	4,732,612	4,985,032	19,003,023
Total Galway	33,612,587	22,729,015	14,436,251	14,590,729	85,368,582
National WSIP	380,270,432	453,149,206	436,385,204	374,779,837	1,644,584,679
National RWP	44,950,497	53,456,033	57,231,364	74,827,846	230,465,740

Source: DEHLG Local Authority Budgets 2000-2003

Appendix A-3

Kildare County Council

Kildare is located on the south west border of County Dublin and has an area of 169,540 hectares, of which 112,518 are under agricultural use. Kildare has no direct access to the sea and in addition to bordering Dublin, is bounded by the Counties Meath, Offaly, Laois, Carlow and Wicklow.

Kildare is highly influenced by the continued growth experienced by Dublin. As a result, several of its main urban population centres, such as Naas, are encountering very rapid population growth. **Table A.3-1** below outlines population growth rates for Counties Kildare and Naas, for the period 1996 to 2002.

Table A.3-1: Population in County Kildare and Naas, 1996 -2002

County	1996	2002	% Pop Growth ('96-'02)
Kildare	134,992	163,944	21.4%
Naas	14,074	18,288	29.9%

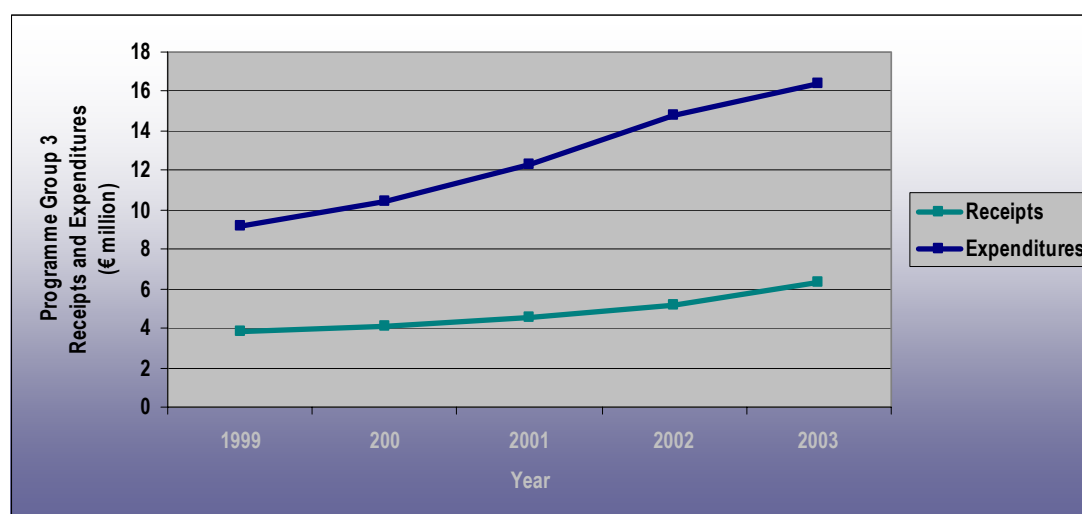
Source: CSO Census (2002)

The population density for County Kildare as a whole has increased from 0.79 people per hectare in 1996 to just under 1.0 in 2002. In 2001, the most recent year for which income data is available, average disposable income stood at €16,755 in County Kildare, representing 105% of the State average. Kildare is part of the Greater Dublin Region.

A.3.1 Programme Group 3 (Water/Sewerage) Receipts and Expenditures

Current Account

Programme Group 3 Current Account Receipt and Expenditure has been collated for the years 1999 to 2003. This data has been obtained from the Local Government Finance Section of the DEHLG. The data is derived from the DEHLG publication "Local Authority Budgets. "The overall trends in Programme 3 Current Receipts and Expenditures are illustrated in **Figure A.3-1**, while **Table A.3-2** highlights these trends in a comparative context with national growth rates.



Source: DEHLG Local Authority Budgets 1999-2003

Figure A.3-1: Kildare County Council Programme Group 3 Receipts and Expenditures (1999-2003)

Table A.3-2: Programme Group 3 Receipts and Expenditures Kildare County Council and National Comparison

Prog 3	1999	2000	2001	2002	2003	% Growth '99-'03
Kildare Receipts	3,851,877	4,088,427	4,525,094	5,140,483	6,297,488	63.5%
Kildare Expenditure	9,204,223	10,459,291	12,253,860	14,812,963	16,351,786	77.7%
National Receipts	117,735,712	133,581,378	145,719,429	169,369,806	200,223,288	70.1%
National Expenditure	257,743,603	288,180,996	325,412,542	370,534,741	424,378,325	64.7%

Source: DEHLG Local Authority Budgets 1999-2003

The above data illustrates that for the period 1999 to 2003 current expenditure growth outpaced that of current receipts. Expenditure growth of just under 78% also significantly exceeded the average national growth rate of 65%. The level of current receipt growth over the period was insufficient to halt a widening of the overall Programme 3 current shortfall. The current account shortfall in 2003 stood at over €10 million, up from €5.3 million in 1999.

Tables A.3-3 and **A.3-4** below detail the growth experienced by sub groups related to both current receipts and expenditures. With regard to current receipt growth, huge increases have been witnessed in Sub Group 3.2 (Public Sewerage) and Sub Group 3.8 (Administration and Miscellaneous). The huge growth in Public Sewerage receipts (373%) may be attributed to the high levels of non domestic sewerage treatment demand which Kildare has experienced in recent years. The huge rise in Sub Group 3.8 (Administration and Miscellaneous) receipts should be considered in the context of a very small baseline of €5,587 in 1999.

Table A.3-3: Kildare County Council Programme Group 3 Receipt Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth 99-03
Public Water (3.1)	3,354,902	3,510,826	3,669,543	4,037,767	4,401,563	31.2%
Public Sewerage (3.2)	325,053	384,731	638,678	788,507	1,538,968	373.4%
Private Installations (3.3)	166,336	173,954	184,112	206,713	246,000	47.9%
Admin and Miscellaneous (3.8)	5,587	18,917	32,761	107,496	110,957	1886.0%

Source: DEHLG Local Authority Budgets 1999-2003

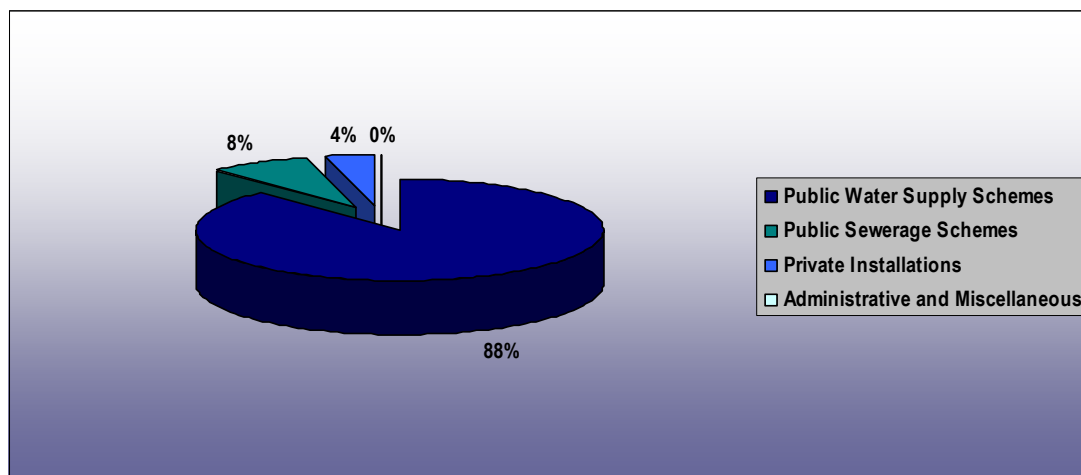
Current expenditure growth again exhibits a more linear growth pattern than that of current receipts, with the most significant increases witnessed in Sub Group 3.2 (Public Sewerage) and Sub Group 3.8 (Administration and Miscellaneous). The current expenditure classified as Sub Group 3.8 (Administration and Miscellaneous) was in excess of €2.2 million in 2003. The evident surge in Sub Group 3.2 (Public Sewerage) current expenditure may have resulted from the higher operational expenses associated with new sewerage treatment infrastructure.

Table A.3-4: Kildare County Council Programme Group 3 Current Expenditure Growth

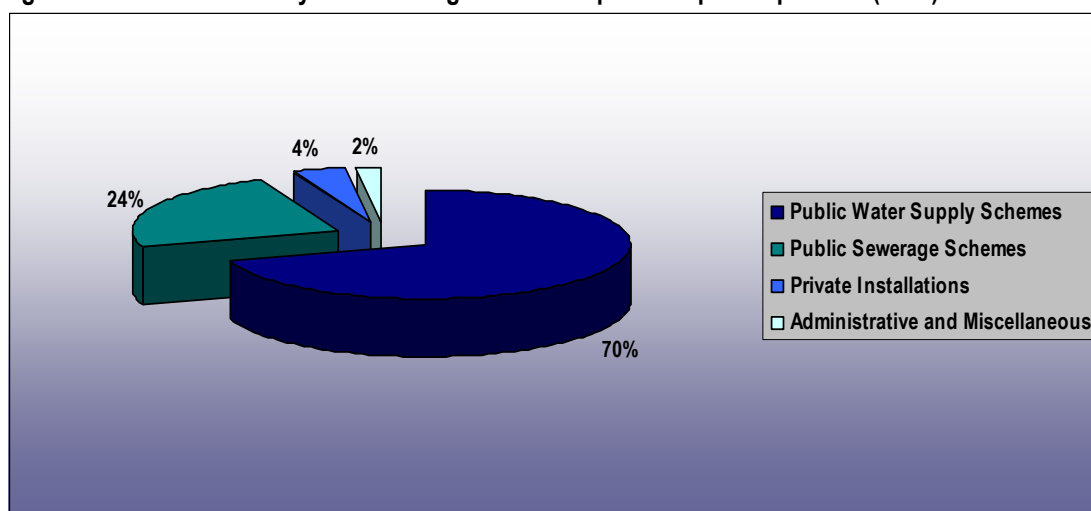
Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth '99-'03
Public Water (3.1)	4,973,437	5,409,592	6,269,781	6,824,969	7,211,683	45.0%
Public Sewerage (3.2)	3,065,148	3,878,415	4,667,164	6,403,953	6,628,876	116.3%
Private Installations (3.3)	170,145	195,286	208,237	228,155	266,817	56.8%
Admin and Miscellaneous (3.8)	995,494	975,998	1,108,678	1,355,886	2,244,410	125.5%

Source: DEHLG Local Authority Budgets 1999-2003

Figures A.3-2 to A.3-6, below, highlight each sub group as a proportion of overall current receipts and expenditure. The years 1999 and 2003 are considered. This data enables identification of the changing composition of receipt and expenditure patterns.



Source: DEHLG Local Authority Budgets 1999

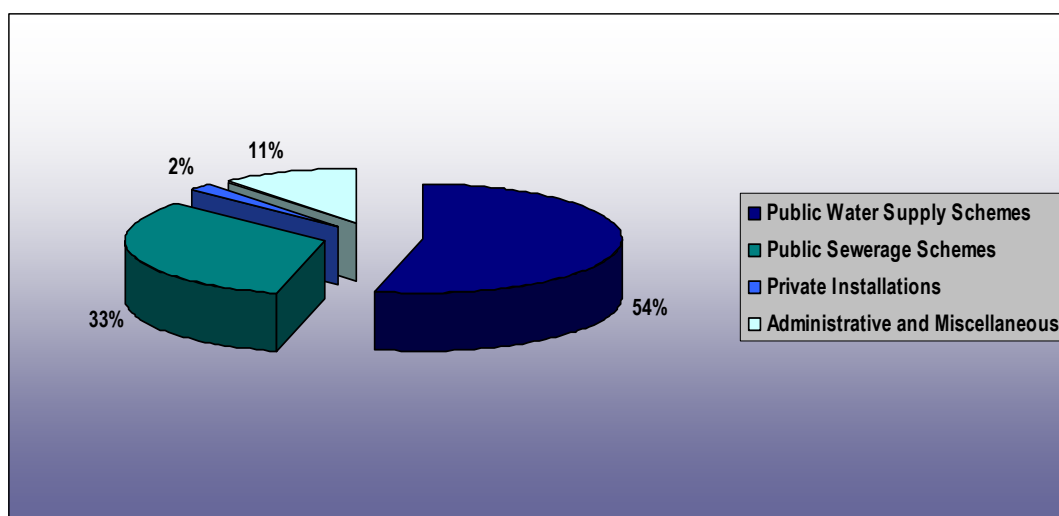
Figure A.3-2: Kildare County Council Programme Group 3 Receipt Composition (1999)

Source: DEHLG Local Authority Budgets 2003

Figure A.3-3: Kildare County Council Programme Group 3 Receipt Composition (2003)

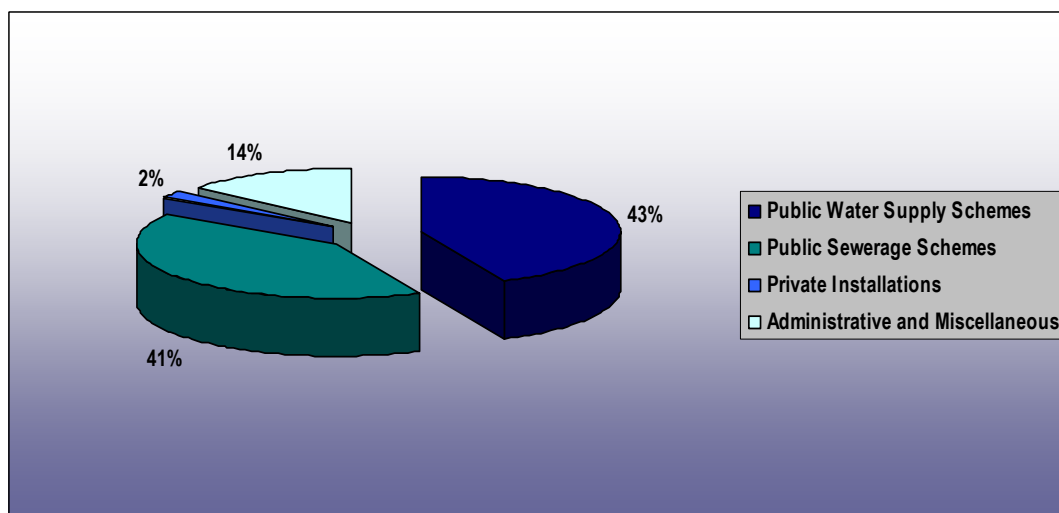
The figures above identify the decline of public water supply as a component of current receipts. Public water supply schemes fell from 88% of total current receipts in 1999 to 70% in 2003. This decline is directly offset by a trebling in the proportion of receipts generated from public sewerage schemes, up to 24% in 2003 from 8% in 1999. This increase in public sewerage may reflect greater industrial use of sewerage schemes, and a more comprehensive cost recovery mechanism for the treatment of industrially generated waste.

A similar image of the trends identified above can be seen in the current expenditure figures set out in **Figures A.3-4 and A.3-5** below. Current expenditure on public water schemes fell from 54% of total current expenditure in 1999, to 43% in 2003. This decrease is almost directly offset by a rise in the proportion spent on public sewerage schemes, up from 33% in 1999, to 41% five years later. This may indicate an overall increase in the operational costs of sewerage scheme infrastructure.



Source: DEHLG Local Authority Budgets 1999

Figure A.3-4: Kildare County Council Programme Group 3 Expenditure Composition (1999)



Source: DEHLG Local Authority Budgets 2003

Figure A.3-5: Kildare County Council Programme Group 3 Expenditure Composition (2003)

Capital Account

Information with regard to capital accounts is limited to expenditure datasets for the RWP and the WSIP for the period 2000 to 2003. These represent the DEHLG's capital expenditure on Programme Group 3 under these two schemes only, and should not be considered as the final amount of capital expenditure carried out by Local Authorities, due to some Local Authority Capital Investment not being 100% financed by the central government. Additional capital financing may be sourced from industrial users, Local Authority borrowing, or utilisation of elements of the Local Government Fund for capital purposes.

Table A.3-5 below illustrates the levels of RWP and WSIP expenditure in Kildare for the period 2000 to 2003. Comparative figures are also provided for National expenditure levels on the RWP and the WSIP. The project led nature of the WSIP is illustrated in the fact that the vast majority of funding provided by this mechanism was allocated in two specific years, 2000 and 2003. Funding secured under the RWP over the same period has totalled over €5 million and indicates the survival of the traditional rural nature of County Kildare, notwithstanding the high levels of urbanisation experienced within specific areas of the county.

Table A.3-5: Kildare WSIP and RWP Capital Expenditure 2000 – 2003

Expenditure	2000	2001	2002	2003	Total '00 – '03
Kildare WSIP	20,173,439	5,734,507	7,614,367	25,052,414	58,574,727
Kildare RWP	917,831	2,149,652	1,025,598	1,316,445	5,409,526
Total Kildare	21,091,270	7,884,159	8,639,965	26,368,859	63,984,253
National WSIP	380,270,432	453,149,206	436,385,204	374,779,837	1,644,584,679
National RWP	44,950,497	53,456,033	57,231,364	74,827,846	230,465,740

Source: DEHLG Local Authority Budgets 2000 - 2003

Appendix A-4

Donegal County Council

County Donegal is located in the north west of Ireland. It contains an area of 486,091 hectares, 230,610 of which are under agricultural use. It is bounded by the counties of Derry, Tyrone, Fermanagh and Leitrim. All of these counties, with the exception of Leitrim, are part of Northern Ireland. The County is bound to the north and west by the Atlantic Ocean.

The settlement pattern within County Donegal is predominantly of a rural nature. However, in recent years, strong population growth has been centred on the main urban centre of Letterkenny. Outside of these urban centres, population distribution is scattered and rural. **Table A.4-1** outlines the population growth of County Donegal and Letterkenny for the period 1996 – 2002.

Table A.4-1: Population Growth of County Donegal and Letterkenny, 1996-2000

County	1996	2002	% Pop Growth ('96-'02)
Donegal County	129,994	137,575	5.8%
Letterkenny	11,996	15,231	27.0%

Source: CSO Census (2002)

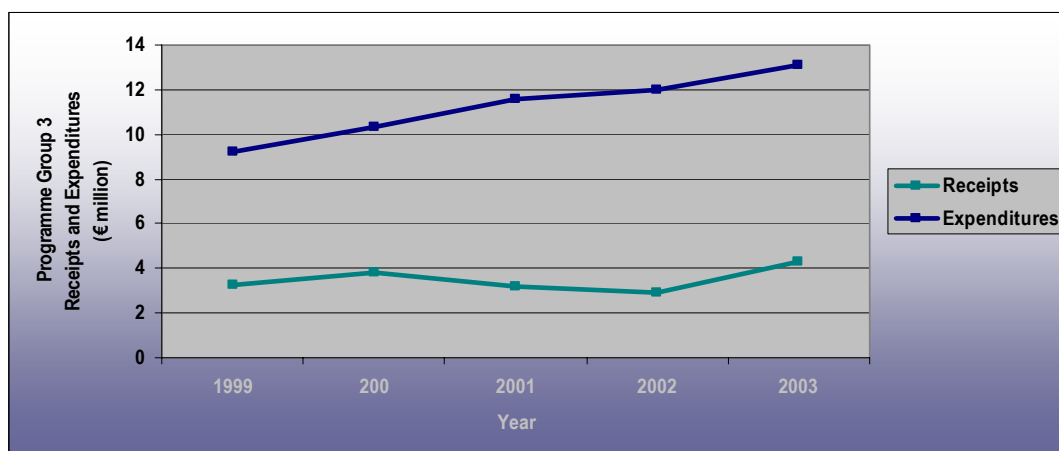
The population density for County Donegal has increased from 0.27 people per hectare in 1996 to 0.28 in 2002. In 2001, the year for which the latest income data is available, average disposable income stood at €13,347 in County Donegal representing 83.7% of the average for the State.

A.4.1 Programme Group 3 (Water/Sewerage) Receipts and Expenditures

Current Account

Programme Group 3 Current Account Receipt and Expenditure data has been collated for the years 1999 to 2003. This data has been obtained from the Local Government Finance Section of the DEHLG. The data is derived from the DEHLG publication “Local Authority Budgets”.

The overall trends in Programme 3 Current Receipts and Expenditures are illustrated in **Figure A.4-1** below while **Table A.4-2** highlights these trends in a comparative context with national growth rates.



Source: DEHLG Local Authority Budgets 1999-2003

Figure A.4-1: Donegal County Council Programme Group 3 Receipts and Expenditures (1999-2003)

Table A.4-2: Programme Group 3 Receipts and Expenditures Donegal County Council and National Comparison

Prog 3	1999	2000	2001	2002	2003	% Growth 99-03
Donegal Receipts	3,269,477	3,807,574	3,188,554	2,928,037	4,285,456	31.1%
Donegal Expenditures	9,209,568	10,319,425	11,598,735	12,015,323	13,132,468	42.6%
National Receipts	117,735,712	133,581,378	145,719,429	169,369,806	200,223,288	70.1%
National Expenditures	257,743,603	288,180,996	325,412,542	370,534,741	424,378,325	64.7%

Source: DEHLG Local Authority Budgets 1999-2003

The above data identifies the relatively steady current expenditure growth experienced by Donegal County Council in the period 1999 to 2004. However, the growth in expenditure of 43.6% remains well below the national average of 64.7%. Current receipt growth amounted to just over 31% and represents a widening of the gap between current expenditure and income for the period under consideration. Current receipt growth lagged substantially behind the national average growth rate of 70.1%.

Tables A.4-3 and A.4-4 below illustrate current receipt and expenditure growth by sub group. Sub Group 3.3 (Private Installations) and Sub Group 3.8 (Administration and Miscellaneous) have both posted receipt increases in excess of 100% from relatively low starting bases. Public water schemes experienced growth of 18.6% in the five-year period, but significant decreases in the years 2001 and 2002.

Table A.4-3: Donegal County Council Programme Group 3 Current Receipt Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth 99-03
Public Water (3.1)	2,809,930	3,107,049	2,645,118	2,124,272	3,331,400	18.6%
Public Sewerage (3.2)	114,276	270,454	111,737	154,908	143,300	25.4%
Private Installations (3.3)	135,862	173,954	153,638	150,464	286,000	110.5%
Admin and Miscellaneous (3.8)	209,408	256,116	278,060	498,393	524,756	150.6%

Source: DEHLG Local Authority Budgets 1999 -2003

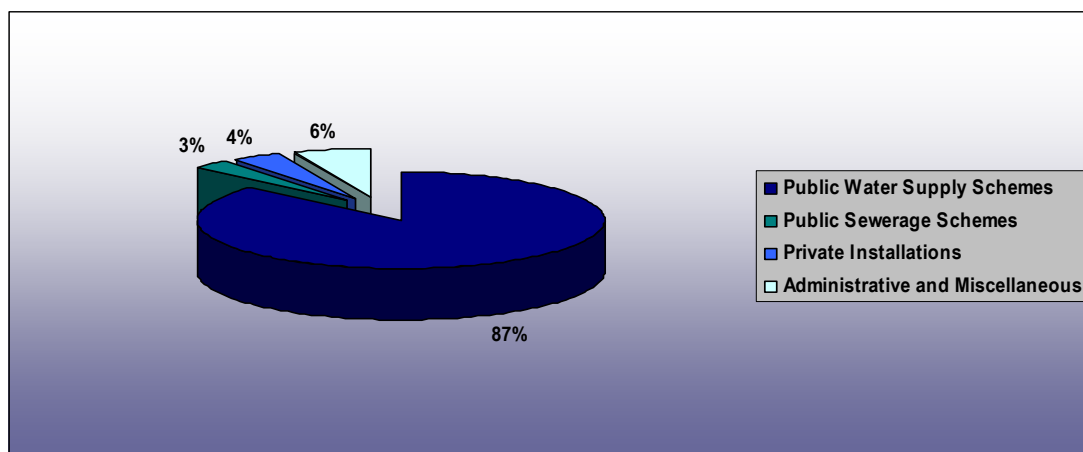
With regard to expenditures, growth is linear with all sub groups posting increases. The level of increase varies from 8% for Sub Group 3.3 (Private Installations), to 86% for Sub Group 3.8 (Administration and Miscellaneous). Sub Group 3.8 (Administration and Miscellaneous) expenditure for 2003 totalled well in excess of €1.5 million. It should be noted that a significant current shortfall (€329,600) exists in relation to Sub Group 3.3 (Private Installations). This may be due to increased operational costs associated with upgraded group water schemes, which is particularly relevant in Donegal.

