

North-Western International River Basin District

north western
international
river basin district



North South Shared Aquatic Resource (NS SHARE)

Characterisation Summary Report *for the Republic of Ireland portion of the River Basin District*



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Accompanying information – the results of the risk assessments are available through a reporting tool on the WFD Ireland website (www.wfdireland.ie). A link to the reporting tool is also available on the NWIRBD website (www.nwirbd.com/reportingtool.html)

1.0 Introduction

1.1 Water Framework Directive

As part of a substantial restructuring of European Union (EU) water policy and legislation, a Directive establishing a new framework for Community action in the field of water policy (2000/60/EC) came into force in December 2000. The Directive, generally known as the Water Framework Directive (WFD) rationalises and updates existing water legislation and provides for water management on the basis of River Basin Districts (RBDs).

The WFD is a wide ranging and ambitious piece of European environmental legislation setting clear objectives to ensure that all waters achieve at least “good status” by 2015, that “high status” is maintained where it exists and any deterioration in the existing status of waters is prevented. The initiative applies to all Europe’s groundwaters, rivers, lakes, transitional waters (estuaries) and coastal waters.

The WFD sets common EU wide objectives for water. It provides for a new, strengthened system for the protection and improvement of water quality and dependent ecosystems. The overall ethos of the Directive is to bring about the effective co-ordination of water environment policy and regulation across Europe in order to:

- protect and enhance the status of aquatic ecosystems (and terrestrial ecosystems and wetlands directly dependent on aquatic ecosystems)
- promote sustainable water use based on long-term protection of available water resources
- provide for sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use
- provide for enhanced protection and improvement of the aquatic environment by reducing / phasing out of discharges, emissions and losses of priority substances
- contribute to mitigating the effects of floods and droughts
- protect territorial and marine waters
- establish a register of 'protected areas' e.g. areas designated for protection of habitats or species.

Article 3 of the WFD requires individual river basins to be identified and assigned to **River Basin Districts**, which, for the purposes of the Directive, are used as the main unit for managing the water environment. A River Basin District (RBD) can include several individual river basins or catchments which are defined as:

“The area of land from which all surface run-off flows through a sequence of streams rivers, and possibly lakes into the sea at a single river, mouth, estuary or delta.”

RBDs refer to a natural, environmental unit rather than to administrative or legal boundaries and as such, can cross international borders. Coastal and groundwater bodies are also assigned to RBDs.

The River Basin Management Planning process requires the preparation, implementation and review of a River Basin Management Plan (RBMP) over six yearly cycles for each RBD identified. This requires an iterative approach to river basin planning and management that will integrate all relevant factors in addressing the issues pertinent to water quality. There are four main elements of the process:

1. **Environmental** and **economic assessment** or '**characterisation**' of the river basin district and the pressures and impacts on the water environment;
2. Environmental **monitoring** based on river basin characterisation;
3. Setting of environmental **objectives**; and
4. Design and implementation of a **programme of measures** to achieve environmental objectives.

The RBMP will ensure that the management of our waters are planned and implemented in a way that achieves the best possible balance between the protection and improvement of the water environment and the interests of those who depend on it for their livelihood and quality of life.

Within the European Union there are many "international river basin districts" (IRBDs) which are shared between Member States. An important feature of the WFD is a planning mechanism, which requires co-operation between Member States to ensure that water quality targets for shared waters are met.

1.2 Legislation Transposing the WFD into Irish Law

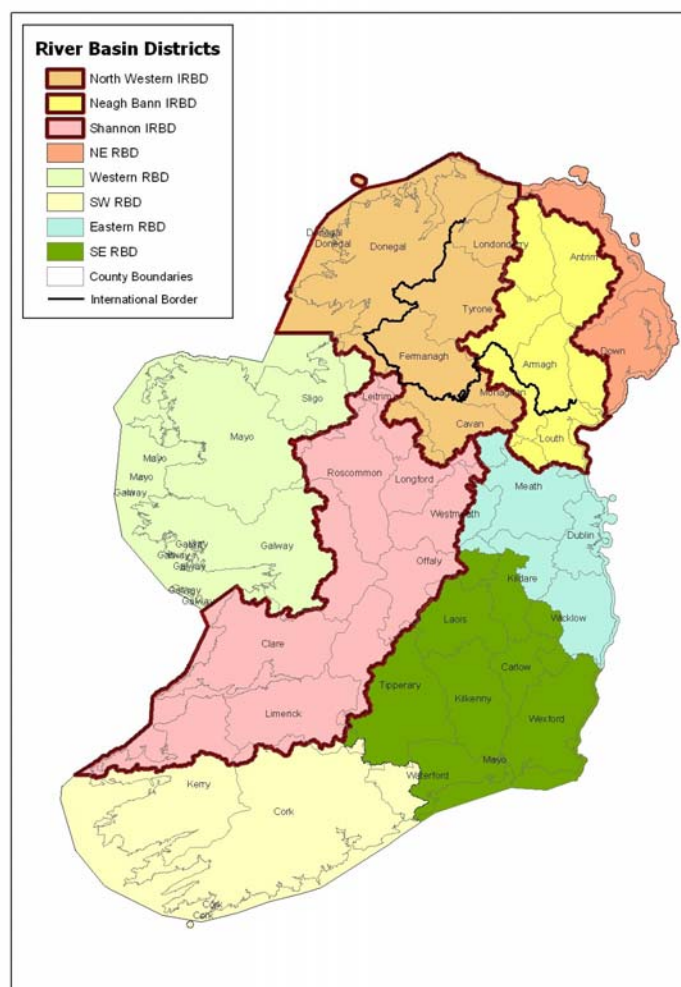
The WFD was transposed into Irish Legislation by the European Communities (Water Policy) Regulations 2003, (Statutory Instrument No. 722) in December 2003. Table 1.1 shows the implementation timetable as scheduled in Irish legislation.

In brief, the legislation provides for the protection of the status of all waters, the establishment of RBDs, co-ordination of actions by relevant public authorities for water quality management in an RBD, characterisation of each RBD, establishment of environmental objectives and the development of programmes of measures and river basin management plans (RBMP).

In addition, **Water Policy Regulations (Amendment) (Statutory Instrument No. 413)** was published in 2005. These regulations amend Article 16 of the 2003 regulations (which relate to the establishment of River Basin District Advisory Councils) in relation to matters such as the size, composition, duration and time of establishment of the councils. The Regulations also amend the list of relevant public authorities in the First Schedule of the 2003 Regulations (www.wfdireland.ie).

Table 1.1 Implementation timetable as scheduled in EC Water Policy Regulations (S.I. 722, 2003)

Key Date	Key Tasks	Public Information and Consultation (ongoing)
22 nd December 2003	Implementation of the WFD on a National level	
22 nd June 2004	Establishing of River Basin Districts as the fundamental unit for applying and co-ordinating the Directive's provisions	
22 nd December 2004	Characterisation of River Basin Districts	
22 nd June 2006	Develop Classification systems for surface water and groundwater	
	Establishing and maintaining appropriate Monitoring Programmes - operational by 22nd December 2006	
	Prepare and publish a work Programme and Timetable for the production of River Basin Management Plans (RBMP)	
22 nd June 2007	Prepare and publish an overview of the significant water management issues identified in each river basin	
22 nd June 2008	Prepare and publish draft RBMPs and allow six months for written comment.	
	Publish a draft Programmes of Measures for comment by any person for a six month period	
22 nd June 2009	Establish environmental objectives and final Programmes of Measures and developing RBMPs for their implementation	
	Making of RBMPs	
2010	Water Pricing Policies that take into account the principle of 'cost recovery' for water services	
2012	Latest date for making operational the Programme of Measures	
2015	Meet environmental objectives of first RBMP and adopt the Second RBMP	



Map 1.1 River Basin Districts delineated for Ireland

1.3 Purpose of this report

One of the first major milestones required of Member States by the WFD was the preparation of Summary Characterisation Reports (under Article 5) for each RBD in their jurisdiction. The national report for the Republic of Ireland (RoI), which can be found on the Water Framework Directive Ireland website, <http://www.wfdireland.ie> includes:

- an analysis of RBD characteristics,
- a review of the impact of human activity on the status of waters, and
- an economic analysis of water use.

This document provides a summary of the characterisation information specifically relating to that section of the North Western IRBD located within the Republic of Ireland. It does not present pressure and impact analysis data relating to Northern Ireland. The report outlines the estimated risk of a water body not achieving the Directive's objectives by 2015. The report also highlights the key pressures acting in the river basin district.

1.4 North Western International River Basin District

Eight RBDs have been established on the island of Ireland (Map 1.1). The North Western International River Basin District (NWIRBD) is one of three "international" river basin districts (IRBDs) within the island of Ireland. The basin was delineated jointly by the Department of the Environment (DOE) in Northern Ireland and the Department of the Environment, Heritage and Local Government (DEHLG) in the Republic of Ireland. These authorities are responsible for the implementation of the WFD and are co-operating to ensure the co-ordinated sustainable management of our water environment.

The extent of the entire NWIRBD, showing the main population centres and county boundaries, is illustrated in Map 1.2. The RoI portion of the NWIRBD drains all of County Donegal, significant portions of counties Cavan, Monaghan, and Leitrim, and smaller portions of Longford and Sligo.

The main catchments within the NWIRBD include the cross-border Foyle and the Erne systems and the main lakes include Upper and Lower Lough Erne, Lough Macnean and Lough Melvin.

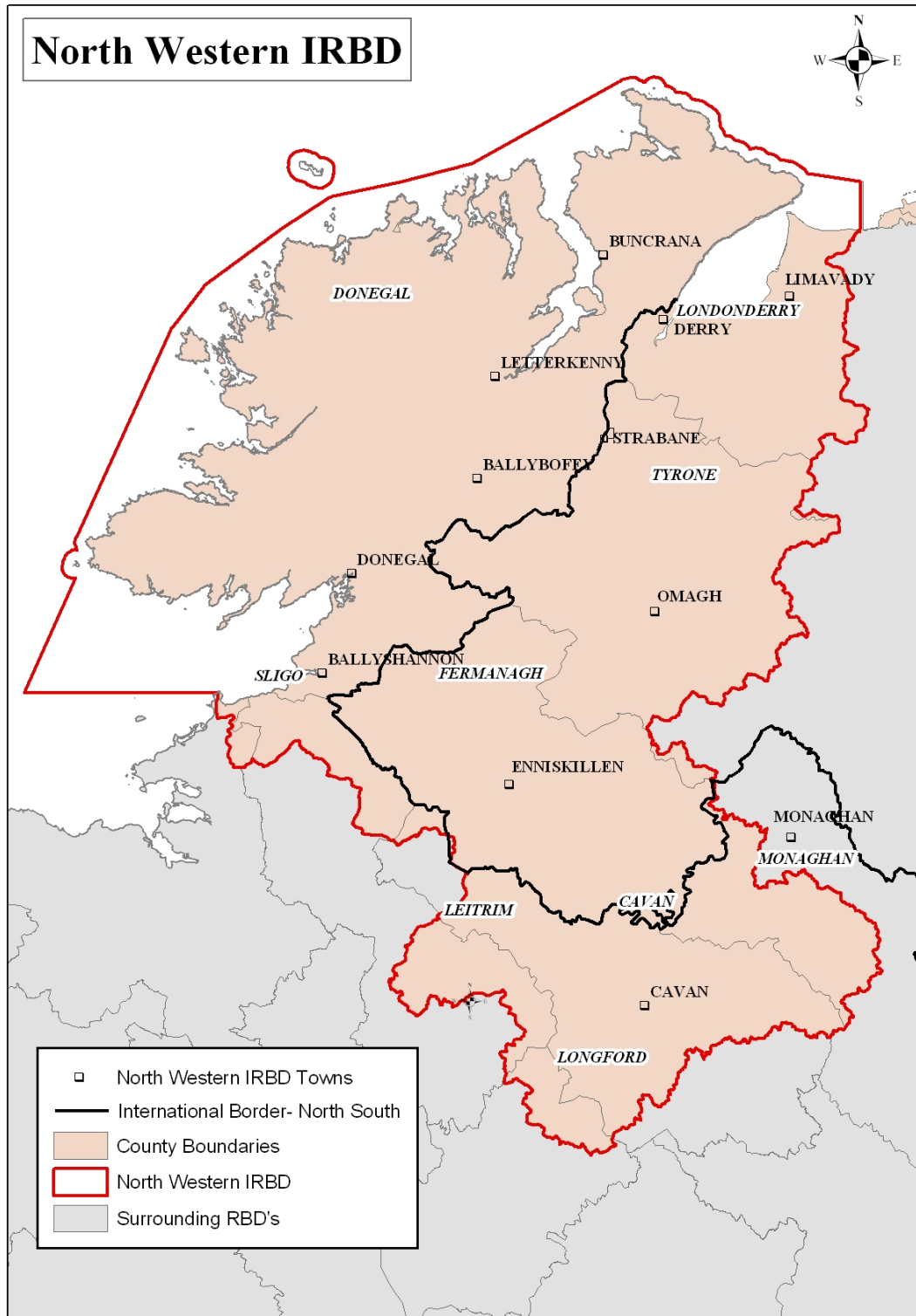
Agricultural and natural areas represent the main land-use within the NWIRBD. The fertile Foyle basin and valley supports intensive and arable farming. In the Erne catchment the predominant land use is pasture, reflecting the rural nature of the catchment and subsequent reliance on livestock farming. Intensive farming mainly consists of beef, dairy, sheep and pig farming. The upland regions of the NWIRBD support coniferous forest plantations, as well as sheep and cattle grazing.

The RBD as a whole has a low population density. The portion of the NWIRBD in the Republic of Ireland has a population of 201,096 persons. Approximately 70% of this

population is in county Donegal, and 17% in Cavan. Counties Monaghan, Leitrim, Longford and Sligo comprise the remaining 13% in decreasing proportions respectively. There are some urban population clusters including the main towns of Letterkenny, Cavan, and Ballybofey. In total it is estimated that less than 2% of the RBD is urbanised.

The western portion of the district within RoI, namely County Donegal, is dominated by glacial deposits of schist, quartzite and granite. The northeast-southwest quartzite strip, due to its erosion resistant properties, has resulted in ridges of mountains such as Errigal, Muckish and Crocknafarragh. Glacial inlets such as Lough Swilly characterise the northwest coast of the district. To the northeast of the district, Lough Foyle is formed by sedimentary rocks and has a long history of subsidence. Metamorphic basement rocks dominate the northern portion of the district although younger Carboniferous and Triassic sandstones and mudstones occur to the east. Carboniferous and Devonian mudstones, limestones and sandstones form the majority of the southern portion including the area around the Lough Erne system. To the south east, older Ordovician/Silurian greywackes and mudstones occur. There is extensive coverage of superficial deposits, mainly glacial till, but also sand and gravels.

The climate is temperate; rainfall exceeds 2000 mm per year in the upland regions of Donegal, compared to annual rainfall of approximately 1000 mm in the low lying areas.



Map 1.2 North Western International River Basin District (NWIRBD)

2.0. Typology

2.1 Introduction

All waters within the NWIRBD were differentiated into water categories: groundwater, rivers, lakes, transitional waters (estuaries) and coastal waters. The waters in each of these categories were sub-divided into smaller units called water bodies, and these are the basic compliance, reporting and management unit for the WFD.

Water bodies have also been classified based on natural factors such as altitude, geology or size. These are factors that might influence the plants and animals dependent on the waters. This system of classifying waters according to meaningful types is called typology.

2.2 Groundwaters

The island of Ireland has a diverse, complex bedrock and subsoil geology. Consequently, the groundwater flow regime varies from inter-granular flow in subsoils to fissure flow in bedrock and karstic (conduit) flow in limestones. Groundwater body typology is based on the flow regime of the aquifer. Boundaries between different water bodies are delineated where there is little or no flow across them. Four groundwater body types have been identified, based on flow regime, namely karstic, productive fissured bedrock, gravel and poorly productive bedrock.

Based on these four types, 72 groundwater bodies have been delineated in the RoI portion of the NWIRBD - 29 of these are cross-border bodies. Ongoing delineation and characterisation of these cross-border groundwater bodies may result in some redefining of water body boundaries. Table 2.1 indicates the number of groundwater bodies within each of the four types identified.

Table 2.1 Groundwater Body Types in the RoI portion of NWIRBD

Groundwater body types based on flow regime	Number of Water Bodies	% of number	% area of RoI portion of RBD
Karstic	13	18.1	6.7
Productive fissured bedrock	13	18.1	5.1
Gravel	6	8.3	0.6
Poorly productive bedrock	40	55.6	87.6

2.3 Surface Waters

The WFD requires the surface waters of a RBD to be placed into one of four natural categories – river, lake, transitional (estuaries) or coastal, or alternatively, identified as an artificial or heavily modified water body. An artificial water body is defined as a body of surface water created by human activity. A heavily modified water body is a body of surface water which as a result of physical alterations by human activity is substantially changed in character, and as such is designated under Annex II of the WFD (Chapter 5.0).

Based on the concept of typology described above, each surface water category is further split into water bodies that are ecologically distinct. The WFD recognises that important physical factors (such as altitude, depth, size, flow, catchment rock type and tidal regime), dictate the plants and animals that would typically be found within a water body. For example the type of insects found in a fast flowing hardwater river will be very different from those supported by a sluggish siliceous river. Consequently, the Directive requires that surface water bodies are differentiated according to “type” using appropriate physical characteristics. A more detailed description of the typology processes can be obtained from the National Characterisation Report (Ref 1) on Ireland’s WFD website, www.wfdireland.ie.

2.3.1 Rivers

Irish rivers have been allocated to one of twelve primary types, which have been shown to be ecologically meaningful in unimpacted river systems. The Irish typology system is based on geology (associated with its impact on water hardness) and channel slope (representative of water velocity). Three levels of hardness (soft, medium and hard) and four slope conditions (low, medium, high, and very high) are distinguished and combined to give the 12 different river types. Table 2.2 provides a definition of the Irish river types derived from the typology system.