Table A.4-4: Donegal County Council Programme Group 3 Current Expenditure Growth

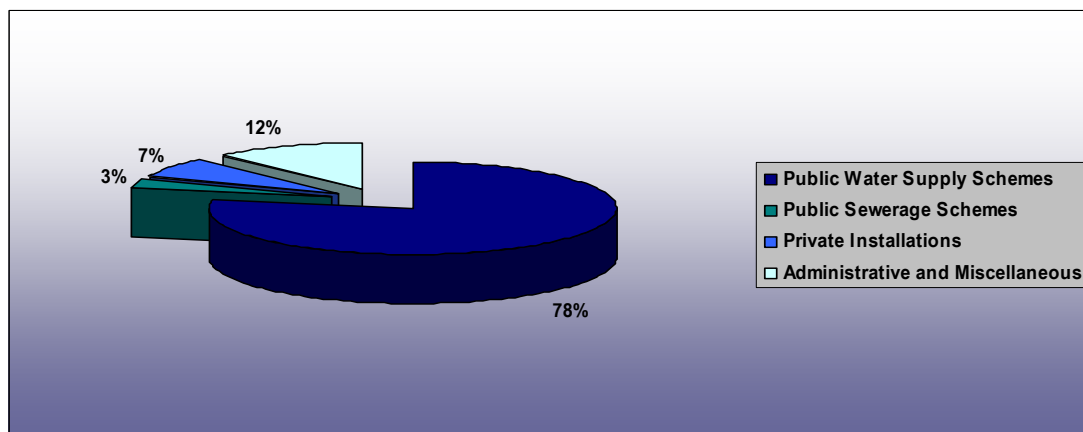
Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth
						'99-'03
Public Water (3.1)	5,798,132	6,539,405	7,260,362	7,465,679	7,826,200	35.0%
Public Sewerage (3.2)	1,446,359	1,688,752	1,907,020	1,930,129	2,100,000	45.2%
Private Installations (3.3)	570,366	584,714	616,204	628,139	615,600	7.9%
Admin and Miscellaneous (3.8)	1,394,711	1,506,554	1,815,149	1,991,376	2,590,668	85.6%

Source: DEHLG Local Authority Budgets 1999 -2003

The composition of current receipts is illustrated in **Figures A.4-2** and **A.4-3**, below, the main identifiable trend being the reduction in the proportion of current receipts derived from Sub Group 3.1 (Public Water), down from 87% in 1999 to 78% in 2003. The relatively low level of current receipts generated from Sub Group 3.2 (Public Sewerage) may be attributed to the low levels of sewerage treatment plant use by non-domestic users and the subsequent lack of a domestic cost recovery mechanism.



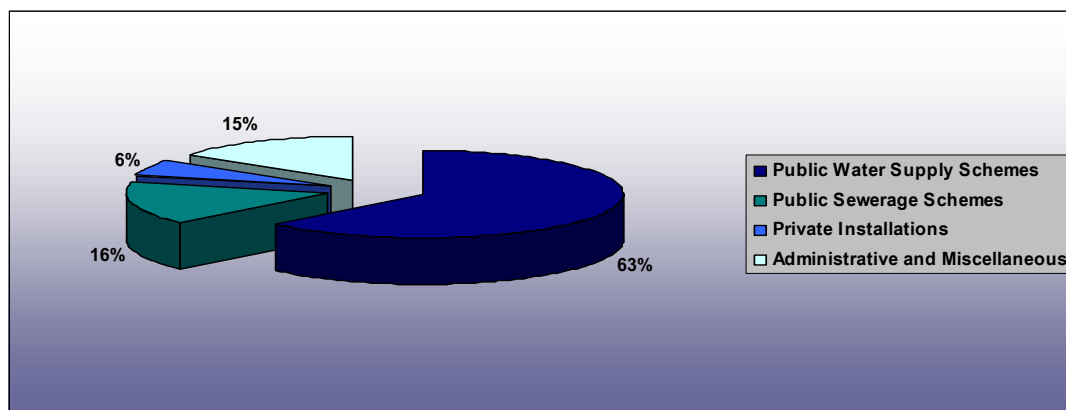
Source: DEHLG Local Authority Budgets 1999

Figure A.4-2: Donegal County Council Programme Group 3 Receipt Composition (1999)

Source: DEHLG Local Authority Budgets 2003

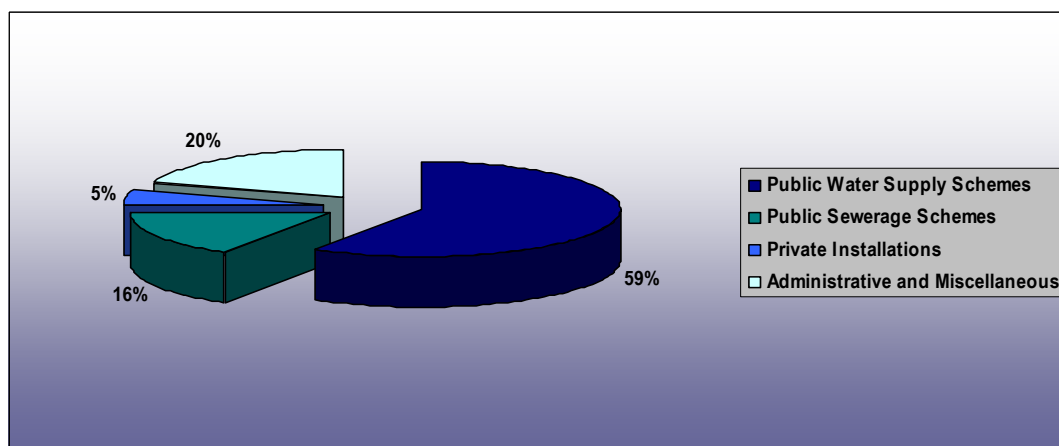
Figure A.4-3: Donegal County Council Programme Group 3 Receipt Composition (2003)

Figures A.4-4 and A.4-5 outline a decrease in the proportion of current expenditure spent on Sub Group 3.1 (Public Water), which has reduced from 63% to 59% over the period under consideration. The proportion of current expenditure allocated to all other sub groups has generally remained stable. However, the proportion characterised as Sub Group 3.8 (Administration and Miscellaneous) has increased to 20% of total current expenditure in 2003. It is noteworthy that such a large proportion of current expenditure is classified in this way.



Source: DEHLG Local Authority Budgets 1999

Figure A.4-4: Donegal County Council Programme Group 3 Expenditure Composition (1999)



Source: DEHLG Local Authority Budgets 2003

Figure A.4-5: Donegal County Council Programme Group 3 Expenditure Composition (2003)

Capital Account

Information with regard to capital accounts is limited to expenditure datasets for the RWP and the WSIP for the period 2000 to 2003. These represent the DEHLG's capital expenditure on Programme 3 under these two schemes only, and should not be considered as the final amount of capital expenditure carried out by Local Authorities, due to some Local Authority Capital Investment not being 100% financed by central government. Alternative financing arrangements are available from industrial users, Local Authority borrowing, and the potential utilisation of elements of the Local Government Fund for capital purposes.

Table A.4-5 below illustrates the levels of RWP and WSIP expenditure in Donegal for the period 2000 to 2003. Comparative figures are also provided for National expenditure levels on the RWP and WSIP. This data highlights the project-led nature of allocations under the WSIP. Funding under the RWP has totalled over €14 million in the period 2000 to 2003. This highlights the rural nature of Donegal and the subsequent pivotal role of rural water schemes in service provision.

Table A.4-5: Donegal WSIP and RWP Capital Expenditure 2000 – 2003

Expenditure	2000	2001	2002	2003	Total '00 – '03
Donegal WSIP	5,352,233	8,650,006	11,135,791	7,702,585	32,840,615
Donegal RWP	2,349,922	3,626,538	4,403,368	3,720,573	14,100,401
Total Donegal	7,702,155	12,276,544	15,539,159	11,423,158	46,941,016
National WSIP	380,270,432	453,149,206	436,385,204	374,779,837	1,644,584,679
National RWP	44,950,497	53,456,033	57,231,364	74,827,846	230,465,740

Source: DEHLG Local Authority Budgets 2000 - 2003

Appendix A-5

Dublin City Council

Dublin City Council forms part of the Local Authority Structure of County Dublin, which is also composed of Fingal, Dun Laoghaire/Rathdown and South Dublin Local Authorities. It encompasses the urban core of Dublin City. **Table A.5-1** outlines the population growth of County Dublin and Dublin City for the period 1996 – 2002.

Table A.5-1: Population Growth Dublin City and County, 1996-2002

County	1996	2002	% Pop Growth ('96-'02)
Dublin County	1,058,264	1,122,821	6.1%
Dublin City	481,854	495,781	2.9%

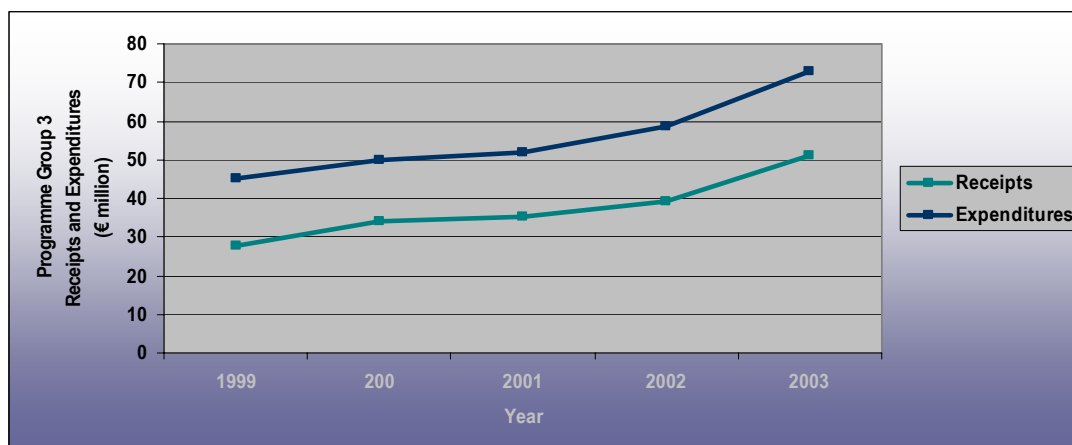
Source: CSO Census (2002)

A.5.1 Programme Group 3 (Water/Sewerage) Receipts and Expenditures

Current Account

Programme Group 3 Current Account Receipts and Expenditure data has been collated for the years 1999 to 2003. This data has been obtained from the Local Government Finance Section of the DEHLG. The data is derived from the DEHLG publication "Local Authority Budgets" for the years in question.

The overall trends in Programme 3 Current Receipts and Expenditures are illustrated in **Figure A.5-1**, while **Table A.5-2** highlights these trends in a comparative context with national growth rates.



Source: DEHLG Local Authority Budgets 1999-2003

Figure A.5-1: Dublin City Council Programme Group 3 Receipts and Expenditures (1999-2003)

Table A.5-2: Programme Group 3 Receipt and Expenditure Dublin City and National Comparison

Prog 3	1999	2000	2001	2002	2003	% Growth 99-03
Dublin City Receipts	27,898,914	34,049,296	35,096,302	39,051,311	50,951,882	82.6%
Dublin Expenditures	44,954,531	49,812,206	51,921,220	58,532,659	72,848,549	62.1%
National Receipts	117,735,712	133,581,378	145,719,429	169,369,806	200,223,288	70.1%
National Expenditures	257,743,603	288,180,996	325,412,542	370,534,741	424,378,325	64.7%

Source: DEHLG Local Authority Budgets 1999 - 2003

The above data illustrates that Dublin City experienced current receipt growth in excess of the national average. The level of current expenditure growth was marginally under the 64.7% national average growth rate. However, in real terms, the current budget shortfall widened from just over €17 million in 1999 to €21.9 million in 2003. It is also noteworthy that in 2003, Dublin City accounted for over 25% of all receipts and over 17% of all current expenditures gathered nationally for water and wastewater services. This should be considered in light of a population in Dublin City in 2002 which accounted for less than 10% of the national total.

Tables A.5-3 and **A.5-4** outline the trends in current receipts and expenditure for the period 1999 to 2003. The data for current receipts outlines a significant rise in income generated from Sub Group 3.2 (Public Sewerage Schemes). This may indicate greater non domestic use and subsequent cost recovery from these users. The urban nature of Dublin City is highlighted by the lack of any receipts in Sub Group 3.3 (Private Installation).

Table A.5-3: Dublin City Council Programme Group 3 Current Receipt Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth '99-'03
Public Water (3.1)	20,214,230	22,864,174	23,473,648	24,193,991	28,760,636	42.3%
Public Sewerage (3.2)	6,347,421	9,503,990	9,858,246	12,536,759	19,908,754	213.7%
Private Installations (3.3)	0	0	0	0	0	0.0%
Admin and Miscellaneous (3.8)	1,337,263	1,681,133	1,764,408	2,320,561	2,282,492	70.7%

Source: DEHLG Local Authority Budgets 1999 - 2003

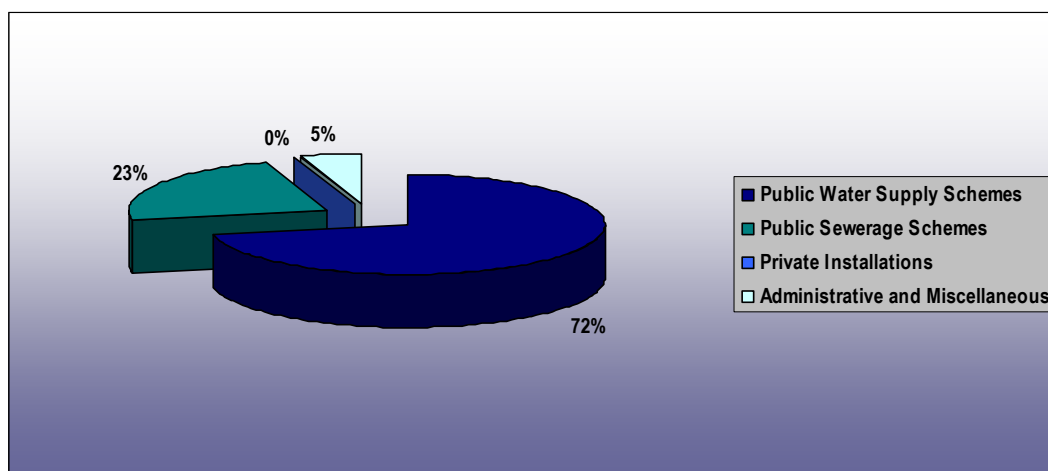
Table A.5-4: Dublin City Council Programme Group 3 Current Expenditure Growth

Prog 3 Sub Group	1999	2000	2001	2002	2003	% Growth
						'99-'03
Public Water (3.1)	25,460,788	26,583,236	27,919,001	29,193,401	32,516,871	27.7%
Public Sewerage (3.2)	15,163,212	18,442,946	18,802,281	23,240,681	32,280,160	112.9%
Private Installations (3.3)	0	0	0	0	0	0.0%
Admin and Miscellaneous (3.8)	4,330,531	4,786,024	5,199,938	6,098,577	8,051,518	85.9%

Source: DEHLG Local Authority Budgets 1999 - 2003

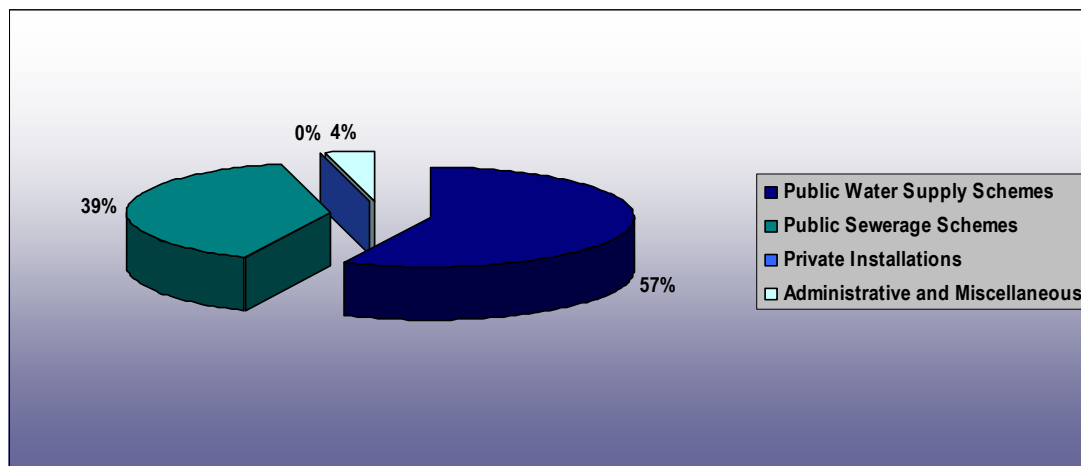
Current Expenditure growth as outlined above in **Table A.5-4** witnessed a very significant rise in Sub Group 3.2 (Public Sewerage). This rise, which amounted to over 112.9% during the five year period, may be due to increased operational costs of newly constructed capital projects. This is particularly relevant in relation to the new Ringsend treatment facility.

The composition of current receipts is illustrated in **Figures A.5-2** and **A.5-3**, below. The proportion of current receipts generated from Sub Group 3.2 (Public Sewerage Schemes) has increased from 23% in 1999 to 39% in 2003, largely offsetting the drop in income generated from Sub Group 3.1 (Public Water Schemes). These trends may relate to a more comprehensive cost recovery mechanism being employed for non domestic customers.



Source: DEHLG Local Authority Budgets 1999

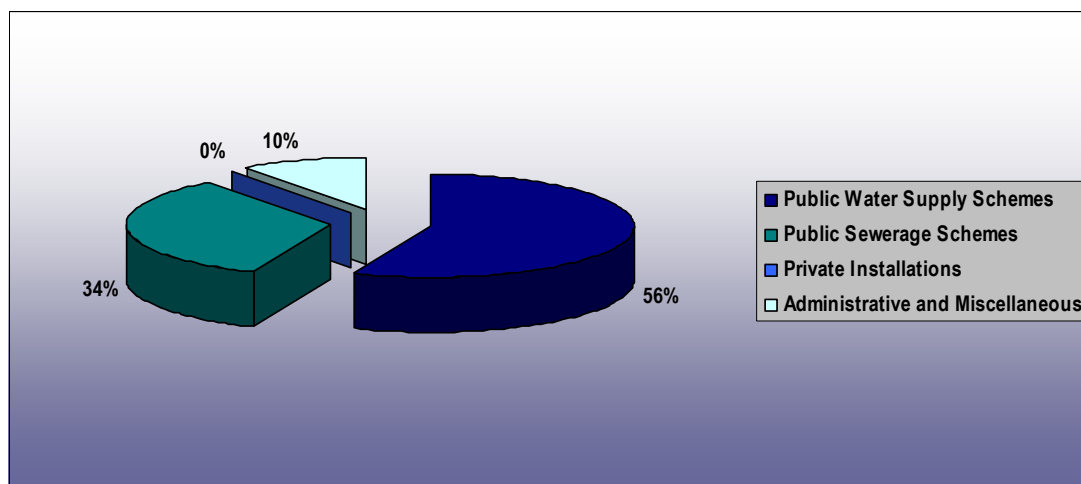
Figure A.5-2: Dublin City Council Programme Group 3 Receipt Composition (1999)



Source: DEHLG Local Authority Budgets 2003

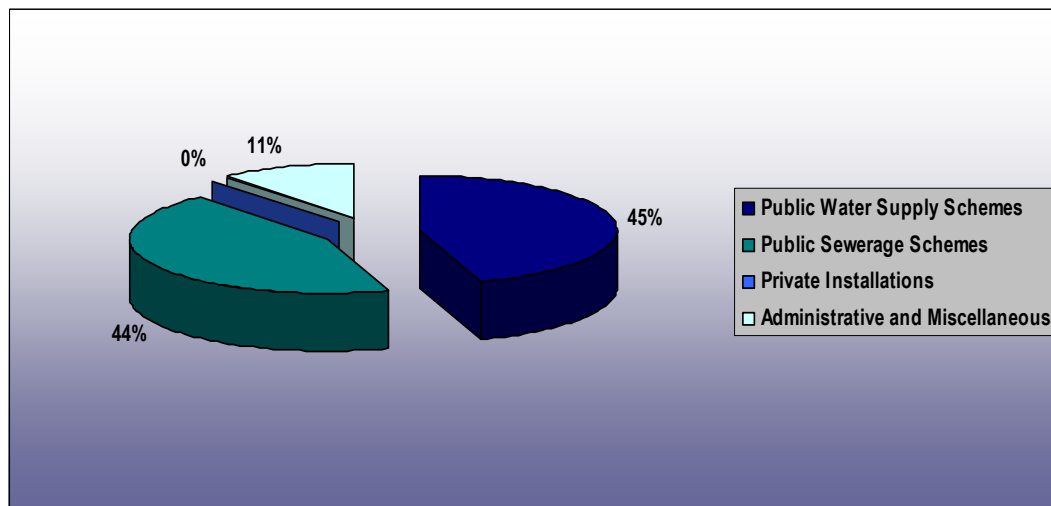
Figure A.5-3: Dublin City Council Programme Group 3 Receipt Composition (2003)

Figures A.5-4 and A.5-5 below outline the composition of current expenditure for the years 1999 and 2003. They highlight similar trends to those identified above in relation to current receipts. Primarily, these trends are: (1) a decrease in the proportion of current expenditure allocated to Sub Group 3.1 (Public Water Schemes); and, (2) a decrease offset by a similar proportionate rise in the expenditure allocation to Sub Group 3.2 (Public Sewerage Schemes). The rise in the proportion of current expenditure allocated to Sub Group 3.2 (Public Sewerage Schemes) may be partly attributed to the increased operational costs of recently completed new capital projects.



Source: DEHLG Local Authority Budgets 1999

Figure A.5-4: Dublin City County Council Programme Group 3 Expenditure Composition (1999)



Source: DEHLG Local Authority Budgets 2003

Figure A.5-5: Dublin City Council Programme Group 3 Expenditure Composition (2003)

Capital Account

Information regarding capital accounts is limited to expenditure datasets for the RWP and the WSIP for the period 2000 to 2003. These represent the DEHLG's capital expenditure on Programme 3 under these two schemes only, and should not be considered as the final amount of capital expenditure carried out by Local Authorities, due to some Local Authority Capital Investment not being 100% financed by the central government. Additional funding may be derived from industrial users, borrowing, or the utilisation of elements of the Local Government Fund for capital purposes.

Table A.5-5 illustrates the levels of RWP and WSIP expenditure in Dublin City for the period 2000 to 2003. Comparative figures are also provided for National expenditure levels on the RWP and WSIP. As anticipated, the urban nature of Dublin City Council is highlighted by the lack of any funding under the RWP. The project-led nature of the WSIP is evidenced by the uneven allocations under this mechanism.

Table A.5-5: Dublin City WSIP and RWP Capital Expenditure, 2000 – 2003

Expenditure	2000	2001	2002	2003	Total '00 – '03
Dublin WSIP	82,523,900	96,987,553	68,021,978	35,104,028	282,637,459
Dublin RWP	0	0	0	0	0
Total Dublin	85,523,900	96,987,553	68,021,978	35,104,028	282,637,459
National WSIP	380,270,432	453,149,206	436,385,204	374,779,837	1,644,584,679
National RWP	44,950,497	53,456,033	57,231,364	74,827,846	230,465,740

Source: DEHLG Local Authority Budgets 2000 – 2003

Appendix A-6

Conclusions

Current Expenditures

Analysed on a sub group level, the following salient points for the selected local authorities are noted:

- Current expenditure grew steadily across all sub groups for all local authorities in the period under consideration.
- Particularly evident is that all local authorities experienced very high levels of growth in Administration and Miscellaneous Expenditure (3.8).
- In the primary urban centre (Dublin City), and the local authority most affected by population growth (Kildare), the increase in current expenditure on Public Sewerage Schemes (3.2) was significantly higher than those experienced in the predominantly rural areas of Donegal and Kilkenny. This reflects the greater population and industrial concentrations in largely urban areas and associated increased infrastructural operational costs.
- The predominantly urban area (Dublin City), and the local authority most affected by population growth (Kildare), both witnessed a reduction in the proportion of current expenditure allocated to Public Water Schemes (3.1).

Both of these local authorities also experienced an increase in the proportion of total current expenditure allocated to Public Sewerage Schemes (3.2). This trend was not witnessed so conclusively in the rural dominated areas of Galway, Donegal and Kilkenny and highlight greater non-domestic usage in the primarily urban areas.