Table 2.2 Definition of the Irish River Types based on the Typology System

Code:	Catchment Geology (% bedrock in upstream catchment by type)	Description	Water Chemistry (where data are available)
1	100% Siliceous	Soft water	<35 mg CaCO ₃ /l
2	1-25% Calcareous (Mixed Geology)	Medium hardness	35-100 mg CaCO ₃ /l
3	>25% Calcareous	Hard water	>100 mg CaCO ₃ /l
Code:	Slope (m/m)		
1	<=0.005	Low Slope	
2	0.005-0.02	Medium Slope	
3	0.02-0.04	High Slope	
4	>0.04	Very High Slope	
Legend			
Examples of Type Codes			
The two codes from above are combined in order geology first digit and slope second digit			
e.g. A code of 31 indicates a calcareous low-slope site			
e.g. A code of 23 indicates a mixed geology and high slope of between 2 and 4% gradient			

There are 665 river water bodies in the RoI portion of the NWIRBD. Approximately half of these are siliceous (or soft water) types covering a range of channel slope conditions. In addition, approximately 150 cross-border river water bodies exist within the NWIRBD. These have not yet been assigned a typology or included in the pressure and impact analysis. Table 2.3 summarises the percentage of river channel within each of the major river types for the RoI portion of the NWIRBD.

Table 2.3 Breakdown of the River Types for the NWIRBD within RoI (excluding cross-border river water bodies)

River Water Body Type				
Hardness	Slope	Number of River Water Bodies	Channel Length (km)	Channel Length (%)
Soft	Low	54	311.13	13.25
Soft	Medium	140	424.20	18.07
Soft	High	100	218.81	9.32
Soft	Very High	63	85.57	3.64
Medium	Low	43	321.20	13.68
Medium	Medium	55	243.24	10.36
Medium	High	24	66.35	2.83
Medium	Very High	13	37.22	1.59
Hard	Low	58	282.99	12.05
Hard	Medium	69	272.56	11.61
Hard	High	29	52.65	2.24
Hard	Very High	17	31.76	1.35

2.3.2 Lakes

The typology system for lakes in the Republic of Ireland has identified 13 general types using alkalinity (as a surrogate for geology), depth and size as the dictating parameters. Irish lake water bodies include all large lakes (above the WFD reporting threshold of 50 hectares) and small lakes which are listed as protected areas (e.g. SACs or lakes used for drinking water abstraction). There are 227 lake water bodies in the RoI portion of the NWIRBD. There is one cross-border lake in the NWIRBD, which spans the Northern Ireland/Republic of Ireland border. This is Lough Melvin in County Leitrim (RoI) and County Fermanagh (NI). Typology information is available for 49 large lakes which places them into eight different types (mainly low and moderate alkalinity groups).

2.3.3 Transitional and Coastal Waters

The typology scheme for transitional and coastal waters uses the factors of tidal range, salinity and exposure, with special categories for coastal and transitional lagoons. Applying the typology factors to the water bodies within the RoI portion of the NWIRBD has resulted in 22 transitional water bodies (falling into two types) and 23 coastal water bodies (falling into four types). Lough Foyle and Portstewart Bay are cross-border coastal water bodies. There are two cross-border transitional water bodies, the Foyle and Faughan estuaries. Table 2.4 summaries the transitional and coastal water bodies by type in the RoI portion of the NWIRBD.

Table 2.4 Transitional and Coastal Water Bodies by Type in the NWIRBD

Type	Description	Number of Water Bodies
TW2	Transitional: Meso or Polyhaline, Strongly Mesotidal, Sheltered	14
TW6	Transitional: lagoons: Oligo or Polyhaline, Mesotidal, Sheltered	8
CW2	Coastal: Euhaline, Mesotidal, Exposed	5
CW5	Coastal: Euhaline, Mesotidal, Moderately Exposed	12
CW8	Coastal: Euhaline, Mesotidal, Sheltered	6
CW10	Coastal Lagoon	1

3.0 Register of Protected Areas

Protected areas are defined as those requiring special protection of their surface water or groundwater, or for the conservation of habitats and species directly depending on those waters. Protected areas are included under the WFD in order to bring all water related EC legislation under one umbrella. Article 6 of the WFD requires each Member State to establish a register of protected areas. The EPA has established a register for the RoI portion of the NWIRBD. The protected areas are divided into six main categories as follows.

Areas designated for the abstraction of water intended for human consumption

Currently rivers and lakes intended for abstraction of water for human consumption are protected under the Surface Water Abstraction Directive. Protected areas were also identified in relation to groundwater abstraction; in fact all groundwater bodies were included because they are all potentially drinking water supplies.

Areas designated for the protection of economically significant aquatic species

These protected areas are previously designated under EC directives aimed at protecting shellfish and freshwater fish. These areas are currently under review.

Areas designated as recreational & bathing waters

These are bathing waters which have been designated under the Bathing Waters Directive.

Nutrient Sensitive Areas

Nutrient sensitive areas have been designated under the Urban Waste Water Treatment Directive (UWWT).

Areas designated for the protection of habitats (including birds)

These are areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection. These include Salmonid waters, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). SACs are strictly protected sites designated under the EC Habitats Directive. The objective of such designation is to protect some of the most seriously threatened habitats and species across Europe. SPAs are designated under the European Commission Directive on the Conservation of Wild Birds (The Birds Directive). All European Community member States are required to identify internationally important areas for breeding, over-wintering and migrating birds and designate them as SPAs.

Table 3.1 summarises the existing Protected Areas throughout the RoI portion of the NWIRBD.

Table 3.1 Areas designated under the Rol Register of Protected Areas in the NWIRBD

Protected Area	River Water Bodies	Lake Water Bodies	Transitional Water Bodies	Coastal Water Bodies	Groundwater Bodies	Number of Designated Areas
Drinking Waters	44	75			79	
Economically Significant Aquatic Species	172	9		1		
Recreational and Bathing Waters				22		
Nutrient Sensitive Waters	40	3		1		
Protection of Habitats	7	1				
Water Dependent Special Areas of Conservation (SAC)						77
Water Dependent Special Areas of Protection (SPA)						27

4.0 Risk Assessment

4.1 Introduction

The WFD required each Member State to complete an analysis of pressures and impact (P & I) by December 2004 and report on the findings by March 2005. The competent authorities within the NWIRBD achieved these deadlines. The results of the analysis are presented in the national characterisation report and synthesis reports which were submitted to Europe. The national documents are available, to those who want to explore technical detail, on Ireland's WFD website (Ref 1) (www.wfdireland.ie).

This section of the NWIRBD summary report aims to extract the key findings of the P & I analysis relevant to the Republic of Ireland and to highlight what issues need to be focussed on to prepare a River Basin Management Plan for the district.

The P & I analysis considered water status issues from the top down (looking at drivers which cause **pressures** on waters) and from the bottom up (looking at what we know today about **impacts** on water status).

Four categories have been used to describe the P & I analysis results (Table 4.1). The analysis is a risk based assessment, which means that it deals with the likelihood that a waterbody will not meet its WFD status objectives. For example the waterbodies experiencing the greatest degree of a pressure are least likely to achieve the target of at least good status, and likewise any water body already impacted (that is failing existing environmental targets) is unlikely to achieve good status in WFD terms. The P & I analysis also identifies areas where additional information or investigation is needed to improve confidence in the risk assessment.

Member States must investigate a variety of pressures ranging from familiar point and diffuse pollution issues to abstraction, flow regulation and morphology (together known as hydromorphology) pressures which might impact on the flow or physical regime of the water body and consequently affect the natural flora and fauna. The range of pressures considered in the P & I analysis covers all those identified by the European WFD implementation guidance.

Table 4.1 Risk Categories

EU Commissions reporting risk categories for water bodies	Irish equivalent reporting categories for water bodies
Water bodies for which it is already clear without the need for further characterisation or additional monitoring data, that the objectives will be failed;	1a - Water Body at significant risk on the basis of available information for which confidence in the available information being comprehensive and reliable is high
Water bodies for which it is possible that the objectives of the Directive will be failed but, because of inadequate data, further characterisation and operational monitoring are considered necessary to be sufficiently confident that this is the case;	1b - Water Body probably at significant risk but for which further information will be needed to confirm that this view is correct
	2a - Water Body probably not at significant risk on the basis of available information for which confidence in the available information being comprehensive and reliable is lower
Water bodies for which it is already clear, without the need for further characterisation or additional monitoring data, that the achievement of the objectives are not at risk.	2b - Water Body not at risk on the basis of available information for which confidence in the available information being comprehensive and reliable is high

Water bodies which fall into the Irish risk categories **2a** and **1b** will require further characterisation to improve information and allow more refined assessments to be made up to 2008.