Current Receipts

The primary trends in relation to current receipts on a sub group level are as follows:

- Overall, current receipts increased for each of the local authorities considered. However, this growth was not as linear as that experienced by current expenditures.
- Primarily urban areas, or areas directly affected by surrounding areas of high population and industrial growth (Dublin City, Kildare, Galway) experienced significantly higher levels of receipt growth for Public Sewerage Schemes (3.2) than predominantly rural areas (Donegal, Kilkenny). This is primarily due to the low levels of non-domestic use in rural areas and subsequent lack of cost recovery mechanisms.
- Current receipts classified as Administration and Miscellaneous (3.8) increased dramatically across all Local Authorities that were consulted. However, these increases were based on relatively low starting bases.
- Dublin City and Kildare both witnessed a substantial decrease in the proportion of their current receipts classified as Public Water Schemes (3.1), and a significant increase in the proportion classified as Public Sewerage Schemes (3.2). This indicates a higher level of cost recovery from non-domestic sewerage scheme users. These trends were not witnessed so conclusively in Galway, Donegal and Kilkenny due to the relative dearth of large scale, non-domestic users.

Current Budget Shortfall and Indigenous Issues

For all of the Local Authorities considered, Programme Group 3 current receipts and expenditures increased substantially during the period under consideration. In real monetary terms, the Programme Group 3 current budget shortfall increased significantly across all of the Local Authorities considered. **Table A.6-1** outlines this information.

Table A.6-1: Trends in Programme Group 3 Current Budget Shortfalls 1999-2003 (€)

Local Authority	1999 Shortfall	2003 Shortfall	Income as % of Expenditure 1999	Income as % of Expenditure 2003
Kilkenny Co. Co.	1,209,392	2,616,200	62%	55%
Galway Co. Co.	4,723,827	6,843,624	32%	30%
Kildare Co. Co.	5,352,346	10,054,298	42%	39%
Donegal Co. Co.	5,940,091	8,847,012	36%	33%
Dublin City Council	17,055,617	21,896,667	62%	70%

Source: Local Authority Budgets 1999 - 2003

The data above illustrates that for four out of the five Local Authorities, in the period under consideration, current income declined as a proportion of current expenditure. The only exception to this was Dublin City Council. Dublin City's large non domestic water user base and relatively well developed non domestic cost recovery mechanisms resulted in current income increasing to 70% of current expenditure in 2003, up from 62% in 1999.

County Kildare experienced a real increase in its current account shortfall of 88% over the period 1999 to 2003. Current income as a proportion of current expenditure for Kildare declined from 42% to 39% over the same period. Due to its position adjacent to Dublin, Kildare continues to experience high levels of population and industrial growth. It is now home to many of Ireland's flagship companies such as Intel. Such growth requires that additional water and sewerage infrastructure be constructed, in addition to upgrading existing infrastructure. The provision of water and sewerage services in County Kildare is further complicated by the lack of an indigenous water supply and the need to source water from other Local Authorities.

The two predominantly rural Local Authorities of Galway and Donegal witnessed an increase in their real Programme Group 3 current budget shortfall of 50% and 49%, respectively. Both of these Local Authorities saw their current income decline slightly as a proportion of current expenditure over the same period. Galway and Donegal both contain areas of rapid population growth, namely Galway City and Letterkenny, respectively. In Donegal, the primary issue concerning water services is the increased operational costs of upgraded group water schemes. This is vital in Donegal given its predominantly rural nature. In Galway, similar issues exist in tandem with limited problems ensuring that water quality standards are met by all rural water schemes.

Kilkenny County Council posted a 116% increase in its real current budget shortfall over the period 1999 to 2003. Over the same period, current income as a proportion of current expenditure declined from 62% to 55%. The importance of group water schemes to the county is evidenced in the relatively high proportion of income and expenditure classified as sub group 3.3 (Private Installations). The real decline experienced in current receipts for sub group 3.2 (Public Sewerage Schemes) identifies the lack of sewerage treatment capacity as the salient issue in water and sewerage services provision in Kilkenny.

Capital Account

Analysis of the capital account side for the local authorities considered is hampered by the lack of information available. However, the following general trends are evident based on the information available:

- No pattern to Water Services Investment Programme Allocations to each of the local authorities in the period under consideration was detected.
- The importance of the Rural Water Scheme to the local authorities with significant rural areas is highlighted by the increased level of funding provided in the period 2000 to 2003.
- Dublin City, as a wholly urban area, receives no allocation under the Rural Water Programme.

Appendix B

National and River Basin District

Economic Profiles

Appendix B-1

National Profile

I. Estimated Water Use Benefits

A. Estimated Economic Impacts (Reference Year)	Establishment Count ¹	Gross Output Value (€) ²	Gross Value Added (€) ³	Gross Value Added as % GDP ⁴	Employment ⁵	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
1. All Sectors - National (2000)	GDP =	102,845,000,000 ⁶	91,153,000,000 ⁹	100%	1,670,700⁷	100%	41,752,000,000 ⁸	100%
National (2001)	GDP =	114,743,000,000 ⁶	103,245,000,000 ⁹	100%	1,716,500⁷	100%	47,090,000,000 ⁸	100%
National (2002)	GDP =	129,344,000,000 ⁶	116,668,000,000 ⁹	100%	1,749,900⁷	100%	50,327,000,000 ⁸	100%
National (2003)	GDP =	135,200,000,000 ¹⁰	121,950,098,961 [*]	100%	1,778,000¹¹	100%	51,135,154,009 [*]	100%
a. Agricultural Sector	136,500¹²	5,745,600,000¹³	2,631,200,000¹³	2.26%	108,200¹⁴	6.18%	298,000,000¹⁵	0.71%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	2,889,600,000	1,323,293,567	1.13%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	2,580,900,000 ¹⁶	1,181,924,269	1.01%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	212,200,000 ¹⁷	97,177,082	0.08%	-	-	-	-
Potatoes Subsector (2002)	-	96,500,000 ¹⁸	44,192,217	0.04%	-	-	-	-

* Derived from 2000 – 2002 trends

¹ Agriculture = farms or livestock holdings, Industry = local units

² Agriculture = output value at basic prices, Industry = gross output value

³ GVA at basic prices

⁴ GDP at market prices

⁵ Agriculture = annual work units unless otherwise indicated, industry = persons engaged

⁶ Government of Ireland, Economic Review and Outlook, 2003, p. 28, GDP at current market prices

⁷ CSO, Statistical Yearbook of Ireland, 2003, p. 31

⁸ Department of Finance, Budgetary, and Economic Statistics, March 2004, Table 20

⁹ Department of Finance, Budgetary, and Economic Statistics, March 2004, Table 17

¹⁰ Department of Finance, Budgetary and Economic Statistics, March 2004, Table 12

¹¹ Department of Finance, Budgetary and Economic Statistics, March 2004, Table 52

¹² <http://www.eirstat.cso.ie> and CSO, Statistical Yearbook of Ireland, 2003, p. 207, listed as holdings

¹³ CSO, Statistical Yearbook of Ireland, 2003, p. 215

¹⁴ http://www.agriculture.gov.ie/publicat/2004comp_update/individuals_list/f1.xls, Numbers are on International Labour Organisation basis. Total labour input in annual work units in 2002 was 158,100 (http://www.agriculture.gov.ie/publicat/2004comp_update/individuals_list/F3.xls)

¹⁵ Teagasc, Management Data for Farm Planning, 2003, p. 245 (actually 'compensation' of employees)

¹⁶ Teagasc Management Data for Farm Planning, 2003, p. 245

¹⁷ Teagasc, Management Data for Farm Planning, 2003, p. 245 and <http://www.eirstat.cso.ie/diska/ASBA034.html> (wool component is from 1998)

¹⁸ <http://www.eirstat.cso.ie>

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
b. Industrial Sector	5,327 ¹⁹	98,702,000,000 ¹⁹	35,786,000,000 ²⁰	34.7%	268,433 ¹⁹	15.6%	7,504,000,000 ¹⁹	15.9%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	3,507	90,515,000,000	31,971,000,000	31.0%	210,453	12.3%	5,959,570,000	12.6%
Mining and Quarrying Subsector (2001)	174 ¹⁹	1,088,000,000 ¹⁹	464,000,000 ²¹	0.45%	5,918 ¹⁹	0.34%	214,000,000 ¹⁹	0.45%
Food Products and Beverages Manufacturing Subsector (2001)	810 ¹⁹	16,773,000,000 ¹⁹	6,902,000,000 ²²	6.69%	50,079 ¹⁹	2.92%	1,338,000,000 ¹⁹	2.84%
Pulp, Paper, & Paper Products Manufacturing Subsector (2001)	640 ¹⁹	10,021,000,000 ¹⁹	3,241,000,000 ²³	3.14%	24,147 ¹⁹	1.41%	732,000,000 ¹⁹	1.55%
Chemical & Chemical Products Manufacturing Subsector (2001)	242 ¹⁹	25,543,000,000 ¹⁹	12,370,000,000 ²⁴	12.0%	24,589 ¹⁹	1.43%	852,000,000 ¹⁹	1.81%
Basic Metals Manufacturing Subsector (2001)	642 ¹⁹	1,906,000,000 ¹⁹	693,000,000 ²⁵	0.67%	15,355 ¹⁹	0.89%	375,000,000 ¹⁹	0.80%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	367 ¹⁹	1,739,000,000 ¹⁹	639,000,000 ²⁶	0.62%	14,074 ¹⁹	0.82%	350,000,000 ⁹	0.74%
Electrical and Optical Equipment Manufacturing Subsector (2001)	470 ¹⁹	31,624,000,000 ¹⁹	7,270,000,000 ²⁷	7.04%	64,988 ¹⁹	3.79%	1,750,000,000 ¹⁸	3.72%
Transport Equipment Manufacturing Subsector (2001)	130 ¹⁹	1,083,000,000 ¹⁹	392,000,000 ²⁸	0.38%	9,988 ¹⁹	0.58%	273,000,000 ¹⁹	0.58%
Thermoelectric Power Generation Subsector (2003)	12 ²⁹	710,800,000 ³⁰	-	-	1,178 ³⁰	0.07%	67,700,000 ³⁰	0.13%
Hydroelectric Power Generation Subsector (2003)	6 ³¹	27,200,000 ³⁰	-	-	137 ³⁰	0.01%	7,870,000 ³⁰	0.02%
c. Selected Key Water-Using Miscellaneous Subsectors		557,062,000	-	-	9,134	0.52%	14,100,000	0.03%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	2,400 ³²	0.14%	14,100,000 ³³	0.03%

¹⁹ <http://www.eirestat.cso.ie/AIBAvartist.html>²⁰ <http://www.eirestat.cso.ie/diska/AICA201.html>²¹ <http://www.eirestat.cso.ie/diska/AICA210.html>²² <http://www.eirestat.cso.ie/diska/AICA212.html>²³ <http://www.eirestat.cso.ie/diska/AICA230.html>²⁴ <http://www.eirestat.cso.ie/diska/AICA236.html>²⁵ <http://www.eirestat.cso.ie/diska/AICA242.html>²⁶ <http://www.eirestat.cso.ie/diska/AICA248.html>²⁷ <http://www.eirestat.cso.ie/diska/AICA250.html>²⁸ <http://www.eirestat.cso.ie/diska/AICA260.html>²⁹ Information supplied by ESB, July 2004³⁰ Information supplied by ESB, August 2004³¹ Information on major facilities supplied by ESB. Additional minor facilities not accounted for here are detailed at the Irish Hydropower Association web site.³² http://www.agriculture.gov.ie/publicat/2004comp_update/individuals_list/F4.xls³³ CSO, Statistical Yearbook of Ireland, 2003, p. 227 (Coillte Teoranta-owned forest properties only)

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Seaweed Harvesting Category (2003)		12,000,000 ³⁴	-	-	700 ³⁴	0.04%	-	-
Inland Commercial Fishing Subsector (2002)		5,461,000 ³⁵	-	-	-	-	-	-
Aquaculture Subsector (2003)		106,301,000 ³⁵	-	-	-	-	-	-
Water-Based Leisure Category (2003)		433,300,000 ³⁶	-	-	6,034 ³⁶	0.34%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector		
i. Selected Key Water-Using Agricultural Subsectors	159,405	122,991,821
Cattle and Cattle Products Subsector	147,792	114,031,533
Sheep and Sheep Products Subsector	10,548	8,138,565
Potatoes Subsector	1,065	821,722
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	73,522	75,374,122
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	23,721	24,449,948
Pulp, Paper, and Paper Products Manufacturing Subsector	30,930	31,638,133
Chemical and Chemical Products Manufacturing Subsector	9,082	9,261,372
Basic Metals Manufacturing Subsector	3,520	3,619,026

³⁴ Steven Kraan, Irish Seaweed Centre, personal contact, May 20, 2004. To be published in Ohno and Critchley, eds., Seaweed Resources of the World, (forthcoming in 2004)

³⁵ BIM, Annual Review, 2003

³⁶ Williams, J. and B. Ryan, Participation in Water-Based Leisure Activities in Ireland, 2003, Economic and Social Research Institute, 2004 forthcoming

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
Machinery and Equipment n.e.c. Manufacturing Subsector	1,275	1,305,828
Electrical and Optical Equipment Manufacturing Subsector	3,833	3,899,618
Transport Equipment Manufacturing Subsector	1,160	1,200,197
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	196,819	201,565,415
2. Selected In-stream Uses		434,660,134
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		47,300,000 ³⁶
c. Recreational Boating Category (2003)		61,300,000 ³⁶
d. Beach Visitation Category (2003)		283,006,009 ³⁶
e. Other Water-Based Leisure Categories (2003)		41,700,000 ³⁶
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	345	357,808
3. Other Selected Values		-
a. Wetlands (2004)		155,914,919 - 15,375,779
b. Special Riparian Areas (2004)		126,869,507 - 39,888,551
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures - WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	141,571,209
Group 3.2 (Public/Sewerage Schemes)	37,031,274
Group 3.3 (Private Installation)	9,419,298
Group 3.8 (Administration and Miscellaneous)	12,205,868
Expenditures	€
Group 3.1 (Public Water Supply)	198,898,031
Group 3.2 (Public/Sewerage Schemes)	132,476,888
Group 3.3 (Private Installation)	9,851,649
Group 3.8 (Administration and Miscellaneous)	82,321,238
Cost Recovery	%
Group 3.1 (Public Water Supply)	71%
Group 3.2 (Public/Sewerage Schemes)	28%
Group 3.3 (Private Installation)	96%
Group 3.8 (Administration and Miscellaneous)	15%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	62,733,492
Water - Local Government Fund	9,874,682
Sewerage	10,851,865

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Expenditure Needs	3,164,631,821	1,205,740,558	4,370,372,379

III. Estimated Projections of Demand and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	8,922	8,922	8,922
Industrial Sector	48,123	54,161	59,820
Commercial Sector	74,547	80,255	84,972
Domestic Sector	147,028	156,064	164,935
Municipal Sector	9,578	10,378	11,262
Nondomestic Undefined	16,630	18,761	20,593
Dublin	185,347	200,262	216,378
Total	490,175	528,803	566,882
Exported	12,348	13,594	14,848
Unaccounted for Water (excluding in Dublin)	157,239	121,087	91,445
Grand Total	659,762	663,484	673,175

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	125,683,128	190,177,457	254,671,786
Sewerage	353,006,167	452,397,347	551,788,528
Rural Water Programme			
Water	76,574,317	115,684,646	154,794,975
Water - Local Government Fund	13,117,908	19,729,780	26,341,652
Sewerage	12,274,670	19,008,077	25,741,484

Appendix B-2

Eastern River Basin District Profile

I. Estimated Water Use Benefits

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	6,561	276,184,313	126,478,725	0.11%	5,201	0.30%	14,324,514	0.03%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	212,291,079	97,218,791	0.08%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	153,444,893	70,270,155	0.06%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	19,272,510	8,825,854	0.01%	-	-	-	-
Potatoes Subsector (2002)	-	39,573,676	18,122,782	0.02%	-	-	-	-
b. Industrial Sector	1,874	34,725,670,503	12,590,351,205	12.2%	94,441	5.50%	2,640,082,587	5.61%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	1,265	34,508,234,922	11,926,434,130	11.6%	76,015	4.40%	2,177,149,097	4.62%
Mining and Quarrying Subsector (2001)	40	251,260,033	107,155,014	0.10%	1,367	0.08%	49,420,631	0.10%
Food Products and Beverages Manufacturing Subsector (2001)	186	3,860,363,890	1,588,519,142	1.54%	11,526	0.67%	307,945,322	0.65%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	385	6,027,208,755	1,949,324,776	1.89%	14,523	0.85%	440,267,120	0.93%
Chemical and Chemical Products Manufacturing Subsector (2001)	95	10,001,222,482	4,843,406,103	4.69%	9,628	0.56%	333,595,958	0.71%
Basic Metals Manufacturing Subsector (2001)	208	617,502,689	224,516,980	0.22%	4,975	0.29%	121,491,872	0.26%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	117	553,658,207	203,443,125	0.20%	4,481	0.26%	111,432,072	0.24%
Electrical and Optical Equipment Manufacturing Subsector (2001)	187	12,553,093,331	2,885,814,208	2.80%	25,797	1.50%	694,659,541	1.48%
Transport Equipment Manufacturing Subsector (2001)	41	343,285,535	124,254,783	0.12%	3,166	0.18%	86,534,581	0.18%
Thermoelectric Power Generation Subsector (2003)	4	284,320,000	-	-	471	-	27,080,000	0.05%
Hydroelectric Power Generation Subsector (2003)	2	16,320,000	-	-	82	-	4,722,000	0.01%
c. Selected Key Water-Using Miscellaneous Subsectors		168,827,907	-	-	2,537	0.14%	1,093,516	0.002%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	186	0.01%	1,093,516	0.002%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Seaweed Harvesting Category (2003)		0	-	-	0	0.00%	-	-
Inland Commercial Fishing Subsector (2002)		40,684	-	-	-	-	-	-
Aquaculture Subsector (2003)		0	-	-	-	-	-	-
Water-Based Leisure Category (2003)		168,787,223	-	-	2,350	0.13%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	9,920	7,653,765
Cattle and Cattle Products Subsector	8,602	6,637,177
Sheep and Sheep Products Subsector	881	679,609
Potatoes Subsector	437	336,980
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	31,081	31,671,956
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	5,459	5,563,098
Pulp, Paper, and Paper Products Manufacturing Subsector	18,603	18,956,785
Chemical and Chemical Products Manufacturing Subsector	3,556	3,623,761
Basic Metals Manufacturing Subsector	1,140	1,162,035
Machinery and Equipment n.e.c. Manufacturing Subsector	406	413,752
Electrical and Optical Equipment Manufacturing Subsector	1,522	1,550,497
Transport Equipment Manufacturing Subsector	368	374,781
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	76,868	78,328,229
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		18,425,192

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
c. Recreational Boating Category (2003)		23,878,737
d. Beach Visitation Category (2003)		110,241,861
e. Other Water-Based Leisure Categories (2003)		16,243,774
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	27	27,248
3. Other Selected Values		-
a. Wetlands (2004)		5,129,216 - 505,825
b. Special Riparian Areas (2004)		14,407,489 - 4,529,803
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures - Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	54,118,648
Group 3.2 (Public/Sewerage Schemes)	25,967,406
Group 3.3 (Private Installation)	744,441
Group 3.8 (Administration and Miscellaneous)	5,704,731
Expenditures	€
Group 3.1 (Public Water Supply)	76,468,572
Group 3.2 (Public/Sewerage Schemes)	68,793,118
Group 3.3 (Private Installation)	490,595
Group 3.8 (Administration and Miscellaneous)	24,786,189
Cost Recovery	%

II. Estimated Water Use Costs and Costs Recovery (Cont.)

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Cost Recovery	%
Group 3.1 (Public Water Supply)	71%
Group 3.2 (Public/Sewerage Schemes)	38%
Group 3.3 (Private Installation)	152%
Group 3.8 (Administration and Miscellaneous)	23%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	4,813,678
Water - Local Government Fund	720,923
Sewerage	1,780,170

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Expenditure Needs	1,054,845,636	478,617,928	1,533,463,564

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector* (excluding Dublin)	336	336	336
Industrial Sector (excluding Dublin)	2,590	2,912	3,250
Commercial Sector (excluding Dublin)	6,606	7,098	7,513
Domestic Sector (excluding Dublin)	14,596	15,878	17,125
Municipal Sector (excluding Dublin)	289	319	347
Nondomestic Undefined	0	0	0
Dublin	185,347	200,262	216,378

A. Estimated Projections of the Demand for Potable Water (cont'd) (annual megalitres)	2005	2010	2015
Total	209,764	226,805	244,949
Exported	4,416	4,934	5,451
Unaccounted for Water (excluding Dublin)	11,327	9,898	8,513
Grand Total	255,507	241,637	258,913

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	54,944,378	97,164,250	139,384,122
Sewerage	86,875,112	111,335,364	135,795,617
Rural Water Programme			
Water	5,355,454	7,021,117	8,686,780
Water - Local Government Fund	1,176,444	2,315,245	3,454,046
Sewerage	1,955,030	3,176,104	4,397,178

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Louth	Rosehall & Staleen	An increase in demand would require increasing the capacity of the Boyne source works & and WTW
Meath	East Meath Regional	Construction of additional storage, intakes etc, demand will be met
Meath	Kells-Oldcastle	To meet future demand, an additional water source will be needed
Meath	Navan-MidMeath Regional	The abstraction rate can more than double to meet future demand
Meath	Trim	There is capacity for increasing treatment plant throughput
Wicklow	Goldmine River	To meet future demand, an additional water source & WTW will be needed
Wicklow	Ballyduff Catchment	Will be decommissioned

Appendix B-3

Neagh Bann International River Basin District Profile (ROI)

I. Estimated Water Use Benefits

	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
A. Estimated Economic Impacts (Reference Year)								
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	4,283	180,263,264	82,551,640	0.07%	3,395	0.19%	9,349,494	0.02%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	113,276,396	51,874,975	0.04%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	83,159,719	38,083,029	0.03%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	5,437,357	2,490,040	0.002%	-	-	-	-
Potatoes Subsector (2002)	-	24,679,321	11,301,906	0.01%	-	-	-	-
b. Industrial Sector	239	4,428,276,524	1,605,542,985	1.56%	12,043	0.70%	336,667,819	0.71%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	137	2,991,544,743	1,073,739,440	1.04%	7,782	0.45%	215,642,963	0.46%
Mining and Quarrying Subsector (2001)	8	52,871,501	22,548,140	0.02%	288	0.02%	10,399,358	0.02%
Food Products and Beverages Manufacturing Subsector (2001)	35	728,072,100	299,597,784	0.29%	2,174	0.13%	58,079,084	0.12%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	14	217,574,821	70,368,226	0.07%	524	0.03%	15,893,101	0.03%
Chemical and Chemical Products Manufacturing Subsector (2001)	7	747,275,958	361,891,853	0.35%	719	0.04%	24,925,777	0.05%
Basic Metals Manufacturing Subsector (2001)	26	77,805,129	28,289,063	0.03%	627	0.04%	15,307,935	0.03%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	26	121,722,340	44,727,185	0.04%	985	0.06%	24,498,458	0.05%
Electrical and Optical Equipment Manufacturing Subsector (2001)	15	1,002,288,416	230,414,773	0.22%	2,060	0.12%	55,464,354	0.12%
Transport Equipment Manufacturing Subsector (2001)	5	43,934,478	15,902,415	0.02%	405	0.02%	11,074,896	0.02%
Thermoelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
Hydroelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
c. Selected Key Water-Using Miscellaneous Subsectors		15,778,062	-	-	196	0.01%	181,487	0.0004%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	31	0.002%	181,487	0.0004%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Seaweed Harvesting Category (2003)		0	-	-	0	0.00%	-	-
Inland Commercial Fishing Subsector (2002)		19,986	-	-	-	-	-	-
Aquaculture Subsector (2003)		3,937,074	-	-	-	-	-	-
Water-Based Leisure Category (2003)		11,821,002	-	-	165	0.01%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	5,304	4,092,667
Cattle and Cattle Products Subsector	4,749	3,663,848
Sheep and Sheep Products Subsector	283	218,668
Potatoes Subsector	272	210,151
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	2,373	2,196,894
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	1,030	953,288
Pulp, Paper, and Paper Products Manufacturing Subsector	672	621,753
Chemical and Chemical Products Manufacturing Subsector	266	246,008
Basic Metals Manufacturing Subsector	144	133,030
Machinery and Equipment n.e.c. Manufacturing Subsector	89	82,647
Electrical and Optical Equipment Manufacturing Subsector	121	112,480
Transport Equipment Manufacturing Subsector	47	43,580

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
b. Industrial Sector (2001)		
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	5,332	4,936,528
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		1,290,407
c. Recreational Boating Category (2003)		1,672,346
d. Beach Visitation Category (2003)		7,720,781
e. Other Water-Based Leisure Categories (2003)		1,137,632
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	4	4,109
3. Other Selected Values		-
a. Wetlands (2004)		1,309,539 - 129,142
b. Special Riparian Areas (2004)		257,069 - 80,824
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	2,821,462
Group 3.2 (Public/Sewerage Schemes)	1,980,691
Group 3.3 (Private Installation)	497,465
Group 3.8 (Administration and Miscellaneous)	204,812
Expenditures	€
Group 3.1 (Public Water Supply)	4,955,942
Group 3.2 (Public/Sewerage Schemes)	5,228,780
Group 3.3 (Private Installation)	521,384
Group 3.8 (Administration and Miscellaneous)	3,303,031
Cost Recovery	%
Group 3.1 (Public Water Supply)	57%
Group 3.2 (Public/Sewerage Schemes)	38%
Group 3.3 (Private Installation)	95%
Group 3.8 (Administration and Miscellaneous)	6%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	6,894,428
Water - Local Government Fund	713,626
Sewerage	666,973

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Expenditure Needs	57,169,625	99,761,846	156,931,471

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	148	148	148
Industrial Sector	2,525	2,870	3,250
Commercial Sector	2,409	2,603	2,811
Domestic Sector	5,730	6,171	6,686
Municipal Sector	687	726	768
Nondomestic Undefined	0	0	0
Total	11,499	12,518	13,663
Exported	3,376	3,777	4,198
Unaccounted for Water	5,777	5,092	4,467
Grand Total	20,653	21,387	22,328

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	1,759,889	2,662,976	3,566,063
Sewerage	8,572,746	10,986,458	13,400,170
Rural Water Programme			
Water	9,073,508	16,706,583	24,339,657
Water - Local Government Fund	707,903	693,594	679,285
Sewerage	859,553	1,457,666	2,055,779

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Louth	Ardee	Appears that an increase in demand could be accommodated by increasing the capacity of the sourceworks & plant
Louth	Greenmount	
Louth	Cavan Hill	Cannot accommodate an increase in demand
Monaghan	Monaghan Town	Treatment plant at maximum capacity under normal conditions. No scope for additional treatment without extending treatment works.

Appendix B-4

North Western International River Basin District Profile (ROI)

I. Estimated Water Use Benefits

	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
A. Estimated Economic Impacts (Reference Year)								
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,000	100%
a. Agricultural Sector	15,301	644,041,326	294,939,003	0.25%	12,128	0.69%	33,403,703	0.07%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	221,185,736	101,292,103	0.09%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	186,721,854	85,509,354	0.07%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	24,309,370	11,132,487	0.01%	-	-	-	-
Potatoes Subsector (2002)	-	10,154,512	4,650,263	0.004%	-	-	-	-
b. Industrial Sector	323	5,989,499,117	2,171,589,384	2.10%	16,289	0.95%	455,362,621	0.97%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	232	4,932,392,225	1,891,611,112	1.83%	13,220	0.77%	369,226,749	0.78%
Mining and Quarrying Subsector (2001)	19	116,017,636	49,478,109	0.05%	631	0.04%	22,819,645	0.05%
Food Products and Beverages Manufacturing Subsector (2001)	94	1,940,470,920	798,493,429	0.77%	5,794	0.34%	154,793,423	0.33%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	22	338,734,723	109,553,861	0.11%	816	0.05%	24,743,421	0.05%
Chemical and Chemical Products Manufacturing Subsector (2001)	11	1,209,630,758	585,801,686	0.57%	1,164	0.07%	40,347,861	0.09%
Basic Metals Manufacturing Subsector (2001)	41	122,113,772	44,399,183	0.04%	984	0.06%	24,025,532	0.05%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	15	69,312,129	25,468,919	0.02%	561	0.03%	13,950,112	0.03%
Electrical and Optical Equipment Manufacturing Subsector (2001)	15	1,005,600,378	231,176,156	0.22%	2,067	0.12%	55,647,630	0.12%
Transport Equipment Manufacturing Subsector (2001)	16	130,511,910	47,239,768	0.05%	1,204	0.07%	32,899,124 ¹⁸	0.07%
Thermoelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
Hydroelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
c. Selected Key Water-Using Miscellaneous Subsectors		48,740,434	-	-	628	0.04%	1,611,111	0.003%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	274	0.02%	1,611,111	0.003%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Seaweed Harvesting Category (2003)		666,667	-	-	39	0.00%	-	-
Inland Commercial Fishing Subsector (2002)		916,342	-	-	-	-	-	-
Aquaculture Subsector (2003)		24,517,234	-	-	-	-	-	-
Water-Based Leisure Category (2003)		22,640,192	-	-	315	0.02%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	11,672	9,005,557
Cattle and Cattle Products Subsector	10,376	8,005,566
Sheep and Sheep Products Subsector	1,184	913,523
Potatoes Subsector	112	86,468
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	4,797	5,488,756
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	2,744	3,139,751
Pulp, Paper, and Paper Products Manufacturing Subsector	1,046	1,196,211
Chemical and Chemical Products Manufacturing Subsector	430	492,106
Basic Metals Manufacturing Subsector	226	258,015
Machinery and Equipment n.e.c. Manufacturing Subsector	51	58,158
Electrical and Optical Equipment Manufacturing Subsector	122	139,459
Transport Equipment Manufacturing Subsector	140	159,982
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	10,205	11,676,219
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-

I. Estimated Water Use Benefits (*Cont.*)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
2. Selected In-stream Uses		
b. Recreational Fishing Category (2003)		2,471,454
c. Recreational Boating Category (2003)		3,202,963
d. Beach Visitation Category (2003)		14,787,238
e. Other Water-Based Leisure Categories (2003)		2,178,851
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	39	45,074
3. Other Selected Values		-
a. Wetlands (2004)		25,083,894 - 2,473,685
b. Special Riparian Areas (2004)		8,277,165 - 2,602,392
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures - WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	5,982,897
Group 3.2 (Public/Sewerage Schemes)	367,207
Group 3.3 (Private Installation)	753,680
Group 3.8 (Administration and Miscellaneous)	657,660
Expenditures	€
Group 3.1 (Public Water Supply)	11,364,028
Group 3.2 (Public/Sewerage Schemes)	4,709,956
Group 3.3 (Private Installation)	1,434,497
Group 3.8 (Administration and Miscellaneous)	5,243,444
Cost Recovery	%
Group 3.1 (Public Water Supply)	53%
Group 3.2 (Public/Sewerage Schemes)	8%
Group 3.3 (Private Installation)	53%
Group 3.8 (Administration and Miscellaneous)	13%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	10,173,652
Water - Local Government Fund	1,400,345
Sewerage	1,526,335

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Upgrade Needs	239,153,579	26,701,187	265,854,766

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	469	469	469
Industrial Sector	1,295	1,418	1,552
Commercial Sector	4,578	4,755	4,891
Domestic Sector	10,206	10,726	11,228
Municipal Sector	311	336	364
Nondomestic Undefined	108	123	138
Total	16,966	17,829	18,642
Exported	118	117	116
Unaccounted for Water	8,297	6,377	4,694
Grand Total	25,381	24,322	23,451

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	8,629,369	12,476,283	16,323,197
Sewerage	9,588,431	13,125,920	16,663,410
Rural Water Programme			
Water	13,534,768	21,527,141	29,519,513
Water - Local Government Fund	2,390,225	4,864,926	7,339,626
Sewerage	1,777,848	3,094,847	4,411,846

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Donegal	Lough Mourne	Running below capacity
Donegal	Rosses Regional	Source fully developed, future demand needs new source & construction of new plant
Longford	Lough Gowna Regional	Treatment plant must be upgraded to leave scope for increasing the output of the scheme
Cavan	Cavan Regional	Projected demand could be met by increasing the capacity of the treatment plant
Donegal	Letterkenny	Would need new sources and plant

Appendix B-5

Shannon International River Basin District Profile (ROI)

I. Estimated Water Use Benefits

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	37,574 ¹²	1,581,593,563	724,291,455	0.62%	29,784	1.70%	82,030,577	0.16%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	768,925,187	352,129,621	0.30%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	729,840,196	334,230,633	0.29%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	37,156,919	17,016,027	0.01%	-	-	-	-
Potatoes Subsector (2002)	-	1,928,072	882,961	0.001%	-	-	-	-
b. Industrial Sector	866	16,043,644,177	5,816,881,629	5.63%	43,633	2.54%	1,219,747,380	2.59%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	573	15,622,816,254	5,320,013,989	5.15%	36,504	2.10%	1,034,462,500	2.19%
Mining and Quarrying Subsector (2001)	27	170,078,995	72,533,689	0.07%	925	0.05%	33,453,038	0.07%
Food Products and Beverages Manufacturing Subsector (2001)	138	2,849,108,775	1,172,393,058	1.14%	8,507	0.50%	227,276,429	0.48%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	70	1,099,497,017	355,600,223	0.34%	2,649	0.15%	80,314,521	0.17%
Chemical and Chemical Products Manufacturing Subsector (2001)	38	4,050,454,008	1,961,559,570	1.90%	3,899	0.23%	135,104,992	0.29%
Basic Metals Manufacturing Subsector (2001)	113	334,473,649	121,610,828	0.12%	2,695	0.16%	65,806,725	0.14%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	57	270,881,864	99,536,234	0.10%	2,192	0.13%	54,519,064	0.12%
Electrical and Optical Equipment Manufacturing Subsector (2001)	94	6,323,758,565	1,453,760,586	1.41%	12,995	0.76%	349,942,369	0.74%
Transport Equipment Manufacturing Subsector (2001)	28	229,363,379	83,019,801	0.08%	2,115	0.12%	57,817,361	0.12%
Thermoelectric Power Generation Subsector (2003)	4	284,320,000	-	-	471	-	27,080,000	0.05%
Hydroelectric Power Generation Subsector (2003)	4	10,880,000	-	-	55	-	3,148,000	0.01%
c. Selected Key Water-Using Miscellaneous Subsectors		74,058,584	-	-	1,469	0.08%	2,476,435	0.005%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Forestry, Logging and Related Services Subsector (2002)		-	-	-	422	0.02%	2,476,435	0.005%
Seaweed Harvesting Category (2003)		1,333,333	-	-	78	<0.01%	-	-
Inland Commercial Fishing Subsector (2002)		616,750	-	-	-	-	-	-
Aquaculture Subsector (2003)		2,505,411	-	-	-	-	-	-
Water-Based Leisure Category (2003)		69,603,089	-	-	969	0.05%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	43,211	33,339,920
Cattle and Cattle Products Subsector	41,148	31,748,189
Sheep and Sheep Products Subsector	2,042	1,575,313
Potatoes Subsector	21	16,418
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	10,752	11,150,863
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	4,029	4,178,597
Pulp, Paper, and Paper Products Manufacturing Subsector	3,394	3,519,456
Chemical and Chemical Products Manufacturing Subsector	1,440	1,493,630
Basic Metals Manufacturing Subsector	618	640,583
Machinery and Equipment n.e.c. Manufacturing Subsector	199	206,021
Electrical and Optical Equipment Manufacturing Subsector	767	794,929
Transport Equipment Manufacturing Subsector	246	254,847
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	32,017	33,203,927

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		7,598,029
c. Recreational Boating Category (2003)		9,846,918
d. Beach Visitation Category (2003)		45,460,634
e. Other Water-Based Leisure Categories (2003)		6,698,474
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	61	62,800
3. Other Selected Values		-
a. Wetlands (2004)		36,489,926 - 3,598,508
b. Special Riparian Areas (2004)		38,346,096 - 12,056,248
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	26,770,990
Group 3.2 (Public/Sewerage Schemes)	2,254,404
Group 3.3 (Private Installation)	2,401,260
Group 3.8 (Administration and Miscellaneous)	1,857,422
Expenditures	€
Group 3.1 (Public Water Supply)	34,276,793
Group 3.2 (Public/Sewerage Schemes)	17,842,215
Group 3.3 (Private Installation)	2,422,744
Group 3.8 (Administration and Miscellaneous)	16,571,787
Cost Recovery	%
Group 3.1 (Public Water Supply)	78%
Group 3.2 (Public/Sewerage Schemes)	13%
Group 3.3 (Private Installation)	99%
Group 3.8 (Administration and Miscellaneous)	11%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	16,221,420
Water - Local Government Fund	2,813,002
Sewerage	2,508,167

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Upgrade Needs	483,092,478	155,906,641	638,999,119

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	2,549	2,549	2,549
Industrial Sector	5,995	6,341	6,703
Commercial Sector	10,427	10,988	11,444
Domestic Sector	31,353	33,009	34,620
Municipal Sector	1,661	1,810	1,963
Nondomestic Undefined	11,981	13,350	14,660
Total	63,966	68,048	71,940
Exported	2,504	2,671	2,819
Unaccounted for Water	35,324	25,939	18,713
Grand Total	101,794	96,658	93,471

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	21,286,900	23,830,354	26,373,807
Sewerage	69,328,065	71,773,558	74,219,051
Rural Water Programme			
Water	19,876,797	29,657,118	39,437,438
Water - Local Government Fund	3,338,369	4,651,785	5,965,202
Sewerage	2,734,996	3,848,330	4,961,663

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Clare	Ennis	Capacity not examined
Clare	West Clare	Capacity should be sufficient over planning horizon
Cork (North)	Allow Regional	Little scope for increased abstraction from g/w & unsure of potential further abstraction from river
Cork (North)	Charleville	Treatment capacity not examined
Galway	Ballinasloe Regional	Construction of additional storage, intakes etc, demand will be met

III. Estimated Projections of Demand, Supply, and Costs of Water Services (Cont.)

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Kerry	North East Kerry Regional	Source fully utilised, no scope for increased abstraction
Leitrim	South Leitrim Regional	Construction of additional storage, intakes etc, demand will be met
Limerick	Limerick City	Construction of additional storage, intakes etc, demand will be met. At present the plant is under pressure.
Limerick	Newcastle West	Construction of additional storage, intakes etc, demand will be met
Limerick	Limerick City Environs	Treatment plant will need to be expanded to meet demand.
Longford	Longford Central Regional	Construction of additional storage, intakes etc, demand will be met
Longford	Ballymahon Regional	Scope for increasing output of well
Offaly	Tullamore	Consideration should be given to finding a new water source and extending treatment plant
Roscommon	Ballinlough-Loughglynn Regional	Treatment capacity not examined
Roscommon	North-East Roscommon Regional	Additional water source needed to meet future demands
Roscommon	North Roscommon Regional	Limited capacity for increasing treatment plant throughput in line with demand
Roscommon	Roscommon Central Regional	Unknown
Roscommon	South Roscommon Regional	Treatment capacity not examined
Tipperary N.R	Nenagh Urban District	There is a huge amount of room for an increase in demand
Tipperary N.R	Newport Regional	No hydrological yield calculations carried out, therefore no indication as to whether greater abstractions from this source is feasible
Tipperary N.R	Roscrea Regional	No hydrological yield calculations carried out, therefore no indication as to whether greater abstractions from this source is feasible, WTW operating at peak capacity
Westmeath	Athlone Urban	Close to maximum capacity
Westmeath	Mullingar Town	Not at maximum capacity

Appendix B-6

South Eastern River Basin District Profile

I. Estimated Water Use Benefits

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	21,729	914,644,475	418,861,832	0.36%	17,224	0.98%	47,438,745	0.09%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	646,570,429	296,097,207	0.25%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	587,003,373	268,818,448	0.23%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	50,312,311	23,040,545	0.02%	-	-	-	-
Potatoes Subsector (2002)	-	9,254,745	4,238,215	0.004%	-	-	-	-
b. Industrial Sector	827	15,331,239,205	5,558,587,731	5.38%	41,695	2.43%	1,165,585,490	2.48%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	518	11,478,491,073	4,321,121,052	4.19%	28,655	1.67%	801,748,146	1.70%
Mining and Quarrying Subsector (2001)	27	165,800,296	70,708,950	0.07%	902	0.05%	32,611,455	0.07%
Food Products and Beverages Manufacturing Subsector (2001)	149	3,081,231,352	1,267,910,260	1.23%	9,200	0.54%	245,793,093	0.52%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	60	938,539,033	303,543,060	0.29%	2,262	0.13%	68,557,087	0.15%
Chemical and Chemical Products Manufacturing Subsector (2001)	33	3,531,688,363	1,710,331,013	1.66%	3,400	0.20%	117,801,295	0.25%
Basic Metals Manufacturing Subsector (2001)	118	350,937,154	127,596,772	0.12%	2,827	0.16%	69,045,872	0.15%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	69	327,860,133	120,473,045	0.12%	2,653	0.15%	65,986,801	0.14%
Electrical and Optical Equipment Manufacturing Subsector (2001)	43	2,894,615,779	665,439,436	0.64%	5,948	0.35%	160,181,432	0.34%
Transport Equipment Manufacturing Subsector (2001)	18	152,278,963	55,118,516	0.05%	1,404	0.08%	38,386,110	0.08%
Thermoelectric Power Generation Subsector (2003)	1	35,540,000	-	-	59	-	3,385,000	0.01%
Hydroelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
c. Selected Key Water-Using Miscellaneous Subsectors		73,747,087	-	-	1,547	0.09%	3,643,775	0.01%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
Forestry, Logging and Related Services Subsector (2002)		-	-	-	620	0.04%	3,643,775	0.01%
Seaweed Harvesting Category (2003)		1,000,000	-	-	58	<0.01%	-	-
Inland Commercial Fishing Subsector (2002)		448,739	-	-	-	-	-	-
Aquaculture Subsector (2003)		9,932,164	-	-	-	-	-	-
Water-Based Leisure Category (2003)		62,366,184	-	-	868	0.05%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	36,354	28,049,653
Cattle and Cattle Products Subsector	33,793	26,073,830
Sheep and Sheep Products Subsector	2,459	1,897,017
Potatoes Subsector	102	78,807
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	10,002	10,972,574
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	4,358	4,780,454
Pulp, Paper, and Paper Products Manufacturing Subsector	2,897	3,178,024
Chemical and Chemical Products Manufacturing Subsector	1,256	1,377,670
Basic Metals Manufacturing Subsector	648	710,994
Machinery and Equipment n.e.c. Manufacturing Subsector	240	263,781
Electrical and Optical Equipment Manufacturing Subsector	351	384,917
Transport Equipment Manufacturing Subsector	163	178,986
Thermoelectric Power Generation Subsector	-	-

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
c. Domestic Sector (2003)	27,655	30,339,197
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		6,808,032
c. Recreational Boating Category (2003)		8,823,095
d. Beach Visitation Category (2003)		40,733,913
e. Other Water-Based Leisure Categories (2003)		6,002,008
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	89	97,748
3. Other Selected Values		-
a. Wetlands (2004)		4,726,004 - 1,842,959
b. Special Riparian Areas (2004)		16,550,544 - 5,203,593
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	19,956,061
Group 3.2 (Public/Sewerage Schemes)	2,925,843
Group 3.3 (Private Installation)	2,315,425
Group 3.8 (Administration and Miscellaneous)	1,062,795
Expenditures	€
Group 3.1 (Public Water Supply)	26,728,954
Group 3.2 (Public/Sewerage Schemes)	15,672,617
Group 3.3 (Private Installation)	2,271,269
Group 3.8 (Administration and Miscellaneous)	12,494,936
Cost Recovery	%
Group 3.1 (Public Water Supply)	75%
Group 3.2 (Public/Sewerage Schemes)	19%
Group 3.3 (Private Installation)	102%
Group 3.8 (Administration and Miscellaneous)	9%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	7,952,833
Water - Local Government Fund	1,373,523
Sewerage	2,344,228

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Upgrade Needs	487,957,263	350,874,165	838,831,428

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	2,962	2,962	2,962
Industrial Sector	8,015	8,594	9,198
Commercial Sector	20,419	21,840	23,033
Domestic Sector	34,283	36,634	38,923
Municipal Sector	1,047	1,137	1,233
Nondomestic Undefined	4,534	5,280	5,786
Total	71,260	76,447	81,135
Exported	555	600	641
Unaccounted for Water	36,315	27,939	20,486
Grand Total	108,130	104,985	102,262

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	8,844,863	8,319,630	7,794,397
Sewerage	53,997,495	91,524,876	129,052,257
Rural Water Programme			
Water	9,609,349	14,195,636	18,781,923
Water - Local Government Fund	1,855,586	3,060,744	4,265,902
Sewerage	2,740,047	4,362,687	5,985,327

III. Estimated Projections of Demand, Supply, and Costs of Water Services (Cont.)

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Carlow	Carlow North Regional	In theory, there is extra capacity
Kildare	Athy	Capacity is limited
Kilkenny	Kilkenny City & Environs	At maximum capacity
Kilkenny	Mooncoin Regional	Scope for increased throughput
Laois	Portlaoise	Treatment capacity will need to be increased and possibly a new source found for future demand
Tipperary N.R	Thurles Urban District	It is thought that for an increase in demand a new source will have to be sought and a new WTW built
Tipperary S.R	Ardfinnan Regional	Operating at maximum capacity
Tipperary S.R	Carrik-on-Suir	Operating under maximum capacity at present
Tipperary S.R	Galtee Regional	Room for increased throughput at WTW
Tipperary S.R	Tipperary Urban District	Constraint on this source is the capacity of the pumps
Tipperary S.R	Clonmel	Need to increase capacity of WTW
Waterford	Dungarvan	No hydrological yield calculations, unsure if increasing source intakes, plant etc will accommodate demand
Waterford	East Waterford Regional	At maximum capacity
Waterford	Tramore	Sources unable to meet current demand, development of an additional source or increase import of treated water from Adamstown works may be required to meet demand
Wexford	Barnadown & Gorey Regional	No hydrological yield calculations, unsure if increasing source intakes, plant etc will accommodate demand
Wexford	Enniscorthy	Construction of additional storage, intakes etc, demand will be met
Wexford	Fardystown	No hydrological yield calculations, unsure if increasing source intakes, plant etc will accommodate demand
Wexford	New Ross	No hydrological yield calculations, unsure if increasing source intakes, plant etc will accommodate demand. At present there is room for demand at the WTW
Wexford	Southern Wexford Regional	
Wexford	Sow Regional	
Wexford	Wexford Town	

Appendix B-7

South Western River Basin District Profile (ROI)

I. Estimated Water Use Benefits

	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
A. Estimated Economic Impacts (Reference Year)								
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	21,912	922,308,162	422,371,421	0.36%	17,369	0.99%	47,836,228	0.10%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	560,527,166	256,693,657	0.22%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	525,009,451	240,428,305	0.21%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	27,725,091	12,696,717	0.01%	-	-	-	-
Potatoes Subsector (2002)	-	7,792,624	3,568,636	0.003%	-	-	-	-
b. Industrial Sector	732	13,557,043,597	4,915,324,534	4.76%	36,870	2.15%	1,030,699,025	2.19%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	485	13,640,943,633	4,988,019,540	4.83%	30,515	1.77%	869,396,924	1.84%
Mining and Quarrying Subsector (2001)	38	240,212,388	102,443,519	0.10%	1,307	0.08%	47,247,657	0.10%
Food Products and Beverages Manufacturing Subsector (2001)	141	2,910,261,627	1,197,557,131	1.16%	8,689	0.51%	232,154,657	0.49%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	51	805,458,741	260,502,124	0.25%	1,941	0.11%	58,836,024	0.12%
Chemical and Chemical Products Manufacturing Subsector (2001)	43	4,509,671,110	2,183,949,874	2.12%	4,341	0.25%	150,422,417	0.32%
Basic Metals Manufacturing Subsector (2001)	87	256,851,958	93,388,461	0.09%	2,069	0.12%	50,534,882	0.11%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	42	199,227,458	73,206,639	0.07%	1,612	0.09%	40,097,533	0.09%
Electrical and Optical Equipment Manufacturing Subsector (2001)	67	4,487,115,384	1,031,537,087	1.00%	9,221	0.54%	248,306,727	0.53%
Transport Equipment Manufacturing Subsector (2001)	15	125,524,966	45,434,706	0.04%	1,158	0.07%	31,642,028	0.07%
Thermoelectric Power Generation Subsector (2003)	2	106,620,000	-	-	177	-	10,155,000	0.02%
Hydroelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%

I. Estimated Water Use Benefits (Cont.)

	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
A. Estimated Economic Impacts (Reference Year)								
c. Selected Key Water-Using Miscellaneous Subsectors		94,550,855	-	-	1,408	0.08%	2,576,315	0.01%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	439	0.03%	2,576,315	0.01%
Seaweed Harvesting Category (2003)		2,666,667	-	-	156	0.01%	-	-
Inland Commercial Fishing Subsector (2002)		1,754,626	-	-	-	-	-	-
Aquaculture Subsector (2003)		31,675,551	-	-	-	-	-	-
Water-Based Leisure Category (2003)		58,454,012	-	-	814	0.05%	-	-