Risk assessment methods were developed and applied to all groundwaters, rivers, lakes, transitional (estuaries) and coastal water bodies within the study area. The purpose of applying risk assessments was to assess the degree or significance of pressure on a water body. The detail behind the risk assessment methodologies is contained in background documents which support the national characterisation report, and they are available through the WFD Ireland website mentioned above. The results of the P & I risk assessments applied in the RoI portion of the NWIRBD are contained in the following sections of this chapter.

It is important to note that much WFD related work is still ongoing to refine our understanding of pressures and impacts, and to define water status as outlined in the WFD. However, the P & I analysis that has been undertaken makes use of the best information available to identify the issues requiring further investigation and to prioritise the key issues for water management. Analysis is largely based on currently available information, and further studies will be undertaken to look at how changes in drivers and pressures could affect water management issues. The P & I assessment is an iterative procedure (forming part of a management cycle). The first analysis presented in this report must be thought of as an “initial characterisation” which provides an appropriate basis to develop the next phase of the river basin management planning process.

4.2 Groundwater Risk Assessment

4.2.1 Overview of the Groundwater Risk Assessment Approach

The WFD sets objectives of good quantitative and chemical status for groundwaters. Risk assessments based on the pressure, source, pathway and receptor model were used to determine the degree of risk associated with a groundwater body for a given pressure. Impact information was then used, where available, to verify the risk assessment.

Groundwaters feed surface freshwater systems such as rivers, lakes, fens and turloughs which eventually flow into transitional and coastal waters. To take account of these links between groundwater and surface waters, the environmental objectives for groundwater also considered the risk to these downstream receptors as well as to the groundwater bodies themselves. As groundwater is also an important source of drinking water supply, the risk assessment also considered human health standards.

Many chemicals from various diffuse and point sources can potentially put groundwater at risk. For the purposes of the risk assessments chemical pollutants were grouped into four categories according to similarities in behaviour as they move through groundwater pathways. The grouping also takes account of whether the substance decays or is conservative (organic or inorganic, respectively) and whether the substance is adsorbed within the structure of the soils, subsoils and aquifer (mobile or less mobile).

In total, 30 separate groundwater risk assessments were applied dealing with all receptors and pollutants. These were broadly categorised into three different pressure types:

- groundwater abstractions/water balance;
- diffuse source pollution and;
- point source pollution.

4.2.2 Quantitative Risk Assessment - Significant Abstraction Pressures

This assessment considered the overall water balance assessment for the groundwater body (i.e. the level of water abstraction sustainable in terms of water recharging the groundwater body without impacting on the water requirements of dependent systems, such as rivers and lakes and Ground Water Dependent Terrestrial Ecosystems (GWDTE). While many aquatic eco-systems depend on the quality of groundwater bodies, many terrestrial eco-systems depend on them also. Examples include turloughs; fens and dune slacks whereby groundwater either discharges to the surface or to the rooting zone of vegetation. Consequently, the ecological potential of the eco-system is determined by the associated groundwater body. In relation to saline intrusion, groundwater bodies were assessed in localised areas where it was considered there may be a potential impact.

There are a total of 72 groundwater bodies in the Rol portion of the NWIRBD. The results of this risk assessment indicated that all groundwater bodies can be classified as not at risk due to abstractions and saline intrusion.

4.2.3 Chemical Risk Assessment

The groundwater risk assessment integrates pressures and impacts with physical characterisation, using the pressure-pathway-receptor approach, i.e. the likelihood of pollutants being transmitted to a receptor.

The chemical pollutants from diffuse and point sources have been grouped into four sectors.

- Mobile inorganic substances e.g. Nitrate
- Certain agrochemicals
- Certain pesticides
- Less mobile organic substances e.g. agrochemicals which bind to soil

4.2.4 Diffuse Risk Assessment

This assessment consisted of the examination and assessment of agricultural activities, unsewered human populations and usage of dangerous substances from all land use sectors. The assessment included identifying areas within water bodies with significant potential impact (zones where high pressures coincide with vulnerable pathways). The risk category was assigned to each water body depending on the proportion of the area identified as having significant impact potential.

Figure 4.1 shows the groundwater bodies impacted by diffuse source pollution within the Rol portion of the NWIRBD. The assessment demonstrates that a small number of water bodies (10) are probably at risk. The remaining groundwater bodies are not at risk from diffuse source pollution. The majority of groundwater bodies within the “probably at risk” category (8) result from the mobile organic substances assessment, e.g. certain pesticides. These include Manorcunningham, Raphoe, Foyle Gravels, Churchtown, Letterkenny Town_1, Letterkenny Town_2, Killybegs_1 and River Foyle.

There were two groundwater bodies probably at risk due to inorganic chemicals, i.e. nitrates and phosphates. These were at Clones and Dunmuckrum Turloughs. The turloughs were identified as a Groundwater Dependent Terrestrial Eco-system (GWDTE) and a catchment was delineated.

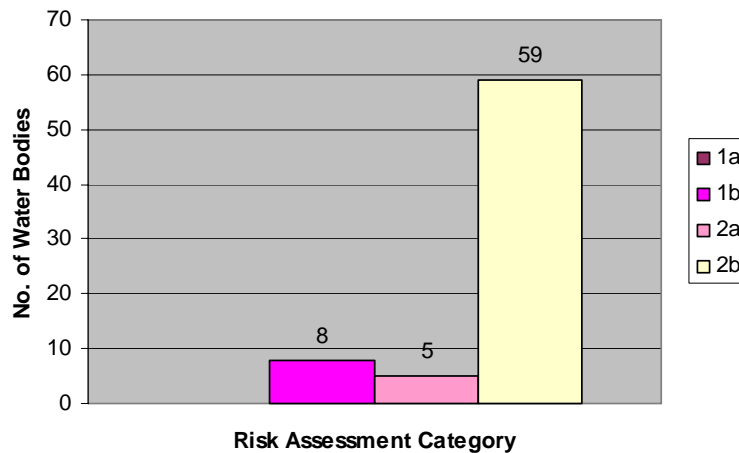


Figure 4.1 Diffuse pressures risk assessment for groundwater bodies within the Rol portion of NWIRBD

4.2.5 Significant Point Pressures

This assessment addressed the risk associated with point source pressures such as mines, quarries, contaminated land, landfills, oil industry infrastructure, licensed trade effluent and wastewater discharges.

Point source influences were considered unlikely to exert a significant influence on an entire groundwater body, as water bodies are relatively large units (generally over fifty square kilometres). Consequently, small water bodies were delineated around each point pressure assigned at risk or probably at risk category to better represent the likely zone of influence of the pressure

Figure 4.2 presents the results of the point source risk assessment for groundwaters. The results indicate that a small number of groundwater bodies are at risk and probably at risk from point source pressures. The risk is associated predominantly with the presence of landfills but also as a result of contaminated land, industry and the presence of major towns above the groundwater body.

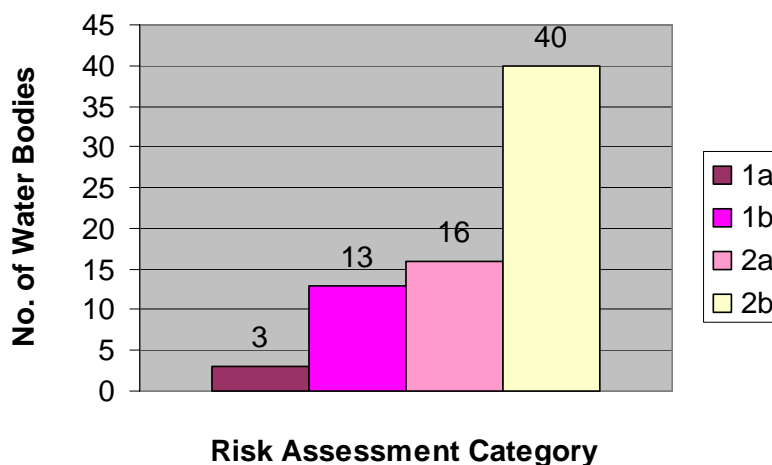


Figure 4.2 Point source pressures risk assessment for NWIRBD groundwater bodies within the Rol

4.2.6 Groundwater Bodies Summary

The overall risk category was obtained by combining the various risk assessments to establish the worst case risk category (Map 4.1). Table 4.4 and Figure 4.3 summarise the findings of the risk assessments carried out for groundwater bodies throughout the Rol portion of the NWIRBD. 30% of groundwater bodies in the district are at risk or probably at risk of failing to meet the objectives of the WFD. The main pressures on groundwater bodies are chemical pollutants from both point and diffuse source pollution.

Table 4.2 Groundwater risk assessment summary for Rol portion of NWIRBD

Reporting Category	Number of Water bodies	% of Number	% area of RBD (Rol portion only)
1a at risk	3	4.2	0.1
1b probably at risk	19	26.4	6.0
2a probably not a risk	19	26.4	41.2
2b not at risk	31	43.0	52.7
Total at Risk (1a+1b)	22	30.6	6.1

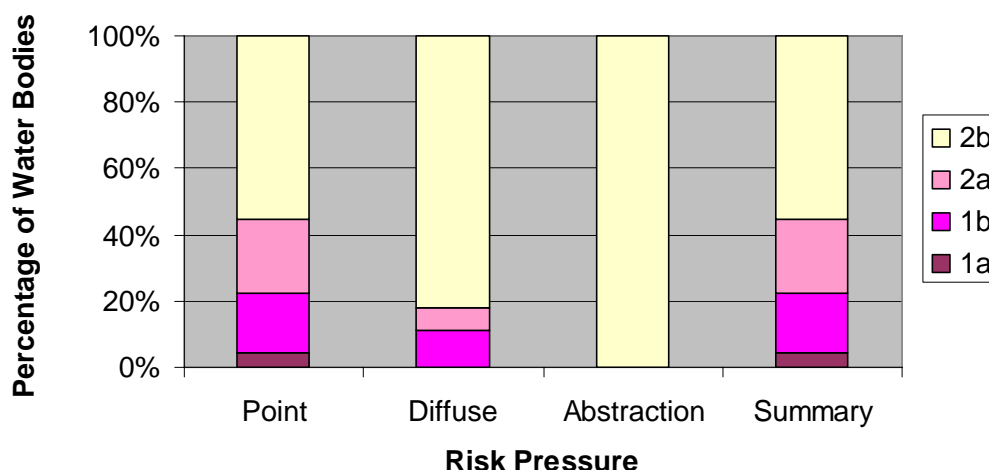
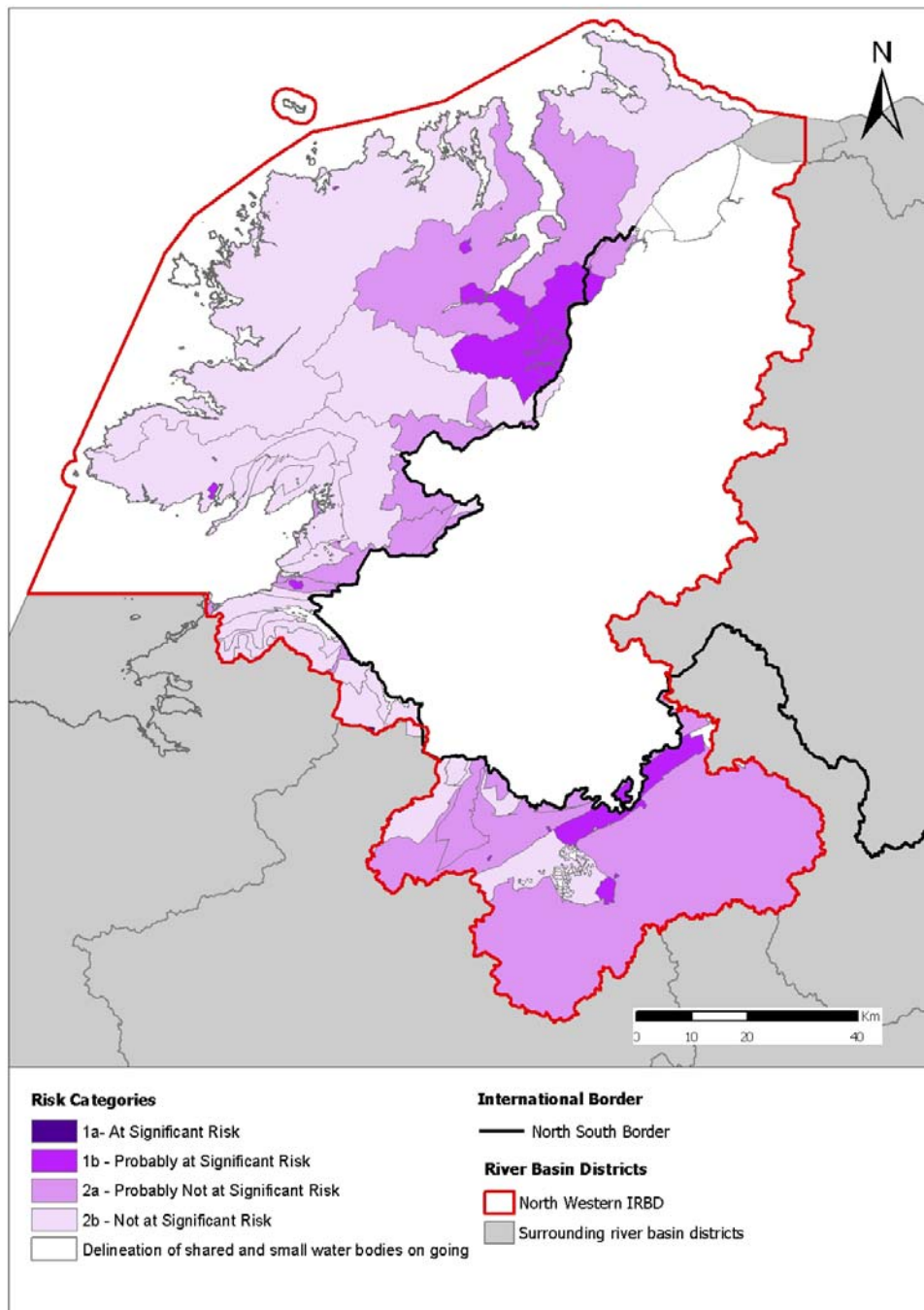


Figure 4.3 Overall risk assessment results for NWIRBD groundwater bodies within the Rol

4.2.7 Groundwater Bodies with Less Stringent Objectives

The WFD requires groundwater bodies for which less stringent environmental objectives are to be specified to be listed. These objectives may be set in cases where a body of water is so affected by human activity that it may be unfeasible or unreasonably expensive to achieve good chemical status within two further river basin planning cycles (i.e. by 2027). Likely candidates for which Less Stringent Objectives (LSOs) might apply were reviewed by experts from the Groundwater Working Group. Three separate mines from the Connaught Coalfield were identified and catchments were delineated. The Groundwater Bodies (GWBs) are Bencroy, Monesk and Slieveanierin and were designated for LSOs. The identification of such groundwater bodies should be regarded as preliminary. It is based on the best

available information at the present time. Further characterisation will provide more information about groundwater characteristics and pressures and impacts.



Map 4.1 Groundwater Combined Risk Assessment – Rol portion of the NWIRBD

4.3 Rivers Risk Assessment

The purpose of the risk assessment is to identify water bodies at risk of failing to achieve good ecological or chemical status due to the effect of human activities. The river risk assessment involved identification and assessment of the significance of pressures from water abstractions, water flow regulations, morphological alterations, point sources and diffuse sources. Known impacts as indicated by available monitoring data were also incorporated into the analysis.



4.3.1 Significant Abstraction and Flow Regulation Pressures

The abstraction risk assessment methodology is based on water balance, with nett abstraction compared to natural low flow characteristics. The presence of significant flow regulation, i.e. dams and other flow control structures, was also considered in the assessment.

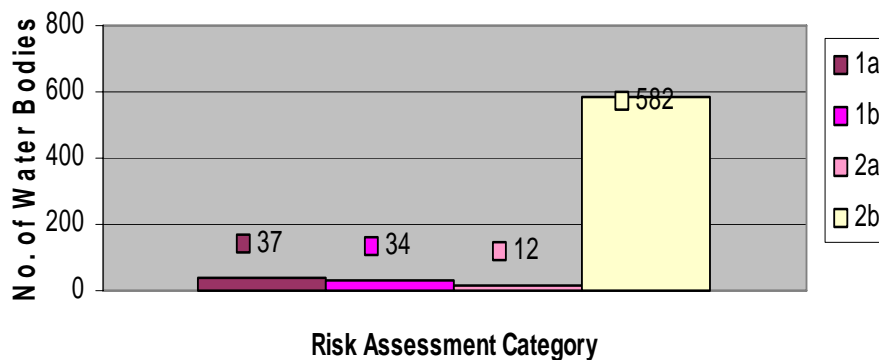


Figure 4.4 Flow regulation and water abstraction risk assessment for NWIRBD within the RoI

Figure 4.4 presents the abstractions and flow regulation risk assessment results for the 665 river water bodies in the RoI portion of the NWIRBD. Significant abstraction and flow regulation pressures are more significant in the NWIRBD than in most other RBDs on the Island of Ireland due to the large number of drinking water supplies from small surface water catchments, particularly in counties Cavan and Monaghan. Figure 4.4 highlights that 10.7% of river water bodies are at risk from flow regulation and water abstraction. Of the water bodies that are considered at risk, the predominant pressure is abstraction for public water supply for both domestic and commercial use.

4.3.2 Significant Morphological Pressures Assessment

The significant morphological pressures assessment addresses physical alterations made on rivers to support human activities such as navigation, urban development or agriculture. The morphological assessment for rivers includes: channelisation and

dredging, river straightening, flood protection and embankments, impoundments, water regulation and intensive land use.

The results for the morphological risk assessment for river water bodies within the RoI portion of the NWIRBD are illustrated in Figure 4.5. Almost one third of the rivers assessed in the NWIRBD are at risk or probably at risk due to morphology pressures. Figure 4.6 illustrates the main morphological pressures associated with river water bodies. The main activities that river water bodies are subjected to are land drainage pressures (associated with agriculture and intensive land use) and channelisation works.