	Annual Water Use (megalitres)	Annual Value of Water Use (€)
B. Estimated Water Uses and Respective Values		
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	33,520	25,862,951
Cattle and Cattle Products Subsector	32,247	24,880,819
Sheep and Sheep Products Subsector	1,187	915,776
Potatoes Subsector	86	66,356
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	9,567	8,898,484
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	4,116	3,828,060
Pulp, Paper, and Paper Products Manufacturing Subsector	2,486	2,312,331
Chemical and Chemical Products Manufacturing Subsector	1,604	1,491,453
Basic Metals Manufacturing Subsector	474	441,186
Machinery and Equipment n.e.c. Manufacturing Subsector	146	135,896
Electrical and Optical Equipment Manufacturing Subsector	544	505,878
Transport Equipment Manufacturing Subsector	134	125,087

I. Estimated Water Use Benefits (*Cont.*)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
i. Selected Key Water-Using Industrial Subsectors		
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	26,623	24,761,817
2. Selected In-stream Uses		-
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		6,380,971
c. Recreational Boating Category (2003)		8,269,631
d. Beach Visitation Category (2003)		38,178,714
e. Other Water-Based Leisure Categories (2003)		5,625,507
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	63	58,595
3. Other Selected Values		-
a. Wetlands (2004)		21,028,744 - 6,611,566
b. Special Riparian Areas (2004)		19,262,981 - 1,899,647
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	21,512,651
Group 3.2 (Public/Sewerage Schemes)	1,041,297
Group 3.3 (Private Installation)	260,977
Group 3.8 (Administration and Miscellaneous)	1,773,270
Expenditures	€
Group 3.1 (Public Water Supply)	27,764,663
Group 3.2 (Public/Sewerage Schemes)	10,229,747
Group 3.3 (Private Installation)	273,677
Group 3.8 (Administration and Miscellaneous)	11,146,915
Cost Recovery	%
Group 3.1 (Public Water Supply)	77%
Group 3.2 (Public/Sewerage Schemes)	10%
Group 3.3 (Private Installation)	95%
Group 3.8 (Administration and Miscellaneous)	16%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	5,556,379
Water - Local Government Fund	514,369
Sewerage	857,845
Water	5,556,379

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Upgrade Needs	479,831,055	4,668,463	484,499,518

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	1,579	1,579	1,579
Industrial Sector	21,924	25,749	29,000
Commercial Sector	22,868	25,162	26,973
Domestic Sector	28,856	30,473	32,050
Municipal Sector	3,255	3,531	3,828
Nondomestic Undefined	0	0	0
Total	78,482	86,494	93,430
Exported	52	55	58
Unaccounted for Water	31,881	27,335	23,381
Grand Total	110,415	113,884	116,869

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	6,751,285	10,215,708	13,680,132
Sewerage	70,399,799	86,977,488	103,555,177
Rural Water Programme			
Water	6,581,812	10,013,214	13,444,615
Water - Local Government Fund	713,071	1,207,176	1,701,280
Sewerage	833,096	1,040,207	1,247,319

III. Estimated Projections of Demand, Supply, and Costs of Water Services (Cont.)

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Cork (North)	Doneraile	Treatment capacity not examined
Cork (North)	Downing Bridge	
Cork (North)	Fermoy	
Cork (North)	Mallow	At maximum capacity, unsure if sources and plant can provide for future demands
Cork (North)	Mitchelstown-Galtee	Unable to predict if source will meet future demand
Cork (North)	Newmarket-Kanturk	Treatment capacity not examined
Cork (South & City)	Bandon Regional	Demand can be met
	Clyne-Aghada	Close to maximum capacity
Cork (South & City)	Cobh Regional	Construction of additional storage etc, demand will be met
	Cork City	
Cork (South & City)	Glanmire Regional	Close to maximum capacity
	Glasaboy-Little Island	Demand can be met
Cork (South & City)	Inniscarra-Ballincollig	Close to maximum capacity
	Innishannon	
Cork (South & City)	Macroom Urban	Construction of additional storage etc, demand will be met
	Midleton Urban	At maximum capacity
Cork (South & City)	Whitegate Regional	Uncertainty as to whether the plant can accommodate demand
	Youghal Regional	
Cork (West)	Clonakilty	Appears to not be operating at maximum capacity, appears that further abstractions from river are possible
Kerry	Central Regional	Uncertainty as to the potential for future abstractions
Kerry	Dingle	Source may be inadequate for future demand
Kerry	Mid-Kerry Regional	Source fully unutilised

Appendix B-8

Western River Basin District Profile (ROI)

I. Estimated Water Use Benefits

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
1. All Sectors - National (2000)	GDP =	102,845,000,000	91,153,000,000	100%	1,670,700	100%	41,752,000,000	100%
National (2001)	GDP =	114,743,000,000	103,245,000,000	100%	1,716,500	100%	47,090,000,000	100%
National (2002)	GDP =	129,344,000,000	116,668,000,000	100%	1,749,900	100%	50,327,000,000	100%
National (2003)	GDP =	135,200,000,000	121,950,098,961	100%	1,778,000	100%	51,135,154,009	100%
a. Agricultural Sector	29,140	1,226,564,897	561,705,924	0.48%	23,098	1.32%	63,616,740	0.13%
i. Selected Key Water-Using Agricultural Subsectors (2002)	-	366,824,006	167,987,212	0.14%	-	-	-	-
Cattle and Cattle Products Subsector (2002)	-	315,720,514	144,584,346	0.12%	-	-	-	-
Sheep and Sheep Products Subsector (2002)	-	47,986,442	21,975,412	0.02%	-	-	-	-
Potatoes Subsector (2002)	-	3,117,050	1,427,454	0.001%	-	-	-	-
b. Industrial Sector	466	8,626,626,876	3,127,722,532	3.03%	23,461	1.37%	655,855,080	1.39%
i. Selected Key Water-Using Industrial Subsectors (2001, 2003)	282	7,340,577,150	2,450,060,736	2.37%	17,761	1.03%	491,943,622	1.04%
Mining and Quarrying Subsector (2001)	15	91,759,151	39,132,579	0.04%	499	0.03%	18,048,215	0.04%
Food Products and Beverages Manufacturing Subsector (2001)	68	1,403,491,336	577,529,196	0.56%	4,190	0.24%	111,957,992	0.24%
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	38	593,986,908	192,107,731	0.19%	1,431	0.08%	43,388,725	0.09%
Chemical and Chemical Products Manufacturing Subsector (2001)	14	1,493,057,322	723,059,902	0.70%	1,437	0.08%	49,801,701	0.11%
Basic Metals Manufacturing Subsector (2001)	49	146,315,649	53,198,712	0.05%	1,179	0.07%	28,787,182	0.06%
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	41	196,337,868	72,144,852	0.07%	1,589	0.09%	39,515,960	0.08%
Electrical and Optical Equipment Manufacturing Subsector (2001)	50	3,357,528,148	771,857,755	0.75%	6,900	0.40%	185,797,946	0.39%
Transport Equipment Manufacturing Subsector (2001)	7	58,100,769	21,030,010	0.02%	536	0.03%	14,645,900	0.03%
Thermoelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%
Hydroelectric Power Generation Subsector (2003)	0	0	0	0.00%	0	0	0	0.00%

I. Estimated Water Use Benefits (Cont.)

A. Estimated Economic Impacts (Reference Year)	Establishment Count	Gross Output Value (€)	Gross Value Added (€)	Gross Value Added as % GDP	Employment	% National Employment	Wages and Salaries (€)	% National Wages and Salaries
c. Selected Key Water-Using Miscellaneous Subsectors		85,206,666	-	-	1,350	0.08%	2,517,361	0.01%
Forestry, Logging and Related Services Subsector (2002)		-	-	-	428	0.02%	2,517,361	0.01%
Seaweed Harvesting Category (2003)		6,333,333	-	-	369	0.02%	-	-
Inland Commercial Fishing Subsector (2002)		1,663,872	-	-	-	-	-	-
Aquaculture Subsector (2003)		37,581,162	-	-	-	-	-	-
Water-Based Leisure Category (2003)		39,628,299	-	-	552	0.03%	-	-

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
1. Abstractive Uses		
a. Agricultural Sector (2002)		
i. Selected Key Water-Using Agricultural Subsectors	19,424	14,987,307
Cattle and Cattle Products Subsector	16,877	13,022,105
Sheep and Sheep Products Subsector	2,513	1,938,660
Potatoes Subsector	34	26,542
b. Industrial Sector (2001)		
i. Selected Key Water-Using Industrial Subsectors	5,294	5,352,404
Mining Subsector	-	-
Food Products and Beverages Manufacturing Subsector	1,985	2,006,701
Pulp, Paper, and Paper Products Manufacturing Subsector	1,833	1,853,573
Chemical and Chemical Products Manufacturing Subsector	531	536,744
Basic Metals Manufacturing Subsector	270	273,184
Machinery and Equipment n.e.c. Manufacturing Subsector	144	145,575
Electrical and Optical Equipment Manufacturing Subsector	407	411,457
Transport Equipment Manufacturing Subsector	62	62,934
Thermoelectric Power Generation Subsector	-	-
c. Domestic Sector (2003)	18,120	18,319,497

I. Estimated Water Use Benefits (Cont.)

B. Estimated Water Uses and Respective Values	Annual Water Use (megalitres)	Annual Value of Water Use (€)
2. Selected In-stream Uses		
a. Inland Commercial Fishing Subsector		-
b. Recreational Fishing Category (2003)		4,325,914
c. Recreational Boating Category (2003)		5,606,311
d. Beach Visitation Category (2003)		25,882,868
e. Other Water-Based Leisure Categories (2003)		3,813,755
f. Aquaculture Subsector	-	-
g. Hydroelectric Power Generation Subsector		-
h. Forestry, Logging, and Other Related Activities Subsector	62	62,235
3. Other Selected Values		-
a. Wetlands (2004)		63,913,358 - 6,302,910
b. Special Riparian Areas (2004)		28,002,398 - 8,804,126
c. Riparian and Coastal Properties' Scenic Vistas		-

II. Estimated Water Use Costs and Costs Recovery

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures - WSIP Programme 3	2003
Receipts	€
Group 3.1 (Public Water Supply)	10,408,499
Group 3.2 (Public/Sewerage Schemes)	2,494,425
Group 3.3 (Private Installation)	2,446,049
Group 3.8 (Administration and Miscellaneous)	945,179

II. Estimated Water Use Costs and Costs Recovery (Cont.)

A. Estimated Costs and Costs Recovery of Water Services	
Local Authority Current Receipts and Expenditures – WSIP Programme 3	2003
Expenditures	€
Group 3.1 (Public Water Supply)	17,339,080
Group 3.2 (Public/Sewerage Schemes)	10,000,454
Group 3.3 (Private Installation)	2,437,482
Group 3.8 (Administration and Miscellaneous)	8,774,937
Cost Recovery	%
Group 3.1 (Public Water Supply)	60%
Group 3.2 (Public/Sewerage Schemes)	25%
Group 3.3 (Private Installation)	100%
Group 3.8 (Administration and Miscellaneous)	11%
Rural Water Programme Expenditures	2003
Expenditures	€
Water	11,121,101
Water - Local Government Fund	2,338,893
Sewerage	1,168,147

B. Estimated Partial Public Environmental/Resource Costs (if the marginal costs of attaining good water status via wastewater treatment is less than or equal to the marginal benefits preserved or restored) : 2004 - 2012 (€)	2004-2006	2007-2012	Total through to 2012
Estimated Wastewater Treatment Upgrade Needs (€)	362,582,185	89,210,329	451,792,514

III. Estimated Projections of Demand, Supply, and Costs of Water Services

A. Estimated Projections of the Demand for Potable Water (annual megalitres)	2005	2010	2015
Agricultural Sector*	879	879	879
Industrial Sector	5,780	6,277	6,867
Commercial Sector	7,241	7,807	8,306
Domestic Sector	22,004	23,173	24,304
Municipal Sector	2,327	2,519	2,759
Nondomestic Undefined	7	8	9
Total	38,238	40,662	43,123
Exported	1,327	1,441	1,565
Unaccounted for Water	28,318	18,508	11,192
Grand Total	67,882	60,611	55,880

* Includes only the schemes covered in the National Water Study (W.S. Atkins Ireland 2000)

B. Estimated Projections of the Costs of Water Services (€)	2005	2010	2015
Water Services Investment Programme			
Water Supply	23,466,445	35,508,257	47,550,069
Sewerage	54,244,520	66,673,683	79,102,846
Rural Water Programme			
Water	12,542,628	16,563,838	20,585,048
Water - Local Government Fund	2,936,312	2,936,312	2,936,312
Sewerage	1,374,099	2,028,236	2,682,373

III. Estimated Projections of Demand, Supply and Costs of Water Services (Cont.)

C. Generalisations Regarding Future Potable Water Supply Capacity		
Local Authority	Scheme	Potable Water Supply Capacity Notes from the National Water Study (Atkins 2000)
Galway	Galway City	Construction of additional storage, intakes etc, demand will be met
Galway	Tuam	
Mayo	Ballina Regional	
Mayo	Lough Mask Regional	
Mayo	Westport	
Sligo	Lough Easkey Regional	At present it appears that it is not possible for additional capacity at the plant
Sligo	Lough Gill Regional	Authorisation for increased abstraction would need to be sought in order to cope with any increase in demand
Sligo	North Sligo Regional	Authorisation for increased abstraction would need to be sought in order to cope with any increase in demand & possibly other source investigated
Sligo	Lough Talt Regional	There is extra capacity to deal with increase in demand
Sligo	Sligo Town	Output capacity not examined (chlorination only)

Appendix B-9

Multipliers and Calculations

Agricultural Sector RBD Distributions³⁷

RBD	% Farms
Eastern	5%
Neagh Bann	3%
North Western	11%
Shannon	28%
South Eastern	16%
South Western	16%
Western	21%
NATIONAL TOTAL	100%

RBD	Cattle	% Cattle	Sheep	% Sheep	Potato Hectarage	% Potato Hectarage
Eastern	392,105	6%	531,266	9%	5,823	41%
Neagh Bann	212,502	3%	149,886	3%	3,632	26%
North Western	477,139	7%	670,112	11%	1,494	11%
Shannon	1,864,996	28%	1,024,267	18%	284	2%
South Eastern	1,499,998	23%	1,386,908	24%	1,362	10%
South Western	1,341,582	20%	764,269	13%	1,147	8%
Western	806,776	12%	1,322,793	23%	459	3%
NATIONAL TOTAL	6,595,100³⁸	100%	5,849,500³⁹	100%	14,200⁴⁰	100%

³⁷ Derived from data in: CSO, Census of Agriculture, 2000

³⁸ <http://www.eirestat.cso.ie/diska/ASCA051.html> and <http://www.eirestat.cso.ie/diska/ASGA031.html> (average of June and December surveys)

³⁹ <http://www.eirestat.cso.ie/diska/ASCA052.html> and <http://www.eirestat.cso.ie/diska/ASGA051.html> (average of June and August surveys)

⁴⁰ <http://www.eirestat.cso.ie/diska/ASCA023.html>

Industrial Sector RBD Distributions (County-based estimates from Census of Industrial Production, 2000 distributed by percent population in each RBD)

RBD	Industrial Local Units by NACE Category								
	% NACE 10-41 in RBD	% NACE 10-14 in RBD	% NACE 15-16 in RBD	% NACE 21-22 in RBD	% NACE 24 in RBD	% NACE 27-28 in RBD	% NACE 29 in RBD	% NACE 30- 33 in RBD	% NACE 34- 35 in RBD
Eastern	35%	23%	23%	60%	39%	32%	32%	40%	32%
Neagh Bann	4%	5%	4%	2%	3%	4%	7%	3%	4%
North Western	6%	11%	12%	3%	5%	6%	4%	3%	12%
Shannon	16%	16%	17%	11%	16%	18%	16%	20%	21%
South Eastern	16%	15%	18%	9%	14%	18%	19%	9%	14%
South Western	14%	22%	17%	8%	18%	13%	11%	14%	12%
Western	9%	8%	8%	6%	6%	8%	11%	11%	5%

Thermoelectric Power Subsector RBD Distributions

RBD	Power Generation (annual gigawatts hours)	% Power Generation	Maximum Permitted Water Flow (annual megalitres)
Eastern	5,972	40%	1,678,460
Neagh Bann	0	0%	0
North Western	0	0%	0
Shannon	5,895	40%	1,656,819
South Eastern	810	5%	227,654
South Western	2,162	15%	607,641
Western	0	0%	0
NATIONAL TOTAL	14,840⁴¹	100%	4,170,855⁴²

Hydroelectric Power Subsector RBD Distributions

RBD	Power Generation (annual megawatts)	% Power Generation
Eastern	340	60%
Neagh Bann	0	0%
North Western	0	0%
Shannon	227	40%
South Eastern	0	0%
South Western	0	0%
Western	0	0%
NATIONAL TOTAL	567⁴³	100%

⁴¹Information supplied by ESB, July 2004⁴²Information supplied by ESB, July 2004⁴³Information supplied by ESB, July 2004

Domestic Sector RBD Distributions⁴⁴

RBD	Population	% Population
Eastern	1,513,992	39%
Neagh Bann	106,032	3%
North Western	203,079	5%
Shannon	624,328	16%
South Eastern	559,414	14%
South Western	524,322	13%
Western	355,459	9%
NATIONAL TOTAL	3,886,626⁴⁵	100%

Forestry Subsector RBD Distributions

RBD	% Forested Area ⁴⁶
Eastern	8%
Neagh Bann	1%
North Western	11%
Shannon	18%
South Eastern	26%
South Western	18%
Western	18%

⁴⁴Derived from GIS data in: CSO, Census 2002

⁴⁵ CSO, Census 2002

⁴⁶ Derived from Forest Inventory and Planning System datasets

Seaweed Classification RBD Distributions

RBD	% Sites in RBD ⁴⁷
Eastern	0%
Neagh Bann	0%
North Western	6%
Shannon	11%
South Eastern	8%
South Western	22%
Western	53%

Aquaculture Subsector RBD Distributions⁴⁸

RBD	% Sites in RBD
Eastern	0%
Neagh Bann	4%
North Western	23%
Shannon	2%
South Eastern	9%
South Western	30%
Western	35%

⁴⁷ Derived from percentages of 36 total seaweed establishments listed by address in the Ireland Seaweed Directory

⁴⁸ Derived from BIM datasets

Parameter for Inland Commercial Fishing RBD Distribution⁴⁹

RBD	% Tagging Scheme Salmon Catch in RBD
Eastern	1%
Neagh Bann	0.4%
North Western	17%
Shannon	11%
South Eastern	8%
South Western	32%
Western	30%

⁴⁹ Derived from Central Fisheries Board data, 2002

Special Riparian Areas (SRA's) Valuations

RBD	Hectares of SRA's (land in NHAs, SPAs and SACs with aquatic/wetland components, excluding the actual waterbody and/or wetland hectareage within these areas) ⁵⁰	Sum of the populations in DEDs with SRA's	Estimated Value of SRA's # 1 (€)	Estimated Value of SRA's # 2 (€)	Estimated Value of SRA's # 3 (€)	Estimated Value of SRA's # 4 (€)	Upper Bound Value (€)	Lower Bound Value (€)
Eastern	15,329	720,227	14,407,489	6,777,592	7,207,057	4,529,803	14,407,489	4,529,803
Neagh Bann	2,910	67,682	257,069	120,931	128,594	80,824	257,069	80,824
North Western	42,301	149,941	8,277,165	3,893,756	4,140,486	2,602,392	8,277,165	2,602,392
Shannon	64,911	452,678	38,346,096	18,038,826	19,181,863	12,056,248	38,346,096	12,056,248
South Eastern	34,613	366,410	16,550,544	7,785,731	8,279,077	5,203,593	16,550,544	5,203,593
South Western	49,645	324,586	21,028,744	9,892,372	10,519,206	6,611,566	21,028,744	6,611,566
Western	75,879	282,788	28,002,398	13,172,929	14,007,636	8,804,126	28,002,398	8,804,126
TOTALS	285,588	2,364,312	126,869,507	414,517,689	440,783,755	277,042,853	126,869,507	39,888,551

SRA Multiplier #1 =	0.0013050	Sands of Forvie, Scotland Study
SRA Multiplier #2 =	0.0006139	River Bladnoch, Scotland Study
SRA Multiplier #3 =	0.0006528	Machair, Scotland Study
SRA Multiplier #4 =	0.0004103	Loch Lomond, Scotland Study

⁵⁰ Estimated from GIS datasets from: Dúchas – The Heritage Service, 2004

Wetlands Valuations

RBD	Hectares of wetlands (including those in nature reserves, NHAs, SPAs and SACs) ⁵¹	Sum of the populations of DEDs in RBD with wetlands (including those with wetlands in nature reserves, NHAs, SPAs and SACs)	Estimated Value of Wetlands # 1 (€)	Estimated Value of Wetlands # 2 (€)	Estimated Value of Wetlands # 3 (€)	Upper Bound Value (€)	Lower Bound Value (€)
Eastern	42,859	192,530	2,000,196	505,825	5,129,216	5,129,216	505,825
Neagh Bann	41,108	51,248	510,670	129,142	1,309,539	1,309,539	129,142
North Western	260,365	154,989	9,781,750	2,473,685	25,083,894	25,083,894	2,473,685
Shannon	173,792	337,779	14,229,662	3,598,508	36,489,926	36,489,926	3,598,508
South Eastern	51,551	147,483	1,842,959	466,062	4,726,004	4,726,004	466,062
South Western	148,267	209,010	7,511,819	1,899,647	19,262,981	19,262,981	1,899,647
Western	429,820	239,218	24,923,742	6,302,910	63,913,358	63,913,358	6,302,910
TOTALS	1,147,763	1,332,257	60,800,798	93,734,801	950,498,401	155,914,919	15,375,779

Wetland Multiplier #1 =	0.0002424	Norfolk Broads, England Study
Wetland Multiplier #2 =	0.0000613	Caithness and Sutherland, Scotland Study
Wetland Multiplier #3 =	0.0006216	Donau Auen, Austria Study

⁵¹ Calculated from GIS data from: EPA, CORINE 2000

Cattle Water Use Valuations⁵²

RBD	Dairy Cattle	Beef Cattle	Annual Water Consumption (megalitres)
Eastern	62,999	329,106	8,602
Neagh Bann	40,386	172,116	4,749
North Western	70,028	407,112	10,376
Shannon	316,405	1,548,592	41,148
South Eastern	304,854	1,195,145	33,793
South Western	418,492	923,090	32,247
Western	70,360	736,416	16,877
Total	1,283,524	5,311,576	147,792
Water Consumption (litres/head/day)	92	54	

⁵² Counts derived from CSO Census of Agriculture, 2000. Consumption rates obtained via consultation with Teagasc.

Sheep Water Use Valuations⁵³

RBD	Hill Ewes	Lowland Ewes	Rams	Annual Water Consumption (megalitres)
Eastern	243,173	270,458	17,634	881
Neagh Bann	28,244	115,176	6,466	283
North Western	220,608	422,406	27,097	1,184
Shannon	90,197	904,011	30,059	2,042
South Eastern	465,541	883,376	37,991	2,459
South Western	443,009	299,733	21,528	1,187
Western	252,317	1,029,231	41,245	2,513
Total	1,743,088	3,924,391	182,021	10,548
Water Consumption (litres/head/day)	3.29	5.75	3.29	

⁵³ Counts derived from CSO Census of Agriculture, 2000. Consumption rates obtained via consultation with Teagasc.

Industrial Subsectors Water Use Valuations

Industrial Subsectors	Gallons Per Employee Per Day Coefficients⁵⁴	Litres Per Employee Per Day Coefficients
Mining and Quarrying Subsector (2001)	-	-
Food Products and Beverages Manufacturing Subsector (2001)	342.9	1298
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	927.3	3509
Chemical and Chemical Products Manufacturing Subsector (2001)	267.4	1012
Basic Metals Manufacturing Subsector (2001)	165.95	628
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	65.6	248
Electrical and Optical Equipment Manufacturing Subsector (2001)	42.7	162
Transport Equipment Manufacturing Subsector (2001)	84.1	318
Forestry, Logging and Related Services Subsector (2002)	104	394

⁵⁴ Derived from Planning and Management Consultants, Ltd. (1995). IWR-MAIN 6.1: User's Manual and System Description. Appendix D.

Domestic Sector Water Use Valuations

RBD	Weighted Average Water Consumption per Capita (litres/head/day) 2003 ⁵⁵
Eastern	139.10
Neagh Bann	137.77
North Western	137.68
Shannon	140.50
South Eastern	135.44
South Western	139.11
Western	139.66

⁵⁵Derived from National Water Study (W.S. Atkins Ireland 2000) county-based per capita estimates.

RBD Water Use Valuations

Eastern RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	8,602	6,637,177
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	881	679,609
Potatoes Subsector (2002)	Hectares of Potato Crops	5,823	205	437	336,980
Mining and Quarrying Subsector (2001)	Number of Employees	1,367	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	11,526	1,298	5,459	5,563,098
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	14,523	3,509	18,603	18,956,785
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	9,628	1,012	3,556	3,623,761
Basic Metals Manufacturing Subsector (2001)	Number of Employees	4,975	628	1,140	1,162,035
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	4,481	248	406	413,752
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	25,797	162	1,522	1,550,497
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	3,166	318	368	374,781
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	186	394	27	27,248
Domestic Sector	Number of people	1,513,992	139	76,868	78,328,229

Eastern RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	1.02
Value per 1000 Litres of Domestic Water Use (€)	1.02

Neagh Bann International RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	4,749	3,663,848
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	283	218,668
Potatoes Subsector (2002)	Hectares of Potato Crops	3,632	205	272	210,151
Mining and Quarrying Subsector (2001)	Number of Employees	288	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	2,174	1,298	1,030	953,288
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	524	3,509	672	621,753
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	719	1,012	266	246,008
Basic Metals Manufacturing Subsector (2001)	Number of Employees	627	628	144	133,030
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	985	248	89	82,647
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	2,060	162	121	112,480
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	405	318	47	43,580
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	31	394	4	4,109
Domestic Sector	Number of people	106,032	135	5,332	4,936,528

Neagh Bann International RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	0.93
Value per 1000 Litres of Domestic Water Use (€)	0.93

North Western International RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	10,376	8,005,566
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	1,184	913,523
Potatoes Subsector (2002)	Hectares of Potato Crops	1,494	205	112	86,468
Mining and Quarrying Subsector (2001)	Number of Employees	631	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	5,794	1,298	2,744	3,139,751
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	816	3,509	1,046	1,196,211
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	1,164	1,012	430	492,106
Basic Metals Manufacturing Subsector (2001)	Number of Employees	984	628	226	258,015
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	561	248	51	58,158
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	2,067	162	122	139,459
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	1,204	318	140	159,982
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	274	394	39	45,074
Domestic Sector	Number of people	203,079	141	10,205	11,676,219

North Western International RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	1.14
Value per 1000 Litres of Domestic Water Use (€)	1.14

Shannon International RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	41,148	31,748,189
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	2,042	1,575,313
Potatoes Subsector (2002)	Hectares of Potato Crops	284	205	21	16,418
Mining and Quarrying Subsector (2001)	Number of Employees	925	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	8,507	1,298	4,029	4,178,597
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	2,649	3,509	3,394	3,519,456
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	3,899	1,012	1,440	1,493,630
Basic Metals Manufacturing Subsector (2001)	Number of Employees	2,695	628	618	640,583
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	2,192	248	199	206,021
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	12,995	162	767	794,929
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	2,115	318	246	254,847
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	422	394	61	62,800
Domestic Sector	Number of people	624,328	138	32,017	33,203,927

Shannon International RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	1.04
Value per 1000 Litres of Domestic Water Use (€)	1.04

South Eastern RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	33,793	26,073,830
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	2,459	1,897,017
Potatoes Subsector (2002)	Hectares of Potato Crops	1,362	205	102	78,807
Mining and Quarrying Subsector (2001)	Number of Employees	902	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	9,200	1,298	4,358	4,780,454
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	2,262	3,509	2,897	3,178,024
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	3,400	1,012	1,256	1,377,670
Basic Metals Manufacturing Subsector (2001)	Number of Employees	2,827	628	648	710,994
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	2,653	248	240	263,781
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	5,948	162	351	384,917
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	1,404	318	163	178,986
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	620	394	89	97,748
Domestic Sector	Number of people	559,414	140	27,655	30,339,197

South Eastern RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	1.10
Value per 1000 Litres of Domestic Water Use (€)	1.10

South Western RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	32,247	24,880,819
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	1,187	915,776
Potatoes Subsector (2002)	Hectares of Potato Crops	1,147	205	86	66,356
Mining and Quarrying Subsector (2001)	Number of Employees	1,307	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	8,689	1,298	4,116	3,828,060
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	1,941	3,509	2,486	2,312,331
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	4,341	1,012	1,604	1,491,453
Basic Metals Manufacturing Subsector (2001)	Number of Employees	2,069	628	474	441,186
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	1,612	248	146	135,896
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	9,221	162	544	505,878
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	1,158	318	134	125,087
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	439	394	63	58,595
Domestic Sector	Number of people	524,322	139	26,623	24,761,817

South Western RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	0.93
Value per 1000 Litres of Domestic Water Use (€)	0.93

Western RBD

Sector/Subsector	Unit	Unit Number	Coefficient (litres per unit per day)	Water Use (annual mega-litres)	Estimated Value of Water (€)
Cattle and Cattle Products Subsector (2002)	Multiple	-	-	16,877	13,022,105
Sheep and Sheep Products Subsector (2002)	Multiple	-	-	2,513	1,938,660
Potatoes Subsector (2002)	Hectares of Potato Crops	459	205	34	26,542
Mining and Quarrying Subsector (2001)	Number of Employees	499	-	-	-
Food Products and Beverages Manufacturing Subsector (2001)	Number of Employees	4,190	1,298	1,985	2,006,701
Pulp, Paper, and Paper Products Manufacturing Subsector (2001)	Number of Employees	1,431	3,509	1,833	1,853,573
Chemical and Chemical Products Manufacturing Subsector (2001)	Number of Employees	1,437	1,012	531	536,744
Basic Metals Manufacturing Subsector (2001)	Number of Employees	1,179	628	270	273,184
Machinery and Equipment n.e.c. Manufacturing Subsector (2001)	Number of Employees	1,589	248	144	145,575
Electrical and Optical Equipment Manufacturing Subsector (2001)	Number of Employees	6,900	162	407	411,457
Transport Equipment Manufacturing Subsector (2001)	Number of Employees	536	318	62	62,934
Forestry, Logging and Related Services Subsector (2002)	Number of Employees	428	394	62	62,235
Domestic Sector	Number of people	355,459	138	18,120	18,319,497

Western RBD (Cont.)

Value per 1000 Litres of Agricultural Water Use (€)	0.77
Value per 1000 Litres of Industrial Water Use (€)	1.01
Value per 1000 Litres of Domestic Water Use (€)	1.01

Appendix B-10

Findings of Survey of Ireland's Local Authority Water Services Cost Recovery Practices

B.10.1 Eastern River Basin District

Prime RBD:	Eastern RBD
Prime RBD Population:	566,363 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Dublin City Council

Non-Domestic Water Rate Charging Structure

Dublin City Council's non-domestic water supply charges are set out in an Order of the Assistant City Manager, reference ENG/884/2003, effective 1 January 2004.

Metered water charges are in €/cubic metre. There are annual standing charges depending on the size (diameter) of supply ranging from 12mm to 200mm supplies. There is also a quarterly minimum charge in addition to the above standing charges.

Non-metered (fixed) water charges are determined by the type of non-domestic premises. Some premises are charged on the basis of number of basins (e.g. hairdressers) or seats (e.g. restaurants and cafes). If not categorised according to type of premises, they may be assessed a charge based on estimated usage, based on the nature of business and the number of employees and using standard consumption figures. This charge is currently at the same rate as the metered charge.

Other charges also apply. For example, there are bulk water charges to Kildare and Wicklow County Councils and to Bray Town Council. There are charges for canal water, standpipes, shipping water (per cubic metre) and fire main, hose reel, hydrant and sprinkler connections. In addition, there are both volume-based and fixed charges for water used in building and construction.

Dublin City Council, by means of another Order of the Assistant City Manager, reference ENG/885/2003 charges for the collection, treatment and disposal of wastewater from non-domestic premises. These charges are added to the cost of both metered water supplies (i.e. by adding, currently, €0.34/m³ to the metered rate) and the non-metered (fixed) water supplies (i.e. by adding, currently, 36.67% to the fixed charges). These charges are designed to assist in cost recovery of the increased operational costs associated with the new Ringsend Wastewater Treatment Plant. The above additional wastewater charges are effective 1 January 2004.

Certain large non-domestic users of water are separately charged for wastewater discharges based on the measured volumes of wastewater or based on volumes allowed by their discharge licences. If they are so charged, they are not then charged the above wastewater charges that would have been based on their water meter reading, i.e. there is not a double wastewater charge.

Prime RBD:	Eastern RBD
Prime RBD Population:	241,518 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Dun Laoghaire/Rathdown County Council

Non-Domestic Water Rate Charging Structure

Dun Laoghaire/Rathdown County Council's charging structure is, in many ways, very similar to that of Dublin City Council (see above) in that there are non-domestic metered and non-metered (fixed) water charges, in addition to separate wastewater charges. Although dealt with in separate County Manager's Orders, a consolidated water and wastewater charge is applied in the billing process.

Non-domestic metered and non-metered (fixed) water charges are detailed in County Manager's Order No. ES/99/2004 and cover charges for metered water supply, fixed charges, water connection fees, standpipe use and water pressure and flow tests.

County Manager's Order ES/98/2004 covers charges for collection, treatment and disposal of wastewater (including sewage and trade effluent) from non-domestic premises. These charges are added to the cost of both metered water supplies (i.e. by adding, currently, €0.43/m³ to the metered rate) and the non-metered (fixed) water supplies (i.e. by adding, currently, 42.14% to the fixed charges). These charges are designed to assist in cost recovery of the increased operational costs associated with the new Ringsend Wastewater Treatment Plant. The above additional wastewater charges are effective 1 January 2004. Certain exceptions apply in the case of licensed premises, details of which are contained in the Order.

Prime RBD:	Eastern RBD
Prime RBD Population:	276,442 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Fingal County Council

Non-Domestic Water Rate Charging Structure

Fingal County Council's charging structure is, in many ways, very similar to that of Dun Laoghaire/Rathdown County Council and Dublin City Council. Again, a separate County Manager's Order, FWD/1/04, provides for cost recovery in line with EU Water Pricing Policy, the Polluter Pays Principle and the Irish Government's National Water Services Pricing Policy.

The local authority applies an overall consolidated charge that includes the following components: operational charges in respect of metered water supply and the collection and treatment of wastewater; a marginal capital cost for Ringsend and Malahide wastewater treatment plants; and a capital replacement fund charge (to offset the cost of replacement of existing and new facilities in the future).

In addition to the above non-domestic wastewater charges, for non-domestic water charges, the situation is similar to most local authorities surveyed. There are metered charges, non-metered (fixed) charges, a domestic allowance, minimum charges, meter rental charges (by size of meter), fixed charges for national schools and churches, connection/disconnection/reconnection fees, standpipe charges, water pressure and flow test charges, foul and surface water connection charges and charges for drainage services.

Prime RBD:	Eastern RBD
Prime RBD Population:	238,835 (100%)
Other RBDs & Populations:	n/a
Local Authority:	South Dublin County Council

Non-Domestic Water Rate Charging Structure

South Dublin County Council's non-domestic water (and wastewater) charges for 2004 are set out in three County Manager's Orders: ENV/902/2003 covering wastewater charges under the Water Pollution Acts 1977 and 1990 (these are not based on non-domestic water metering but rather direct wastewater discharge volumes and strengths); ENV/909/2003 covering cost recovery for charges levied by Dublin City Council on South Dublin County Council for wastewater treatment at Ringsend Wastewater Treatment Plant; and ENV/910/2003 covering non-domestic, metered and non-metered, water charges.

In general, the water and wastewater charging structure is very similar to those in operation in Dublin City Council, Fingal County Council and Dun Laoghaire/Rathdown County Council in that additional charges are levied on the non-domestic water user to recover costs associated with wastewater treatment at Ringsend WWTP. Currently, in the case of South Dublin County Council, the wastewater component is €0.88 per 1,000 gallons of metered water supplied or, for non-metered supplies, 16.07% of the fixed water charges, excluding licensed discharges and agricultural holdings.

For non-domestic, metered, water supply, there are volumetric charges, minimum quarterly charges, a domestic allowance and meter rental charges (based on meter size).

Non-metered (fixed) charges are levied at a standard annual charge with the exception of churches and national schools. The latter is charged on the basis of the school's rateable valuation within certain valuation bands. Non-metered charges are payable in half-yearly equal instalments due on 1 April and 1 October 2004.

Charges are also made for connections. In addition to non-domestic connections, fees also apply to domestic connections and each domestic housing unit is required to have a separate domestic connection. There are also charges for the use of standpipes, water pressure and flow tests, and drainage services (drain clearance, residential and commercial septic tank cleaning, and broadband removal or repair).

Licensed wastewater discharges are the subject of separate charges under Order ENV/902/2003. The charging structure includes: a hydraulic rate (€/m³) based on discharge; monitoring fees (categorised by wastewater strength compared to normal domestic sewage and pollution potential); and large wastewater dischargers (>50,000m³/annum) where charges are calculated using the Mogden Formula.

Prime RBD:	Eastern RBD
Prime RBD Population:	127,368 (62.71%)
Other RBDs & Populations:	South Eastern 75,731 (37.29%)
Local Authority:	Kildare County Council

Non-Domestic Water Rate Charging Structure

Kildare County Council's non-domestic water charges for 2004 are detailed in County Manager's Order No. Finance 698. This Order is for accounts accruing in the year ending 31 December 2004.

For metered supplies, there are charges for water used on a volumetric basis (i.e. €/1,000 gallons or €/1,000 litres). There are also charges for meter rental (e.g. less than 1-inch, and 1-inch and above), and a minimum half-yearly charge of €109. There is a discount scheme in operation for early payment of accounts. Primary schools and charitable institutions (with a residential element) are allowed an abatement of 50% on the normal charges. Primary schools are, however, subject to a minimum charge of €50 per half-year

For non-metered supplies, charging is on the basis of two scales, Scale A and Scale B, which are determined by reference to likely water usage. A discount scheme applies for payment within 6 weeks of issue of invoice.

Prime RBD:	Eastern RBD
Prime RBD Population:	145,554 (92.32%)
Other RBDs & Populations:	Neagh Bann 8,834 (5.60%)
	Shannon 3,280 (2.08%)
Local Authority:	Meath County Council

No information was received from Meath County Council.

Prime RBD:	Eastern RBD
Prime RBD Population:	156,074 (90.66%)
Other RBDs & Populations:	South Eastern 16, 071 (9.34%)
Local Authority:	Wicklow County Council

No information was received from Wicklow County Council.

B.10.2 Neagh Bann International River Basin District

Prime RBD:	Neagh Bann RBD
Prime RBD Population:	112,890 (73.23%)
Other RBDs & Populations:	Eastern 41,278 (13.77%)
Local Authority:	Louth County Council

Non-Domestic Water Rate Charging Structure

Louth County Council provided a schedule of their 2004 non-domestic water charges.

For metered customers, a volumetric charge applies together with a meter rental charges (same for all sizes). A separate charge in respect of a combination meter is levied.

For non-metered (fixed) customers, there is a lengthy list of the types of premises to which the fixed charges apply. They generally break down according to commercial (in which there are nine separate charging bands), schools (varying by pupil numbers) and agricultural (varying by type (dairy, tillage or mixed) and size (acreage bands)).

Prime RBD:	Neagh Bann RBD
Prime RBD Population:	51,963 (61.33%)
Other RBDs & Populations:	North Western 32,767 (38.67%)
Local Authority:	Monaghan County Council

Non-Domestic Water Rate Charging Structure

Monaghan County Council's non-domestic water charges for 2004 are detailed in the Director of Services (Water & Planning) Order W05/04 for water supplied in the year ending 31 December 2004.

For metered water service, a volumetric-based charge is applied (€/m³ or €/1,000 gallons) plus a fixed charge of €50 per customer. Bulk water supply to group water schemes is also charged on a volumetric basis as is water supplied for building and construction.

Non-domestic, non-metered, water supply is charged according to the type of premises supplied. In limited cases, a minimum and a maximum charge applies (e.g. schools, offices, clinics, dispensaries, cinemas, halls and non-residential premises) and, in some other cases, just a minimum charge applies (e.g. licensed premises, nursing and old peoples homes).

B.10.3 North Western International River Basin District

Prime RBD:	North Western RBD
Prime RBD Population:	49,970 (63.74%)
Other RBDs & Populations:	Eastern 15,374 (19.61%), Neagh Bann 3,231 (4.12%) & Shannon 9,827 (12.53%)
Local Authority:	Cavan County Council

Non-Domestic Water Rate Charging Structure

For metered water charges, it was reported that the current rate is €3.17/1000 gallons with a free allowance of 50,000 gallons per annum.

The charges for non-metered water supply were made in a County Manager's Order, Order No. F11/9173, effective 1 January 2004. The Order covers five different categories of non-metered supplies. The Order gives the local authority the right to install water meters if necessary.

A separate County Manager's Order, SS11,110, dated 16 May 2003, covers water meter rentals. Water meter sizes designated range from ½" to 6" meters.

Prime RBD:	North Western RBD
Prime RBD Population:	246,993 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Donegal County Council

Non-Domestic Water Rate Charging Structure

Metered and non-metered water charges are contained in the County Manager's Order, dated 2 June 2004 and effective from 1 January 2004. It should be noted that this Order excludes the towns of Bundoran and Letterkenny which are the subject of separate Orders.

Metered water charges are levied on a €/1,000 litres basis. There is a minimum charge which is dependent on the frequency of invoicing (quarterly or half-yearly). Meter rental charges are also levied and there is an allowance (domestic allowance) in respect of mixed – partly domestic, partly non-domestic – supplies.

Non-metered (or fixed) charges apply in respect of premises with a mixed supply, field/agricultural use and all other non-domestic, non-metered supplies.

B.10.4 Shannon International River Basin District

Prime RBD:	Shannon RBD
Prime RBD Population:	144,424 (97.39%)
Other RBDs & Populations:	Western 3,869 (2.61%)
Local Authority:	Clare County Council

Non-Domestic Water Rate Charging Structure

The charges for water services are contained in a County Manager's Order for the year ending 31 December 2004. It is contained within Programme Group 3 – Water Supply & Sewerage and is a consolidated (i.e. water and wastewater) charge.

There are three general categories: metered, non-metered and fixed. “Fixed” applies to drinking taps or troughs in a field or farmyard.

Because the overall charge is a consolidated one, there are discount provisions where wastewater services are not used.

Prime RBD:	Shannon RBD
Prime RBD Population:	16,108 (42.48%)
Other RBDs & Populations:	North Western 14, 469 (38.16%)
	Western 7,342 (19.36%)
Local Authority:	Leitrim County Council

Non-Domestic Water Rate Charging Structure

Leitrim County Manager’s Order No. 03/177 provides the basis for water charging in the county. The information received related to 2003 and this Order covered the period from 1 January to 31 December 2003.

For metered water supplies, there is a volumetric charge that varies according to the type of user. Different volumetric charges apply to institutional users and other sanitary authorities, commercial connections, mixed (domestic and non-domestic) connections, agricultural supplies, and group water schemes. In most cases, a minimum quarterly charge is levied. In the case of mixed connections and connections to group water schemes, allowances of 25,000 and 12,500 gallons per quarter respectively is provided.

Non-metered water supply charges vary according to the same types of user as with metered water supplies.

Prime RBD:	Shannon RBD
Prime RBD Population:	71,658 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Limerick City Council

Non-Domestic Water Rate Charging Structure

Limerick City Council’s water rate charging structure provides a “general” (water) charge, a “waste” (wastewater) charge and the “total” (consolidated) charge for both metered and non-metered (fixed) supplies.

Metered charges are based on volume of water supplied.

Non-metered charges are described for a number of categories of premises. These are primary schools, other schools, common supply and guest houses (further broken down by summer trade and six room guesthouses). Fixed charges are also levied based on various rateable valuation bands.

Prime RBD:	Shannon RBD
Prime RBD Population:	154,018 (94.40%)
Other RBDs & Populations:	South Western 6,532 (4.00%) South Eastern 2,600 (1.59%)
Local Authority:	Limerick County Council

Non-Domestic Water Rate Charging Structure

The information on Limerick County Council's water rate charging structure was provided in a letter dated 12 August 2004.

For metered supplies, a volumetric charge applies. There is a minimum half-yearly charge but there is no meter rental charge. A domestic allowance of 25,000 gallons per half year is granted.

There are three categories of non-metered (fixed) water users: non-agricultural other than domestic; agricultural (per supply point); and churches.

Limerick County Council, in a memo dated 11 August 2004 (ref: WS 901050006 JK), provided further information in relation to wastewater charges. In summary, this memo stated that, at present, there is no direct charge for the collection and treatment of wastewater for most non-domestic consumers but that an indirect charge is levied by way of Rate Demand. Furthermore, for large-scale users (wastewater dischargers), applications need to be made for discharge or IPC licences. In these cases, charging is based on volumetric flows, biological loading and impact on the relevant system. Charges for monitoring are also added. Where these large-scale users are not sewered, there are charges for direct delivery of sewage, sludge or leachate to wastewater treatment plants. These, again, are based on volume, strength and impact.

The intention is that, in future and in line with the Government's policy on water pricing, all costs of water service provision will be transferred to non-domestic consumers in a consolidated charge to encompass capital and operational expenditure. The anticipated level of charges is not known at this early stage. These future charges may impact some of the existing charging structures.

Prime RBD:	Shannon RBD
Prime RBD Population:	29,859 (84.61%)
Other RBDs & Populations:	North Western 5,433 (15.39%)
Local Authority:	Longford County Council

Non-Domestic Water Rate Charging Structure

Longford County Council provided a schedule of water charges for metered and non-metered, non-domestic customers. In the case of metered customers, the charges provided information both on water-only charges and on consolidated (water and wastewater) charges.

For all metered, non-domestic, customers (commercial, licensed premises and agricultural) a volumetric rate applies. The same rate is also applied for metered primary and secondary schools. For metered customers, a minimum quarterly charge applies while a domestic allowance also is granted. The domestic allowance is granted per invoicing period (not stated) and varies according to whether the customer is water-only or combined water and wastewater.

In the case of non-metered customers, there are six listed types of premises for which fixed charges are leveled: licensed premises; banks and financial institutions; primary and secondary schools; hairdressers; shops/offices; and agricultural supply.

Prime RBD:	Shannon RBD
Prime RBD Population:	37,903 (54.59%)
Other RBDs & Populations:	South Eastern 31,534 (45.41%)
Local Authority:	North Tipperary County Council

Non-Domestic Water Rate Charging Structure

North Tipperary County Council's 2004 non-domestic water charges are contained in the County Manager's Order, dated 5 February 2004, ref. File No. 25/3, (Order No. not known), and detailed in an attached schedule.

The metered water charges are categorised according to a series of charge codes (301-323), detailed in a "List of Charge Codes 2004", that indicate the volumetric charge, meter rental charge, free quantity (domestic allowance) and minimum charge. Demands are issued half-yearly on 1 April and 1 October 2004.

Non-metered water charges include a fixed charge for water and a separate fixed charge for sewerage. As with the metered charges, there are a number of separate charge codes. There is a separate fixed water charge for "land only".

Prime RBD:	Shannon RBD
Prime RBD Population:	45,347 (64.69%)
Other RBDs & Populations:	South Eastern 15,810 (22.56%)
	Eastern 8,937 (12.75%)
Local Authority:	Offaly County Council

No information was received from Offaly County Council.

Prime RBD:	Shannon RBD
Prime RBD Population:	53,774 (89.17%)
Other RBDs & Populations:	Western 6,533 (10.83%)
Local Authority:	Roscommon County Council

No information was received from Roscommon County Council.

Prime RBD:	Shannon RBD
Prime RBD Population:	62,019 (70.53%)
Other RBDs & Populations:	Eastern 25,908 (29.47%)
Local Authority:	Westmeath County Council

Non-Domestic Water Rate Charging Structure

Westmeath County Council's rate structure was provided in a fax, dated 15 July 2004. They are effective from 1 March 2004 until 28 February 2005. Charges are payable on demand.

For non-domestic, metered, supplies, the Council charges on a volumetric basis (€/1,000 gallons or €/1,000 litres or €/1,000m³).

Non-metered supplies are charged by the type of premises or establishment. In the case of group water schemes, no charges are levied for a period of two years from the date of commencement of water supply to the scheme.

Westmeath County Council's contact stated that their charges were for water only but that their Environment Section may deal with wastewater charges differently.

B.10.5 South Eastern River Basin District

Prime RBD:	South Eastern RBD
Prime RBD Population:	47,025 (100%)
Other RBDs:	n/a
Local Authority:	Carlow County Council

Non-Domestic Water Rate Charging Structure

The charges for water supply are made in a County Manager's Order, reference FIN 1/04, effective 1 January 2004. There are two main charging categories: metered water charges and non-metered charges.

Metered charges are shown in both metric (€/1000 litres) and imperial units (€/1000 gallons). There is also an annual meter rental / standing charge, an annual minimum charge and a domestic allowance. The minimum charge, however, is not charges where the Green Schools Programme allowance is given.

Non-metered charges (for water supplied otherwise than by measure) are payable in two equal half-yearly instalments due on 1 April and 1 October. The same minimum payment applies as for metered charges.