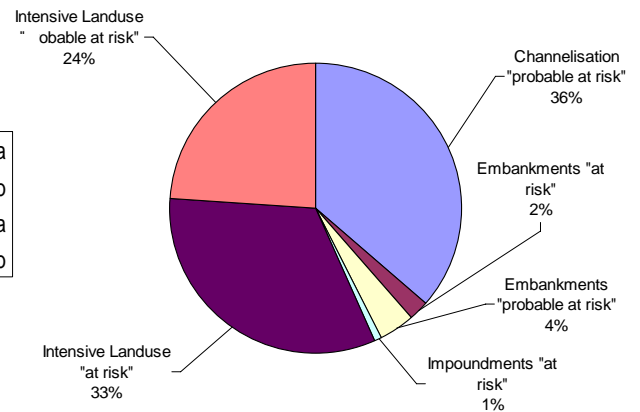
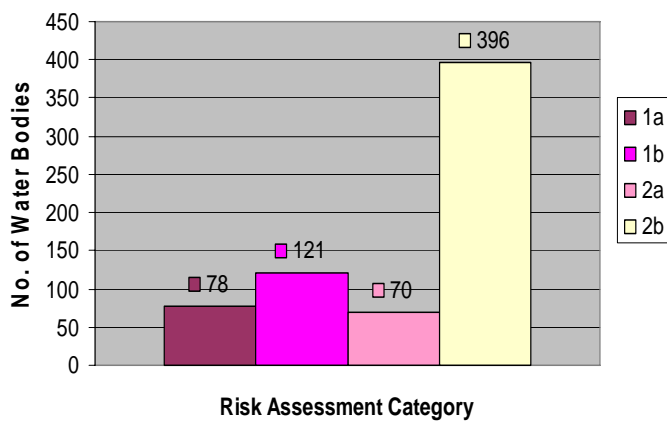


Figure 4.5 Morphological pressures risk assessment for NWIRBD rivers within RoI

Figure 4.6 Morphological Pressures: Rivers within RoI

4.3.3 Significant Point Source Pressures

The significant point source pressures addressed in the river risk assessment include discharges from Urban Wastewater Treatment Plants (UWWT), storm overflows, sludge treatment plants and industries. Other point source pressures including landfills, quarries and mines were also addressed where they were considered significant at an RBD level.

The results for the point source risk assessment of river water bodies within the RoI portion of the NWIRBD are presented in Figure 4.7. Point source pressures place 49 river water bodies, around 10%, at risk or probably at risk. The main sectors affecting those water bodies are waste water treatment plants, combined storm overflows and industrial discharges, Figure 4.8.

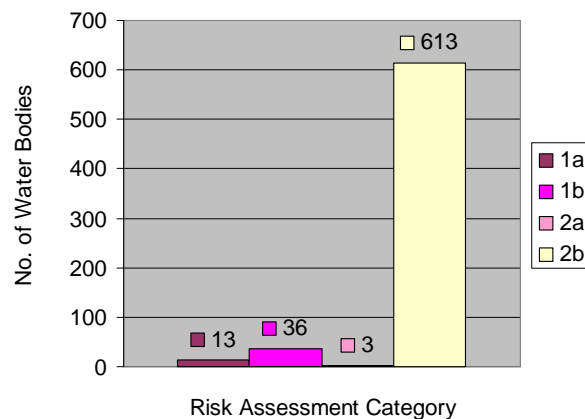


Figure 4.7 Point source pressures risk assessment for NWIRBD rivers within the ROI

The assessment highlights that point source discharges, for the most part, are centred around population clusters with wastewater treatment plants and industrial discharges accounting for the majority of water bodies at risk or probably at risk. This is consistent with the assessments in other RBDs and reflects the challenges required to regulate facilities throughout Ireland.

4.3.4 Significant Diffuse Source Pressures

Diffuse pollution pressures arise from widespread rural and urban land use activities. The diffuse pollution risk assessment considers a variety of activities which potentially give rise to various pollutants to aquatic systems, such as agriculture, non-sewered population, urban land use, transport, some industrial activities and other main land uses which in the NWIRBD include peat exploitation and forestry activities. The diffuse source risk assessment used monitoring data, where available, supplemented by expert knowledge and predictive modelling to provide assessment of the diffuse pollution pressures in the absence of known impact status.

The pressure datasets used in the predictive diffuse assessments included land management practices, infrastructure details, forestry inventories, in addition to physical attributes such as soil and sub-soil coverage, digital terrain model, extent of urbanised areas and agricultural statistics.

The results for the diffuse source risk assessment of river water bodies within the section of the NWIRBD under consideration here are illustrated in Figure 4.9. The assessment highlights the significance of diffuse pressures, with 185 water bodies, over a third of the area of the RBD, at risk or probably at risk due to diffuse source pollution. The water bodies at least risk are mainly located in the upland areas of County Donegal. In general, Agriculture and forestry are the sectors found to be the largest contributors to diffuse source pollution pressures in the RoI portion of the NWIRBD as illustrated in the pie chart in Figure 4.10. Whilst the extent of diffuse pressures is lower in the NWIRBD than in other river basin districts in Ireland, the assessment is consistent with the findings throughout Ireland, where diffuse pollution is associated with the majority of moderate pollution incidences.

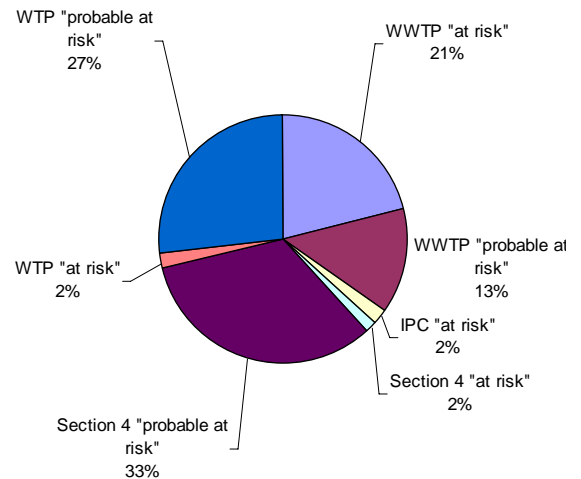


Figure 4.8 Proportion of river water bodies at risk from point source pressures



Diffuse source pressures have been confirmed by existing monitoring programmes, in particular Ireland’s national river water quality surveys, as being a significant and widespread risk to water status. Much research is ongoing to quantify these pressures and to identify effective abatement measures. Further characterisation studies will help in developing supplementary management measures, which may be required in sensitive areas, to augment basic measures (i.e. measures already required by existing legislation).

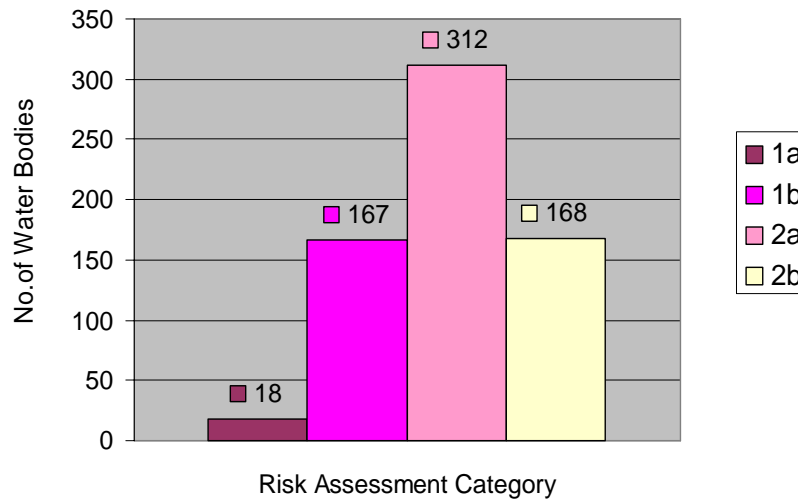


Figure 4.9 Diffuse source pressures risk assessment for NWIRBD rivers within the RoI

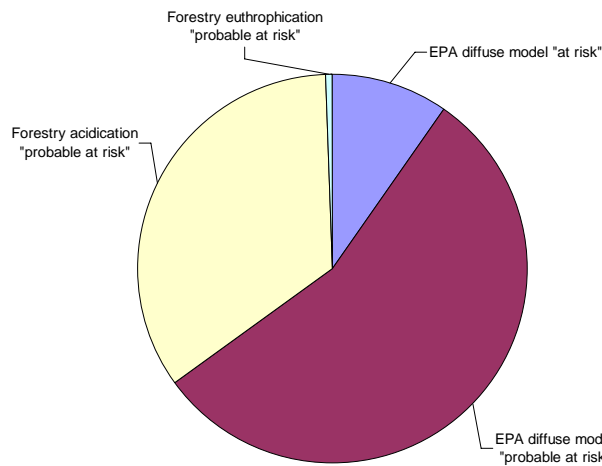


Figure 4.10 Proportion of river water bodies at risk from diffuse source pressures within the RoI

4.3.5 River Impact Assessment

Existing river impact data were taken into account where available. These included the EPA’s river biological survey (Q System), Local Authorities’ physico-chemical monitoring programmes and surveys of pollution sensitive freshwater pearl mussel populations (*Margaritifera* species) commissioned by the National Parks and Wildlife Service. Impact data was obtained from monitoring programmes carried out on an

ongoing basis throughout the study area. This monitoring data indicates where pressures are impacting water quality, regardless of the source of the pressure.

The Q value and freshwater pearl mussel assessment results were combined on a worst case basis to determine the river impacts assessment. The results of the river impact data risk assessment for the RoI portion of the NWIRBD are illustrated in Figure 4.11. The results indicate that of the 222 river water bodies that have available impact data, 93 are at risk - this equates to some 42% of river water bodies within the RoI portion of the NWIRBD.

During further characterisation data gaps will be addressed by gathering impact data where appropriate to represent pressures on water bodies.

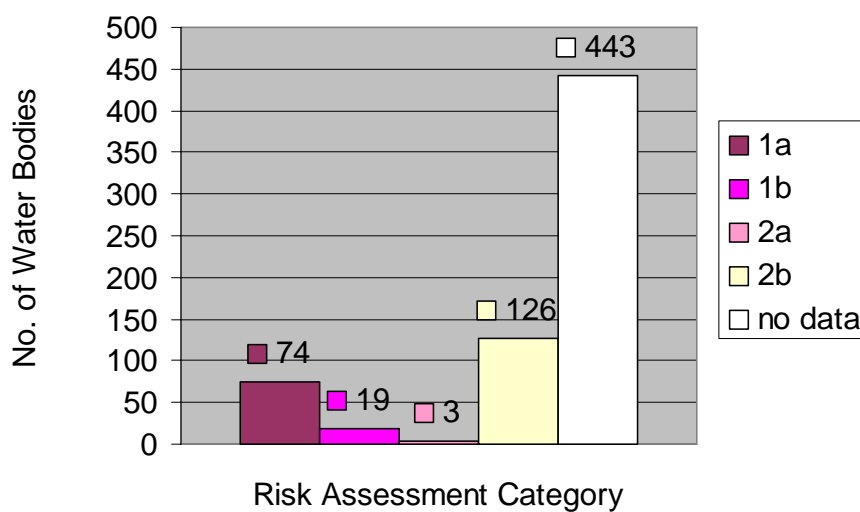


Figure 4.11 Impact risk assessment for NWIRBD rivers within the RoI

4.3.6 River Water Bodies Risk Assessment Summary

The overall risk assessment process is precautionary in that a single pressure can cause a water body to be classified at risk. Where a water body has more than one pressure associated with it, the worst case will be used to classify the overall risk assessment results for the water body.

Map 4.2 illustrates the combined risk category associated with the NWIRBD river water bodies within RoI. The water bodies at risk tend to be located in areas where land use is intensive, such as urban areas and fertile agricultural area such as the Foyle and Erne systems. The upland areas of west Donegal are less intensively exploited and this is reflected in the risk assessment with a greater number of water bodies classified as not at risk.

Table 4.5 and Figure 4.12 summarise the risk assessment combined results. Table 4.5 indicates that of the 665 water bodies assessed in the RoI portion of the NWIRBD over half are considered to be at risk of not achieving their good status objectives. Figure 4.12 demonstrates that the main sources of human pressures in the district

are from diffuse and morphological pressures. This assessment is supported by impact data.

Table 4.3 River water bodies risk assessment summary

Reporting Category	Number of Water Bodies	% of number	Km Affected	% area of RBD (Rol portion only)
1a at risk	182	27.4	966.1	41.9
1b probably at risk	184	27.7	621.4	29.4
2a probably not at risk	157	23.6	376.4	13.8
2b not at risk	142	21.3	383.8	14.9
Total at Risk (1a+1b)	366	55.1	1617.5	71.3

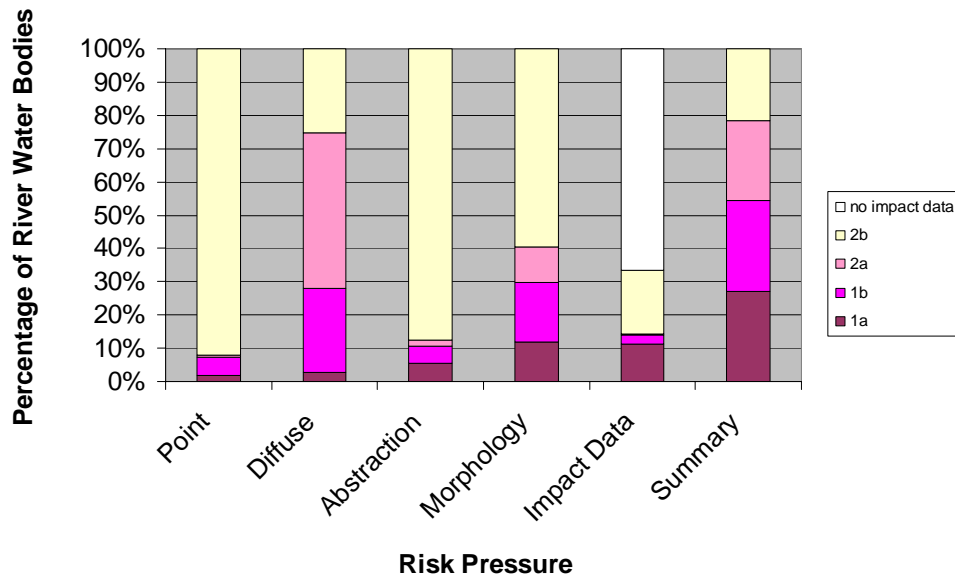
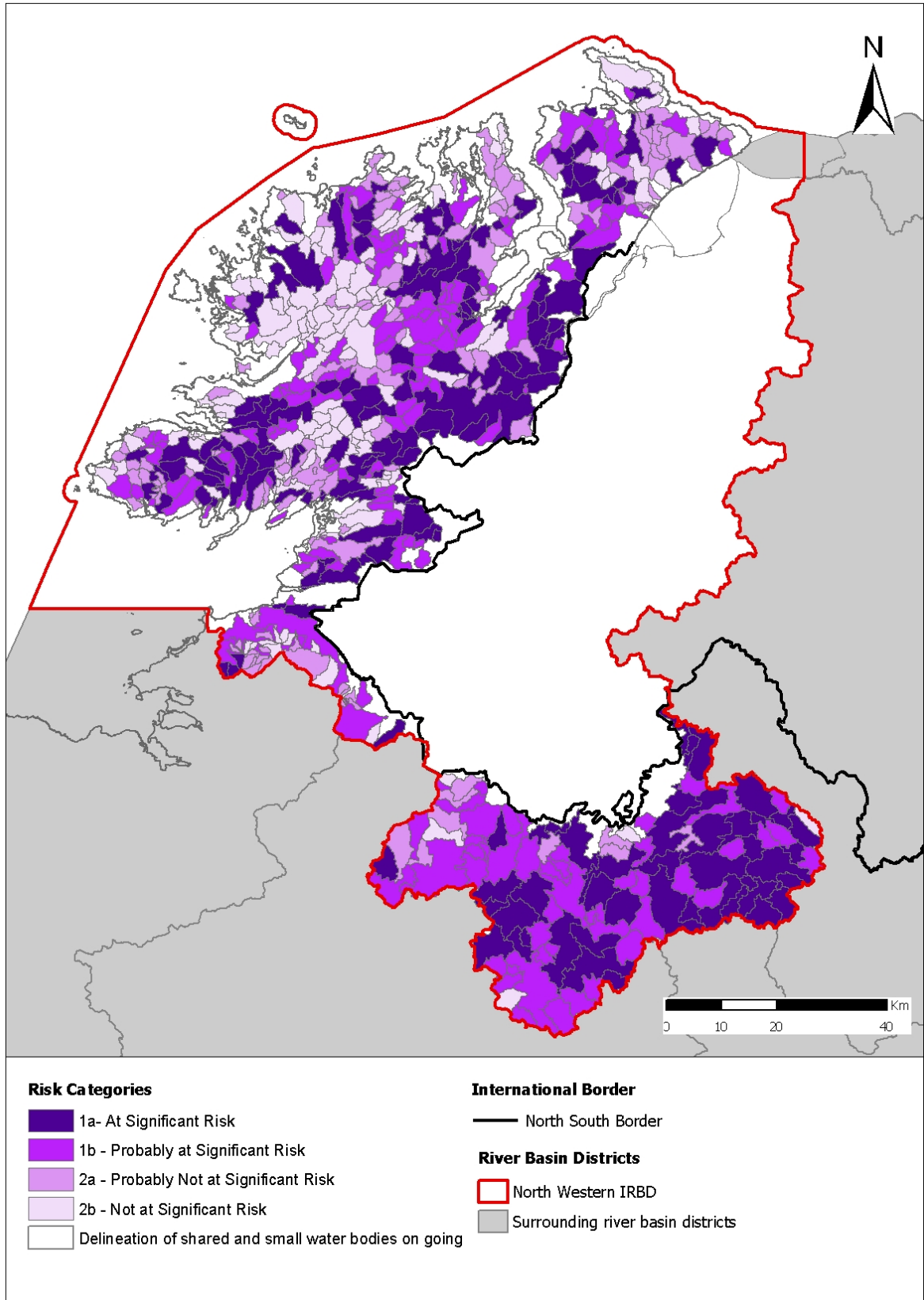