Discounts are applied to both metered and non-metered accounts for payment within 30 days of the date of issue of the demand.

Prime RBD:	South Eastern RBD
Prime RBD Population:	90,190 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Kilkenny County Council

Non-Domestic Water Rate Charging Structure

Kilkenny County Manager's Order (no reference given) provides details of water charges with effect from 1 April 2004.

For metered water supplies, there are volumetric charges and meter rental charges (by meter size). There is also a parallel set of charges applicable to group water schemes that are less than the normal metered charge.

Non-metered (fixed) charges are categorised as follows: drinking troughs on land and outside taps; group water schemes not taken-in-charge by the Council; and non-metered commercial premises (including B&Bs). There are also fixed charges for schools and colleges, with charges varying according to the number of pupils.

Prime RBD:	South Eastern RBD
Prime RBD Population:	58,398 (95.58%)
Other RBDs & Populations:	Shannon 2,699 (4.42%)
Local Authority:	Laois County Council

Non-Domestic Water Rate Charging Structure

Laois County Manager's Order (File Ref: Finance; No. 1) provides the basis for water charging in the county. This Order is effective from 1 January 2004. There is, at present, no separate wastewater charging structure.

For metered water supplies, there is a volumetric charge and a meter rental/standing charge. Halls and clubs are given an allowance of 25,000 gallons per annum without charge.

Non-metered (fixed) charges for water supplied other than by measure is payable in advance in two half-yearly instalments, the first due on 1 April 2004, the second on 1 October 2004. The fixed charges apply to a detailed schedule of types of premises as detailed in the Order. For the majority of cases, the annual charge consists of a fixed charge plus a charge of €4.43 per €1.27 (formerly IEP1.00) of rateable valuation. Some premises, including those not valued under the valuation system, are simply charged a fixed annual charge (e.g. churches, taps). There are also instances of fixed charges being applied to very specific premises (e.g. Flour Mills/Knockmay School).

Prime RBD:	South Eastern RBD
Prime RBD Population:	77,825 (87.28%)
Other RBDs & Populations:	Shannon 7,273 (8.16%)
	South Western 4,072 (2.24%)
Local Authority:	South Tipperary County Council

Non-Domestic Water Rate Charging Structure

South Tipperary County Council provided information on their water charges for 2004 in a fax, dated 26 July 2004. They provided information on non-domestic, metered water-only (water in) charges and consolidated charges (including a wastewater (water out) component).

Both metered water and metered consolidated charges include a volumetric charge (€/1,000 gallons or €/1,000 litres), minimum charges for the first and second meter, and domestic allowances in respect of the first and second meters. For comparison purposes, the water-only metered charge is €3.40/1,000 gallons (€0.75/1,000 litres), while the consolidated (water and wastewater) metered charge is €4.93/1,000 gallons (€1.09/1,000 litres).

No information was provided in respect of non-domestic, non-metered (fixed) water charges.

Prime RBD:	South Eastern RBD
Prime RBD Population:	52,701 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Waterford City Council

Non-Domestic Water Rate Charging Structure

Waterford City Council's non-domestic water charging structure is detailed in a City Manager's Order, dated 31 October 2003, and effective from 1 October 2003. These charges apply to water only. Further information in respect of charges relating to licensed wastewater dischargers was also provided in a fax, dated 2 September 2004.

For non-domestic, metered, water supplies there are four main categories where volumetric charges apply: commercial customers; special industrial rate; consumers outside the city boundary; and Ardkeen Hospital. The industrial consumers and Ardkeen Hospital are charged on at a rate that diminishes with increasing consumption (defined as being within volumetric bands). The other non-domestic consumers are charged at the same rate regardless of consumption. Quarterly meter rental charges are also applied.

Non-metered customers are charged, depending on category, a fixed annual charge. There are three categories: low consumers (small shops, offices, etc.); doctor surgeries, butchers, garages, etc.; and B&Bs, banks, hairdressers, restaurants, etc.

According to the Water Services (Drainage) Section, industries, licensed to discharge wastewater, are charged differently. Charges comprise: a volumetric charge of €0.08/m³ of discharge; a monitoring charge based on industry size (large, €1,167/annum; medium, €667/annum; and small, €167/annum).

Prime RBD:	South Eastern RBD
Prime RBD Population:	82,209 (76.94%)
Other RBDs & Populations:	South Western 24,646 (23.06%)
Local Authority:	Waterford County Council

No information was received from Waterford County Council.

Prime RBD:	South Eastern RBD
Prime RBD Population:	169,103 (98.16%)
Other RBDs & Populations:	Eastern 3,168 (1.84%)
Local Authority:	Wexford County Council

Non-Domestic Water Rate Charging Structure

Wexford County Council's water rate structure was provided in a schedule entitled, Water Services Charges 2004. Charges are provided for water (water in) and sewerage (water out), the latter based, for metered supplies, on the volume of metered water.

For non-domestic, metered, water (and wastewater) there are: volumetric charges; minimum charges; and domestic allowances. For water only, there are meter rental charges based on size and number of meters.

For non-metered water (and wastewater), fixed charges are levied according to five categories: non-domestic (general); community facilities; bed and breakfast properties; self-catering properties; and agricultural. In the non-domestic category, charge is by rateable valuation within a set minimum and maximum charge. For agriculture, the fixed charge is based on farm size within nine size bands ranging from 0-5 acres to greater than 200 acres. For some categories, there is a €50 discount to clear accounts by 31 May 2004.

B.10.6 South Western River Basin District

Prime RBD:	South Western RBD
Prime RBD Population:	151,731 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Cork City Council

Non-Domestic Water Rate Charging Structure

The charges for water services are contained in a County Manager's Order, No. 10,089/03, effective 1 January 2004. It is a consolidated charge (i.e. it includes water and wastewater).

Metered customers are charged per cubic metre (1000 litres) and are subject to a minimum annual charge. Metered water for supply to ships is charged at a higher rate but has a slightly lower minimum charge.

Non-metered charges vary by type of business with some charged a flat rate and some charged on the basis of the rateable valuation (i.e. €/€ R.V.). Some businesses are charged on the basis of number of basins (e.g. hairdressers), rooms (e.g. guest houses) or similar methodologies. Business premises are charged on the increasing scale of occupancy grouping (e.g. min. 0-5 persons; max. 81-100 persons).

For its metered water charge, Cork City Council provided the breakdown of its consolidated rate (€2.03/m³) between water (€0.80/m³) and wastewater (€1.23/m³). The breakdown for non-metered charges was unavailable.

Prime RBD:	South Western RBD
Prime RBD Population:	440,454 (96.6%)
Other RBDs & Populations:	Shannon 10,301 (2.26%) & South Eastern 5,184 (1.14%)
Local Authority:	Cork County Council - North District

Non-Domestic Water Rate Charging Structure

Metered water charges are detailed in a schedule, "Charges for 2004". In addition to the charge per 1,000 gallons, there are other charges including a minimum charge per annum (by user category), a charge for a second meter, a retention fee and water connection/disconnection/reconnection fees. Offsetting the non-domestic water charge, where there is domestic use, is a domestic allowance (in €/annum).

For non-metered, non-domestic, supplies, the water charges are provided for in Acting Director of Services' Order No. 156/2003, for the year ending 31 December 2004. Charges are payable in equal half-yearly instalments, due on 1 February and 1 July 2004. There are fixed annual charges based on the type of premises served.

The local authority confirmed that its charges relate to water charges only; they are not consolidated water and wastewater charges.

Prime RBD:	South Western RBD
Prime RBD Population:	440,454 (96.6%)
Other RBDs & Populations:	Shannon 10,301 (2.26%) & South Eastern 5,184 (1.14%)
Local Authority:	Cork County Council - South District

No information was received from this Cork County Council - South District.

Prime RBD:	South Western RBD
Prime RBD Population:	440,454 (96.6%)
Other RBDs & Populations:	Shannon 10,301 (2.26%) & South Eastern 5,184 (1.14%)
Local Authority:	Cork County Council - West District

Non-Domestic Water Rate Charging Structure

The information on water charges was provided in three Orders of the Director of Services: W/255/03 – Scale of Water Charges on Commercial Holiday Accommodation; W/256/03 – Scale of Water Charges, Revised Water Charges effective from 1 January 2004; and W/257/03 – Rates of Water Charges (Metered Supplies) effective to 31 December 2004.

According to W/257/03, metered water charges, unusually, distinguish between a charge for filtered water and unfiltered water, the latter currently 50% of the former. There are meter rental charges and also an allowance in respect of domestic consumption.

The other two Orders, W/255/03 and W/256/03, provide fixed charges in respect of rented holiday accommodation and non-metered commercial premises respectively.

Prime RBD:	South Western RBD
Prime RBD Population:	117,418 (50.06%)
Other RBDs & Populations:	Shannon 117,142 (49.94%)
Local Authority:	Kerry County Council

Non-Domestic Water Rate Charging Structure

Kerry County Council's current water rate charges are contained in a schedule, 2004 Water Charges. Separate wastewater charges are detailed in another schedule, 2004 Sewer Charges.

Non-domestic metered supplies include the following charges: a volume-based charge (in €/1,000 gallons and €/m³); meter rental; and connection fee. A domestic allowance of 12,500 gallons per quarter applies to mixed, domestic and non-domestic.

Non-metered (fixed) charges are levied according to the type of premises and, where those premises are on a group water scheme, a separate schedule applies. Generally the group water scheme fixed charge is 50% of the non-GWS fixed charge. There are also fixed charges in relation to farms where there is a house and land, and where there is land only. These farm charges are based on the rateable valuation of the farm and land, and of the land only, as appropriate. Again, there is a general 50% reduction in fixed charges for supplies from a group water scheme.

B.10.7 Western River Basin District

Prime RBD:	Western RBD
Prime RBD Population:	82,760 (100%)
Other RBDs & Populations:	n/a
Local Authority:	Galway City Council

Non-Domestic Water Rate Charging Structure

Current water charging is provided for in a series of City Manager's Orders, effective from 1 January 2004: No. 02/000682 for non-domestic metered water and wastewater services consolidated charges for 2004; 02/000683 for non-domestic non-metered water and wastewater services consolidated charges for 2004; 02/000678 for non-domestic water only charges for 2004; 02/000685 for non-domestic wastewater only charges for 2004; and 02/000679 for water connection charges; and 02/000680 for non-domestic water and wastewater services consolidated charges, covering types of guest accommodation, for 2004.

For metered water supplies, in addition to the volume-based charge, there are charges for meter rental based on its size (under 75mm, and 75mm and over).

For non-metered supplies, the fixed charge varies by type of premises.

Connection charges are based on pipe diameter, ranging from 15mm to 300mm.

Prime RBD:	Western RBD
Prime RBD Population:	146,456 (78.22%)
Other RBDs & Populations:	Shannon 40,777 (21.78%)
Local Authority:	Galway County Council

Non-Domestic Water Rate Charging Structure

Galway County Council's water rate charging structure includes both metered and non-metered, and separate water and wastewater charges, detailed in a series of County Manager's Orders (no Order references provided). These Orders cover: metered water charges; non-metered water charges; metered wastewater charges; and non-metered wastewater charges.

For metered water and metered wastewater, the current charges are €3.00/1,000 gallons and €0.30/1,000 gallons respectively. Where there are domestic and non-domestic components, an allowance (domestic) is given.

The non-metered water and non-metered wastewater charges are detailed, generally by premises type, in schedules contained in the County Manager's Orders. It should be noted that a separate schedule of charges applies to water supplied from private Group Water Schemes who obtain their water from Galway County Council and that, within this GWS category, there are different schedules according to the length of time the GWS is in existence (i.e. 10 years or less, and over 10 years).

The effective period of the current charges is 1 April 2004 to 31 March 2005.

Prime RBD:	Western RBD
Prime RBD Population:	152,699 (96.44%)
Other RBDs & Populations:	Shannon 5,629 (3.56%)
Local Authority:	Mayo County Council

Non-Domestic Water Rate Charging Structure

Mayo County Council's water charging structure was provided in a schedule of water charges 2004.

For all metered water charges, a volumetric charge is applied. Where the supply is mixed (i.e. domestic as well as non-domestic) a 50,000 gallon allowance is made in respect of the domestic element. A minimum charge is also applied.

The non-metered water charges are categorised by business premises, schools, and agricultural consumers. These categories are, in turn, categorised into a number of subcategories.

Prime RBD:	Western RBD
Prime RBD Population:	89,063 (94.56%)
Other RBDs & Populations:	Shannon 2,811 (2.98%)
	North Western 2,313 (2.46%)
Local Authority:	Sligo County Council

No information was received from Sligo County Council.

Appendix C

Primer on the Utilisation of Decision Support Systems in River Basin Management

C.1 Primer on Formulation and Evaluation of Measures

C.1.1 Defining a Meaningful Planning Objective

In Section 4, we highlighted the basic components of the planning process related to formulation and evaluation of measures. As described, the formulation of measures depends on a formal statement of the planning objective. As implied above, the planning objective must be much more precise than achieving “good” water status. The planning objective must present a measurable goal (or several goals) against which the outcome of prospective plans can be measured and compared.

Quantitative planning objectives are preferable to ones that are qualitative. For example, a goal of achieving a 25 percent reduction in contaminant loadings is a better-stated objective than “less loading” or “good status”. However, the ease in which one may establish the planning objective will depend on both the geographic and socioeconomic scale at which it is applied, as well as the measures that are available to help achieve the objective. For example, establishing a baseline of comparison for the objective of a 25 percent reduction in the loadings of a particular loading, on average, nationwide or in an entire river basin district is more difficult than establishing a baseline for achieving a 25 percent reduction in a particular stream segment. Further, tracing the impact of a broad measure, such as a change in National pricing policy, on contaminant loadings may take significant empirical work and may contain a lot of uncertainty. Thus, the development of the planning objective will require careful elaboration of the problem, the scale at which the problem exists, the metrics that can be used to evaluate success, and an adequate understanding of the measures that are possible to contribute to objective.

C.1.2 Formulating Measures and Programmes

Figure C-1 provides a more detailed illustration of the formulation process. Formulation and evaluation of programmes of measures should be expected to be iterative. Given a baseline (sometimes called a without-action condition) to compare against, and an operational planning objective, measures to achieve the planning objective are appropriately tailored, scaled, combined, and possibly even eliminated. Both practical and legal-institutional constraints are considered in the process. For example, a change in water pricing policy may be screened out if it requires a costly change in the law. Or, a change in pricing policy may be retained and combined with a measure that provides subsidies for pollution abatement technologies. A point-source pollution penalty measure may be devised, but its success may depend on other measures related to public education and communication. There may be alternative physical/geographical scales for a measure that proposes the restoration of critical wetlands or a structural (engineering) solution to the problem may have several possible increments in size. Formulating measures for enhancing the status of water quality will be complicated. There

likely are a number of ways to promote better water quality. However, many of the measures that are possible may rely on broad policy changes and implementation at large geographic scales, such as adoption of market-based mechanisms or the development of standards. Predicting the impact of such measures will be difficult.

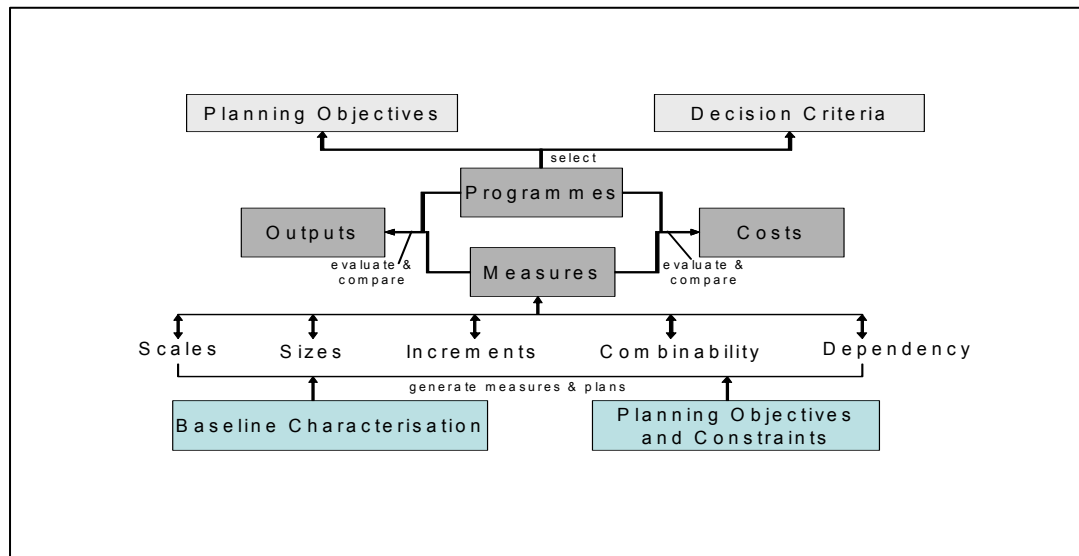


Figure C-1: Formulation of Programmes and Evaluation of Outputs and Costs Development of Programme Evaluation Criteria

Key evaluation criteria will need to be identified in the formulation process. The fundamental criteria involve costs and outputs. Costs will normally reflect the capital, operations and maintenance, and administrative costs associated with a measure or set of measures that make up a programme. At a minimum, outputs reflect measurable success or achievement attributes associated with the planning objective, or benefits.

In an environmental management context, benefits of a measure might be expressed in both monetary and non-monetary measures. Furthermore, indirect costs or opportunity costs associated with a measure may be expressed as negative benefits or treated separately in the form of other output attributes. As individual measures are blended into programmes, it is also important to keep in mind that the output attributes of individual measures may not be strictly additive.

Whatever the evaluation criteria, they will need to be measured and compared across all measures and programmes consistently. For example, if the output criteria are defined as percent reduction in contaminant load per cubic meter of flow, increase in recreational-based business receipts, increase in the number of aquatic species, and change in jobs in industrial manufacturing, then each programme will require a measured and stated effect for each of the four criteria.

C.1.3 Screening and Comparing Programmes

The evaluation and comparison of outputs and costs among alternative programmes can comprise various levels of analytical complexity. If all costs and outputs are expressible in monetary terms for a consistent accounting perspective, then standard cost-benefit analysis can be applied. Seldom is that possible, however. In the absence of assigned property rights and functioning markets for environmental services such as water quality, economic benefits are at best difficult to measure and express in monetary terms and at worst prone to outright refutability on ethical grounds.

Situations like these normally result in the use of multi-criteria decision-making approaches that seek to value benefits via weighting and scoring procedures. Multi-criteria approaches are powerful in that they create a context in which to frame a multidimensional decision problem that has multiple output attributes with incommensurate measures. They allow a complex decision process to be broken down into smaller parts, and as a result identify a reproducible trace of how decisions are made. Furthermore, multi-criteria models are often used to screen out measures that do not perform adequately across multiple criteria related to the planning objective. There are many kinds of multi-criteria algorithms used for screening. Some of the more common ones include:

- Domination procedures—plans better or worse on all criteria;
- Conjunctive procedures—plan meets all criteria thresholds;
- Disjunctive procedures—plan meets at least one criterion threshold;
- Elimination by aspects—set cut-off value for most important criterion and eliminate plans that fall short, then set cut-off value for next most important criterion, etc.;
- Lexicographic rules—rank all criteria then rank plans against the criteria.

There is ample available guidance on how to use multi-criteria approaches, as well as automated software to support decision-making in the context of multiple decision attributes. However, it is important that the decision criteria be established early on in the process so that time is not wasted on formulating programmes that are not acceptable.

Cost-effectiveness analysis is also commonly used to evaluate the outputs and costs of alternative measures. Assuming that one is successful in measuring benefits of a measure, whether they are strictly monetary or represent a composite output score, it is possible to evaluate the measure on common metrics. **Figure C-2** illustrates the concept of cost-effectiveness. For a measure or programme to be cost-effective, no other measure or programme can produce the same output at lower cost and no other programme can produce more output for the same or lower cost. These cost-effectiveness criteria do not imply or ensure that a single best programme is identifiable, and more than one programme can be cost-effective. The key is to exclude those measures that are not cost-effective from further consideration. **Figure C-3** illustrates how one may screen out the programmes that are not cost-effective and/or do not meet some minimum threshold of programme output.

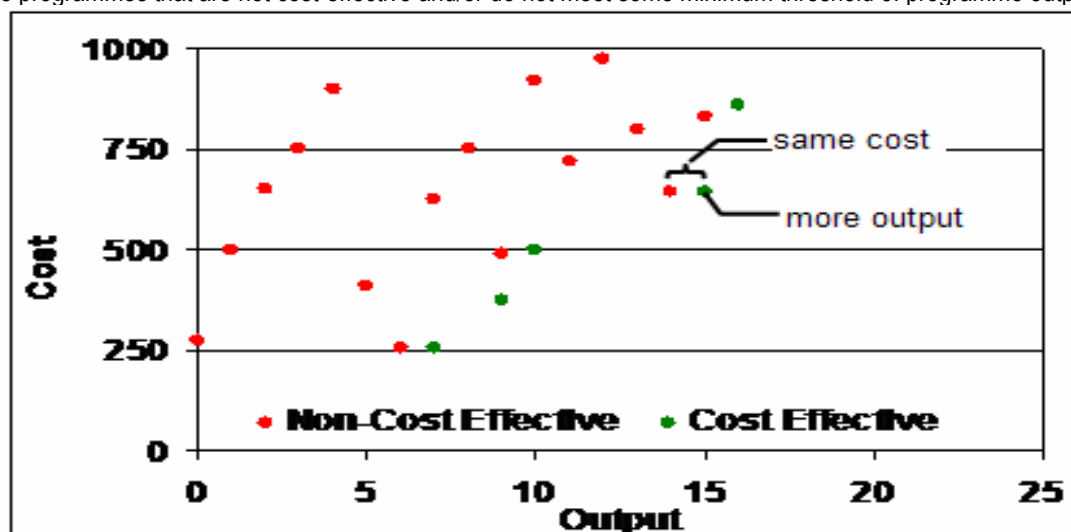


Figure C-2: Identifying Cost-Effective Measures

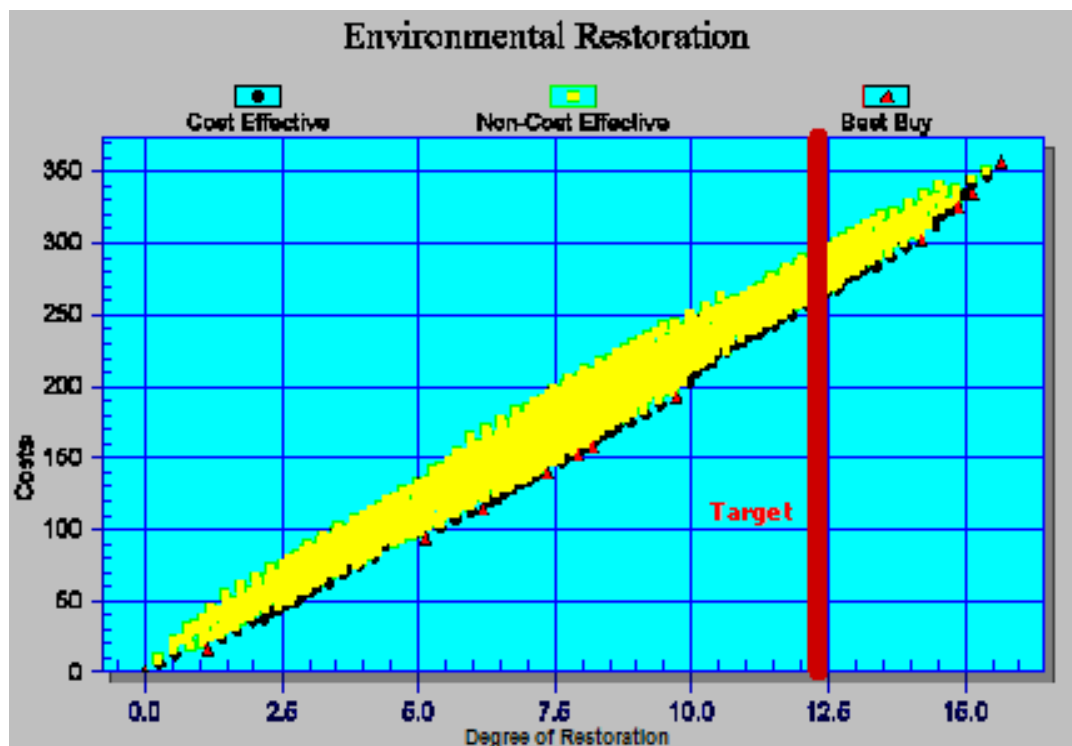


Figure C-3: Screening of Plans that are not Cost-effective nor Able to Produce Target Output

C.1.4 Selection and Recommendation of Programmes

As suggested above, the ultimate selection and recommendation of programmes of measures in any particular application may not rely on measured benefits/outputs, costs, or cost-effectiveness alone. There are bound to be new considerations (or decision criteria) that arise at different times in the planning and evaluation process. Who pays the burden of improving water quality status may become a heavily weighted decision factor. Uncertainty in the impacts of alternative regulatory or market-based measures may become a decision criterion once one examines the results of stream-modelling experiments. In the end, more universal and qualitative assessments may be either required or more appropriate to make final selections of programmes.

In Federal water resources planning and management in the United States, four general criteria are used to confirm the qualities of alternatives before recommending them for implementation. First, is a planning alternative complete? Once the effects of measures have been identified, it is important to scrutinize the plan to ensure that it includes all that is necessary to realize its intended effects. This means considering those things beyond the planners' control. For example, if a plan that relies on complete and voluntary implementation of specific pollution control technologies, then it may not be considered as complete as another alternative whose benefits do not depend on factors beyond the control of the planners.

Second is the programme alternative effective? An effective plan is responsive to the wants and needs of people. An effective plan makes a significant contribution to the solution of some problems and contributes to the attainment of the planning objectives. In the screening process, it is possible to identify alternatives that make little or no contribution to the planning objectives. When the formal evaluation process has been completed, the extent of a plan's effectiveness may well be quantified to varying extents, facilitating a more objective application of this criterion. Although it may be quite simple to say which plan is more effective in creating better water quality, it remains a subjective judgment to say whether a plan is, on balance, effective enough to warrant further consideration as the recommended plan of action.

Third, is the alternative programme efficient? Efficiency is usually interpreted in an economic context. Efficiency refers to the allocation of resources. An efficient plan does not cost more than the value of the outputs it produces, i.e., efficient plans do not waste resources. Pure benefit-cost analyses answer this question in a straightforward way—if there are net benefits then it is efficient to pursue the plan. In cases where it is generally recognized that the monetary value of an alternative programme cannot be reliably estimated, then efficiency becomes somewhat more subjective. In these cases, a useful articulation of the criterion of efficiency is cost effectiveness. An obvious question is, is there a cheaper way to accomplish the same planning objectives. For example, if a programme costs the public the loss of some jobs and there is another way to achieve the same objectives with no or fewer losses in jobs, then this programme is not efficient.

Finally, is the alternative programme acceptable? There is a primary dimension to acceptability—namely one of implementability, meaning is it feasible in the technical, environmental, economic, social, and similar senses. To be acceptable, a programme has to be “doable.” There are many factors that can render a plan infeasible. These factors can generally be categorized as technical (engineering or natural world limitations), economic, financial, environmental, social, political, legal, and institutional. If a plan cannot be done for legitimate reasons, it is not feasible and, therefore, unacceptable. If a plan has opposition it does not make it infeasible or unacceptable. That simply makes it unpopular. If a plan requires changes in laws or authorities, that alone doesn’t make it unacceptable. That only makes it difficult. However, plans that lack fundamental local support and local authority to implement are ultimately, unacceptable. Acceptability can also be defined as the extent to which a plan is welcome or satisfactory. These are qualitative dimensions, not absolutes. If a plan is feasible in a pragmatic sense, in that it could be done, there is no objective way to determine what is welcome or unwelcome, satisfactory or unsatisfactory. Pragmatically, a plan must be acceptable to the National government. This means it meets all legal and policy requirements. And, it must be acceptable to all other parties who have the ability to prevent the plan from being implemented. What this means in practice is far more difficult to identify.

C.2 Summary of General Planning Framework

The sections above have briefly described the primary elements of a general planning framework for implementation of the WFD. It is hopefully clear that the initial characterisations achieved thus far represent a broad reconnaissance-level evaluation of the importance of water to the Irish economy and of the status of its streams. Implementation of measures to achieve good water status will require feasibility-level investigations that will formalize specific planning objectives, analyse and model the impacts of management measures, consolidate measures into programmes, and ultimately help decide on those actions that are the most beneficial in achieving the planning objectives.

Implementation of the WFD will be a challenging application of the planning process. It will be ambitious given the 2015 target for meeting its broad objectives. The analytical and data management requirements of each of the elements of the planning framework should be expected to vary considerably depending on the specific context of application.

C.2.1 A System Response Model Platform

The method of blending the economic statistics, risk factors, and relationships would be the development of a System Response Model (SRM). An SRM is a generalized planning tool used to evaluate a broad range of likely impacts arising from simulated measures or investments in an environmental system. The information to support an SRM is already at hand in the form of GIS databases, risk assessment

methodologies and results, and economic valuation statistics. By blending the scientific risk factors with the economic costs and benefits of improving water quality and use attainability, the SRM can screen all potential measures and provide credible and comprehensive guidance toward satisfying WFD objectives with a cost-effective PoM.

First, an SRM can be programmed to estimate costs of each measure selected for particular scenario evaluation (which may include capital costs, management costs, and opportunity costs). Second, an SRM can be programmed to produce economic indicators based on the relationships between water usability and its value in various economic sectors, such as recreation, supply, and habitat. Third, the SRM can be programmed to yield environmental indicators, such as reduced nutrient loads or fluxes, eutrophication potential, drinking water quality, and others.

The SRM is, in effect, a platform for the integration of economic and scientific analysis, which is precisely what the WFD requires. It would provide comprehensive and multi-sector “what if” guidance by blending the known relationships governing environmental risk factors (from the characterisation efforts) with economic value (resulting from the DEHLG’s independent study). The output would be a predictive measurement of the “benefits” associated with any combination of potential measures. When the aggregate benefits of alternative measures are weighed against programme costs, planners will be able to systematically work toward the identification of the least-cost programme of measures that will achieve “good water quality” and sustainability. A tool that blends environmental and economic considerations would offer very direct in situations where directing policy or investment toward areas with the highest risk may not be commensurate with promoting the greatest economic benefits. While these areas of concern are not necessarily mutually exclusive, it will be extremely important to understand the tradeoffs when making policy decisions and prioritising investments in river basins

Finally, both the WFD and the Wateco economic guidance document emphasize that the process of formulating and implementing a PoM is to be iterative. An SRM will provide a consistent and uniform platform for refining and adapting the scenarios (combinations of simulated measures) and capitalizing on cost-effective combinations by including them in the programmes and building on them. The Wateco guidance document clearly illustrates the process of economic evaluation as an iterative approach such that planners can cyclically screen numerous management alternatives and identify those that offer the most cost-effective progress toward WFD objectives. Likewise, the WFD suggests that follow-up monitoring be used to evaluate the effectiveness of implemented measures so that adjustments can be made as necessary. A System Response Model would serve as a consistent basis for comparative and adaptive management of river basin districts throughout Ireland throughout the life of a PoM, and throughout its implementation.

C.2.2 A Decision-Support Pathway to Cost-Effective Programmes of Measures

The WFD requires development of an integrated regional, basin-wide, approach to water resources planning and management, but provides EU Member States with flexibility in addressing the needs and interests of various governmental authorities and other parties. Thus, a central consideration in WFD implementation relates to the joint needs of the Department and of the several Local Authorities whose territories are encompassed by or are partly within river basin districts and smaller catchments that may be the focus during WFD implementation. Further, the WFD and modern planning practices mandate integrated treatment of a large range of complex factors when management alternatives are to be considered, including political, technical, natural, control, economic, and social factors. Each factor is substantial, and together they constitute a highly complex system that requires sophisticated tools to

develop effective strategies for enhancing water quality. Therefore, it is important that the Department develop a centralised information management and analysis facility, which will allow the development of integrated data management and analysis tools, and will enable overall development, assessment, and comparison of management measures related to the WFD.

The development of a River Basin Management Decision Support System (RBM-DSS) would be a mechanism to integrate the informational and analysis elements of the planning process described in the previous sections. The purpose of an RBM-DSS would be to facilitate accomplishment of key elements of the management strategies of the WFD across Ireland's river basins, including data management and data integration, analysis and reporting. The sections below discuss the major features that would comprise such a system.

C.2.3 Primary RBM-DSS Functional Elements

A complete data management and analytical system should be built around evaluation of water body system responses to potential management measures. The system architecture would need to consist of the following key components that, functioning as a unit, would support implementation of an effective environmental management system.

Integrated Impact Chain Model: This is a basic association model, which indicates which elements of the physical and economic systems will be encompassed by the RBM-DSS, and how they relate. This model would not exist as a computational or data model as other elements of the system might. It is simply a visualization of those aspects of the physical, social, economic, and political world (and their inter-dependencies) that are addressed in an environmental management context. This framework would shape the scope and breadth of problems to be addressed by the RBM-DSS, and help communicate these issues visually.

Interactive System Response Model (SRM): An SRM would become the heart of decision support element of the RBM-DSS, and as mentioned above would be platform used to blend the existing work on economics and environmental risk into a predictive tool to evaluate impacts of a PoM. It is a computer model that would represent those elements of the physical, social, economic, and political world that decision makers will consider in the formulation of measures. The SRM would be developed to provide environmental and economic indicators for macro-level decision guidance, normally at a major catchment level. The SRM, as a system model, would inherently be able to use transform functions to represent physical phenomena and use them to translate a forcing function (driving variable) into a response function (driven variable). It is anticipated that various detailed computer-assisted models would be needed to evaluate elements of the system, such as river mechanics or groundwater flow, that would feed into the SRM. Data for these tools would commonly be provided by manipulation of the GIS and data management system components discussed below. The need for these tools would typically become clear as the SRM component is used to evaluate management measure or geographical areas that may need more detailed analytical focus.

GIS: This element of the RBM-DSS has three major functions. First, it is used to aggregate detailed data into information needed for the macro scale analysis using the SRM. Second, it is used to disaggregate the results of the SRM as necessary to project results in terms of small scale system features. It would also be used to visually display existing conditions and projected impacts of various management strategies.

Enterprise Data Management System: The RBM-DSS would be required to deal with large amounts of information, ranging from the specific data inputs and outputs associated with the other tools internal

and external to the RBM-DSS, to the documents and reports that constitute source information and deliverables associated with individual studies and studies over all. It would represent the heart of communication and memory in the RBMS and would encompass to the extent possible all of the data used to track and evaluate progress on WFD implementation.

C.2.4 Elaboration on Features of System Response Model

A System Response Model is a means of representing key elements of the physical and socioeconomic system and their interrelationships at a planning level of detail, as a support mechanism to facilitate derivation of management measures, sensitivity analysis, and decision making. System response models are particularly useful for portraying and analysing watershed processes that do not normally lead to discrete planning alternatives. As discussed above, an SRM should be a foundational element of the recommended RBMS-DSS.

An SRM can be conceived in many ways, but for present purposes it is defined as a tool that represents elements of the physical river basin system as units, enabling the user to represent movement of quantities and qualities of interest between those units in arbitrary ways. **Figure C-4** illustrates a simple framework that includes representing factors that generates or moves water flows in a system, where a single component may be affected directly or indirectly by the units in the system, including the effects of management measures.

With an SRM, representations of the system and the consequences of decisions can be realised to greater or lesser levels of sophistication as needed. With the use of suitable underlying tools, the SRM can convey the patterns and interactions of the system, and may be used to navigate to any desired level of supporting detail. The units represented can be communicated and visualised as a simple icon and label, but the complexity contained in the algorithms that describe the functional properties of the unit can be developed to any desired degree of complexity.

There are two main types of SRM's. In some river basin management projects, extensive modelling of system components (such as the physical water system, water quality and environmental aspects or costs) has been conducted previously. If this is the case, it is sometimes more appropriate to incorporate such models, or their outputs, into an overall system representation to show the effects of input changes to specific variables. In other cases, an SRM can be prepared on the basis of relatively limited existing data and used to identify linkages between inputs (such as daily loads due to emissions in sub-basins), and resultant outputs (such as water user impacts and sensitivity of water quality impacts to changes in daily loads of emitted substances). In this case, the SRM will combine the understanding and insights provided by the risk assessment efforts and preliminary economic assessment into a single tool aimed at simulating the causal mechanisms within the physical river basin system and the interrelationships with economic variables. This type of preliminary system response modelling can be used to guide:

- Early primary data collection;
- Understanding by all parties of cause-and-effect relationships (and relative magnitudes of likely effects) throughout the river basin system;
- Development of conceptual goal-setting options and management measures for review in conjunction with stakeholders, and in parallel with further data collection; and,
- Comparative evaluation of control options (preliminary screening), after model enhancement and loading of appropriate data.

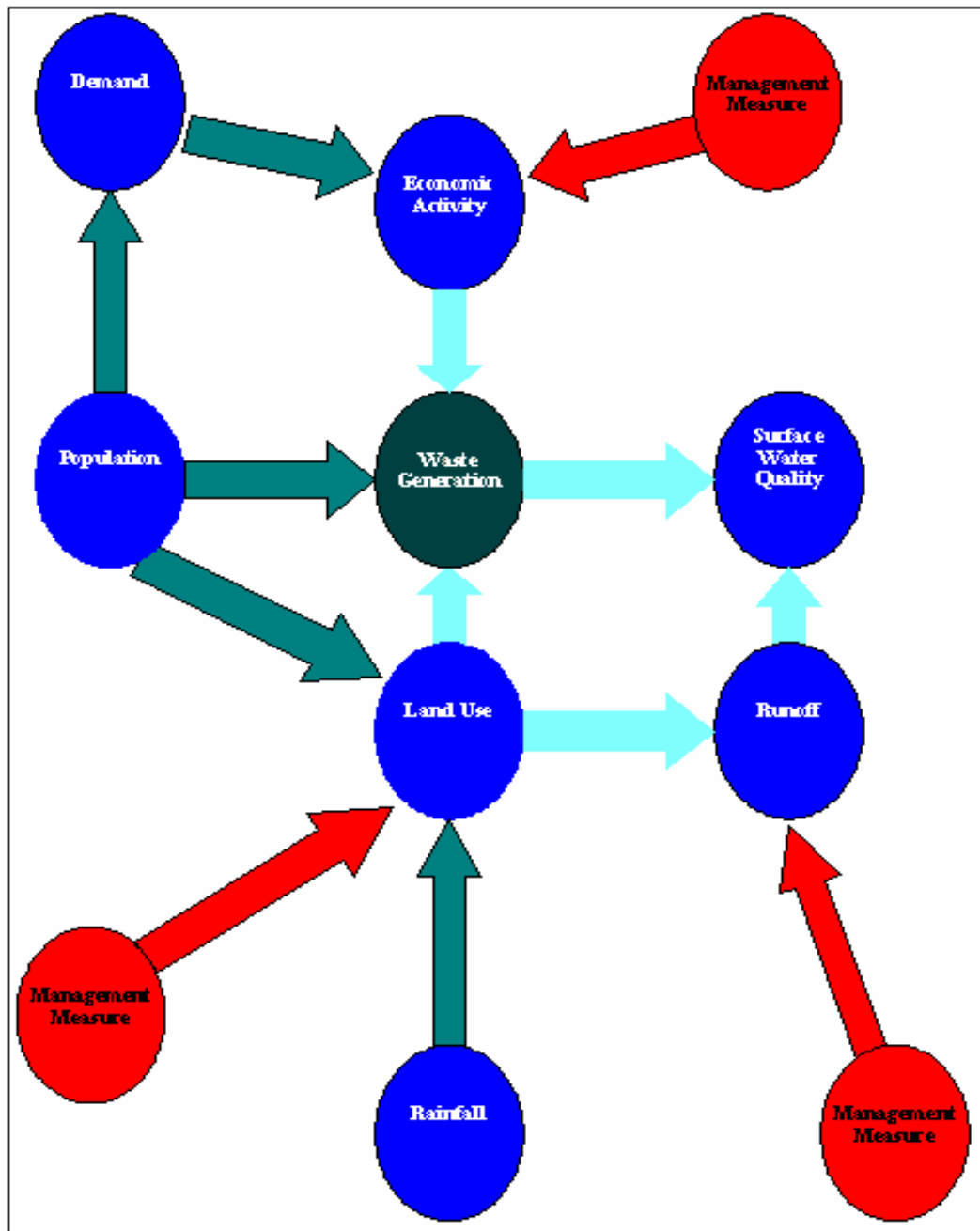


Figure C-4: Simple System Representation

Ensuring overall simplicity and underlying complexity through the use of the SRM is important, for two main reasons. First, the ability to mesh broad patterns of relationships with supporting details in a compelling and convincing way provides users of all types with access to descriptions of the problem that are congruent with their personal communication preferences. Second, because stakeholders can clearly observe where full details of their area of expertise are represented in the system, they may observe how specific details mesh with the problem as a whole.

C.2.5 Formulating and Evaluating Measures Using an SRM

An RBM-DSS developed around the SRM framework would facilitate rapid evaluation of management alternatives at a general level of detail and thereby effectively evaluate a general Programme of Measures with respect to costs and the likely environmental and economic impacts within a catchment, as a composite of impacts at possibly finer geographic levels. Planners and decision-makers could select measures to investigate, and would be able to represent those measures in terms of changes in characteristic loading or impact parameters (for example percent reduction in certain loads). Such a system would simulate general impacts of such measures, and would present several levels of decision support information, including:

Screening Level Information -- to compare overall economic and environmental consequences associated with different management scenarios.

An SRM could be developed to process each management scenario for a catchment (defined by the users) and present a limited amount of on-screen graphical results immediately. These results could take the form of environmental and economic indicators (examples of which are shown in **Figure C-5**) or decision criteria. These indicators could be used to identify or compare the overall “health” of the water resources in a catchment, and what impact various types of measures are likely to have. They would be displayed on-screen so that users of the program could receive immediate feedback on likely system response patterns to any scenario. This generalized type of information would help planners screen potential management strategies in a more expedited fashion.

Quantitative Information -- to help predict and aggregate economic benefits and costs, and physical responses of the system resulting from different management scenarios.

An SRM approach would consist of a reporting model that could provide planners with more quantitative information than would be available from the indicators alone, and would help differentiate between measurement alternatives with more resolution. Planners could use this information to identify sensitivities of the system to various measurement strategies, and can also investigate the cost-benefit tradeoffs between different programmes of measures. Quantitative reporting data might include:

- Listing of mitigation or management measures applied (and their general categories, such as point source abatement, non-point source management, etc.), and the extent to which each measure is applied.
- Estimated economic costs/damages of selected management measures.
- Numeric and graphical comparisons of total annual pollutant loads under the simulated measures and for baseline conditions.
- Hydrologic summary (annual inflows and outflows from the catchment).
- Water use summary for selected management measures and baseline conditions.
- Summary of fluxes into downstream basins, if applicable.

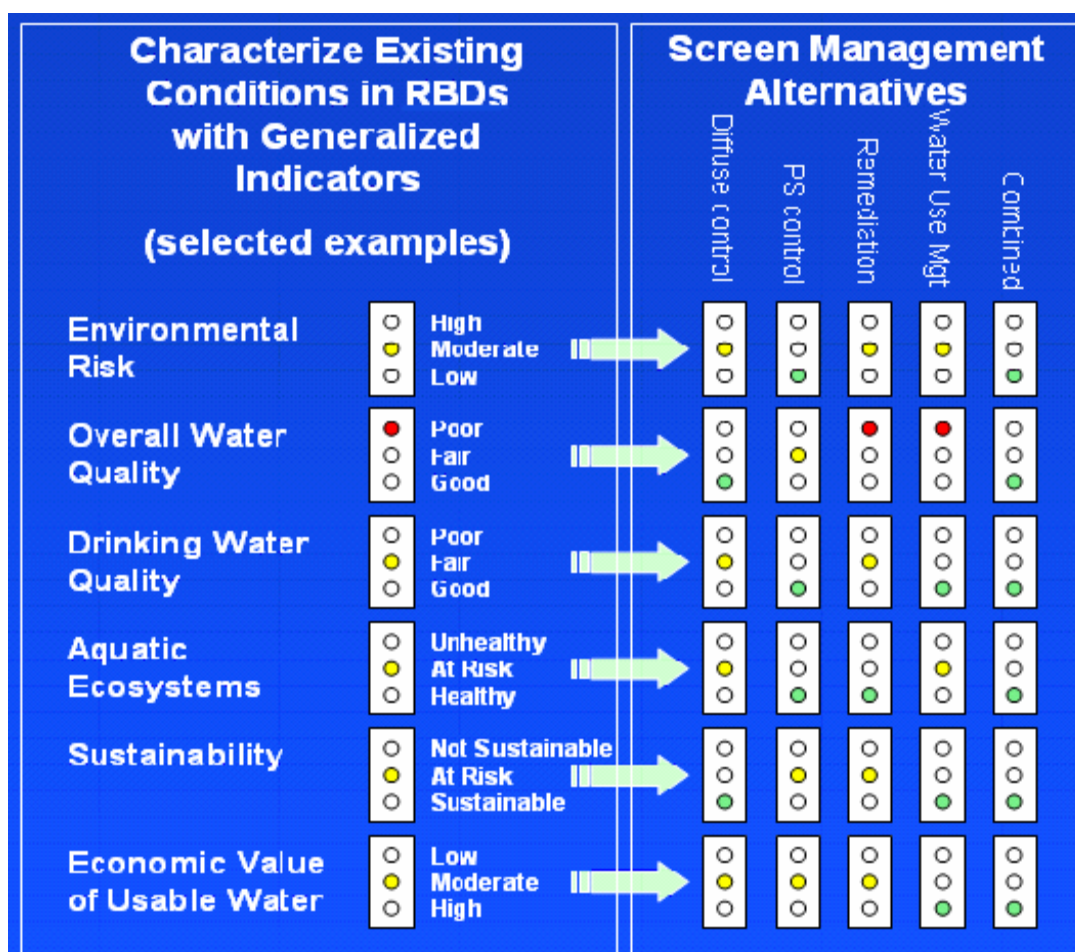


Figure C-5 Sample Management Indicators

Ultimately, the objective of the SRM is to help identify appropriate programmes of measures, and its primary utility will therefore be its ability to screen management approaches for those with the greatest environmental and economic potential. An SRM would represent the behaviour cause-effect relationships that, for example, might show how water quality is improved as money is invested in controls, and in turn how recreational potential of waterways is likely to improve with a given change in water quality. The net result is a chain of consequences that ties several factors together. Other consequences could of course be added on to such a basic model of behaviour, to the point where all major factors of management interest area represented in the SRM. It is fully expected that the SRM will help identify water bodies or sub-catchments in which more refined analysis or simulation is warranted, and such further studies can be undertaken with tools designed to evaluate site-specific environmental responses with high resolution.

Visual Information is required, to communicate results in a graphical form facilitating user comprehension and ease of operation. An SRM should be developed to interface with GIS for post-processing and visual display. This feature would be useful in two ways. First, it could be used to spatially distribute generalized results across a catchment – that is, results generalized over a catchment can be disaggregated (by land use or water body) to project results in terms of smaller scale features of the system (and potentially identify the need for higher resolution analysis of certain features). Second, by visually presenting results in GIS (comparing pollutant loads from various types of sources for different scenarios, for example), planners and decision makers can more effectively communicate SRM results to the public and to administrative stakeholders, and ultimately, decisions can be more solidly justified. Examples of the types of post-processing and displays that could be explored for the GIS output include:

- Differences in pollutant loads between catchments and between scenarios;
- Differences in environmental indicator status between catchments and between scenarios;
- Differences in response patterns to various management scenarios within a catchment;
- Distribution of generalized impacts by land use (disaggregation of SRM results);
- Location of key environmental indicators (beaches, lakes, farmland, etc.); and,
- Spatial interpolation of results if key inputs are known to be spatially varied throughout a catchment (disaggregation of SRM results).

C.2.6 RBM-DSS Summary

The Water Framework Directive states that economic considerations should be blended with technical planning as EU member countries undertake the water management and planning activities associated with the Directive. An RBM-DSS designed around an SRM framework would provide a platform for aggregating all environmental and economic indicators into a predictive measurement of the “benefits” associated with any programme of measures. When the aggregate benefits are weighed against programme costs, planners can efficiently work toward the identification of the least-cost programme of measures that will achieve “good water quality” and sustainability, or the programme that yields the greatest overall benefits, or some combination thereof. An RBM-DSS would become a powerful tool for investigating both environmental and economic tradeoffs and sensitivities throughout the Republic of Ireland, its River Basin Districts, and its sub-areas.

The process of economic and environmental evaluation is an iterative approach that consists of cyclical screening of numerous management alternatives, which seeks to identify those measures that offer the most cost-effective progress toward WFD objectives. An RBM-DSS would be designed to be used specifically in this manner, and its primary functional value would be to make the process of iteration as systematic and comprehensive as possible. By building in the economic assessment of programmes of measures into the SRM, one would integrate economic and scientific evaluation in a systematic tool designed specifically to evaluate and compare programmes of measures, which if developed early on would provide a framework for decision-making throughout the full implementation phase of the WFD.