Figure 4.12 River water bodies affected summary for NWIRBD rivers within Rol



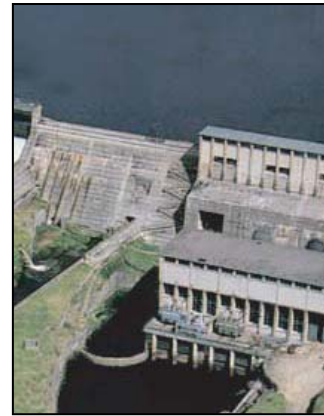
Map 4.2 River Combined Risk Assessment – NWIRBD within RoI

4.4 Lakes Risk Assessment

The lake risk assessment closely parallels the analysis applied to rivers, involving both predictive pressures and impact assessments. The lake analysis includes abstraction, flow regulation, morphology, point and diffuse source pressures and also incorporates impact data from lake monitoring datasets.

4.4.1 Significant Abstraction and Flow Regulation Pressures

The risk assessment of abstraction pressures and flow regulations mirrored the river assessment process comparing nett abstraction with low flow characteristics. The results of the assessment, presented in Figure 4.13, indicate that 52 lake water bodies, approximately 23% in the area under discussion, are at risk or probably at risk. These pressures tend to be localised particularly in the interdrumlin lakes of Cavan and Monaghan. Public water supply to both the domestic and commercial markets is the main abstraction activity that potentially impacts upon lake water bodies in the RoI portion of the NWIRBD. A major hydroelectric scheme at Cathleen Falls represents a significant flow regulation pressure within the NWIRBD.



Cathleen Falls – Flow Regulation at Assaroe Lough

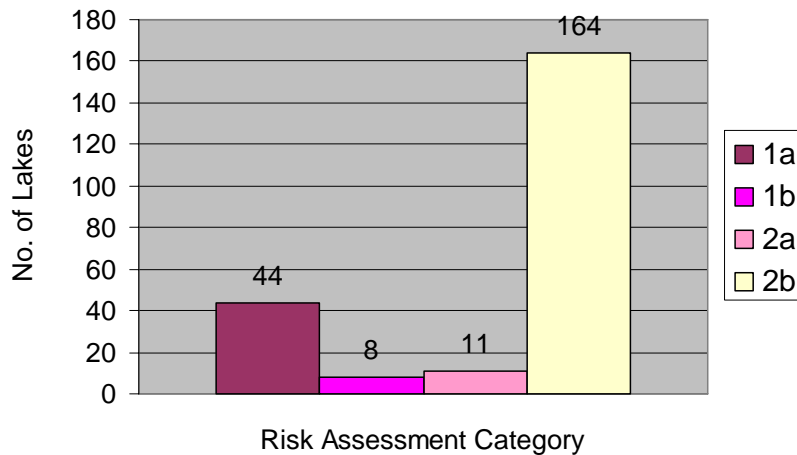


Figure 4.13 Flow regulation and water abstraction pressures risk assessment for relevant NWIRBD lakes within the RoI

4.4.2 Significant Morphological Pressures Assessment

The morphological pressures assessment considered the extent of various known significant alterations within each lake water body, similar to the river morphological risk assessment. Pressures such as intensive land use, channelisation and dredging, flood protection and impounding dams were all assessed in this analysis. Figure 4.14 summarises the findings of the morphological pressures and illustrates that morphological pressures are not generally a significant pressure for lake water bodies within the NWIRBD.

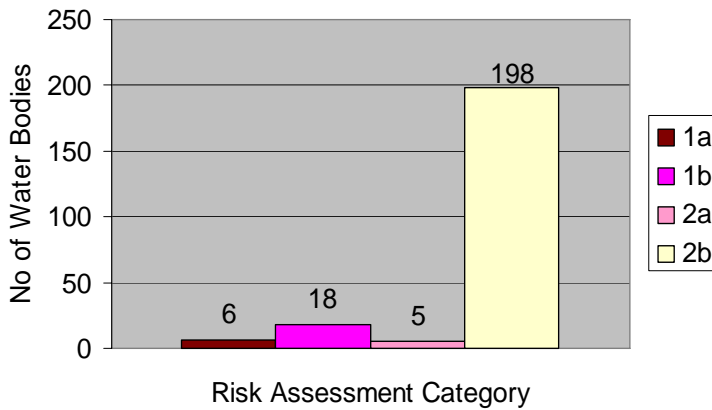


Figure 4.14 Morphological pressures risk assessment for NWIRBD lakes within Rol

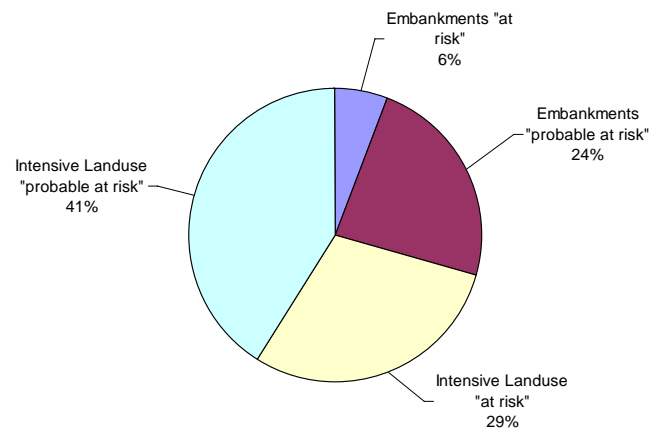


Figure 4.15 Proportion of Lake Water Bodies at risk from Morphology Pressures

Figure 4.15 indicates that intensive land use practices are the main source of morphological pressures on lakes within the Rol portion of the NWIRBD. The other pressure associated with the morphological alteration of lakes is due to embankments constructed for flood protection.

4.4.3 Significant Point Source Pressures

The significant point source pressures methodology applied in the lakes risk assessment considered facilities such as WWTW and sludge treatment plants; storm overflows; industries with licensed discharges. Figure 4.16 illustrates the results of the point source pressures analysis for lakes within the NWIRBD. This report summarises the result for lakes greater than 50 hectares and those lakes located within protected areas.

Less than 18% of the lakes assessed are at risk or probably at risk from point source pollution. The main pressures associated with the lake water bodies considered to be probably at risk are from water treatment works, with an industrial discharge placing one lake, Lough Sillan, at risk from point source pollution.

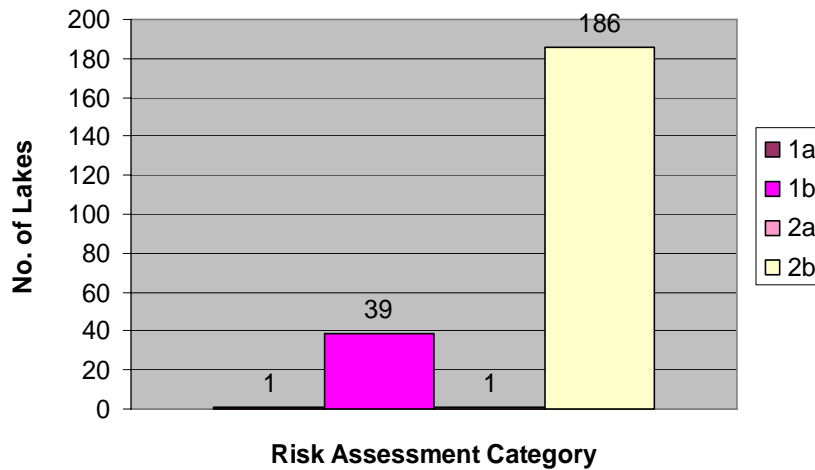


Figure 4.16 Point source pressures risk assessment for NWIRBD lakes within the Rol

4.4.4 Significant Diffuse Source Pressures

The significant diffuse pressures assessment of lakes was based on the general diffuse risk associated with the rivers inflowing into the lake. Impact data, derived from monitoring data from the national lake survey, was used to supplement the predictive modelling of pressures associated with diffuse source pollution for lakes.

Figure 4.17 summarises the results of the diffuse source pollution risk assessment for lake water bodies. The lakes assessment resulted in a total of 50 lake water bodies being categorised as at risk or probably at risk (i.e. in risk categories 1a or 1b respectively). This represents over 20% of the total number of lakes considered in the assessment. Of these 50 lakes, 3 are considered to be at risk due to diffuse source pollution, whilst 47 were considered as probably at risk. The main sources of

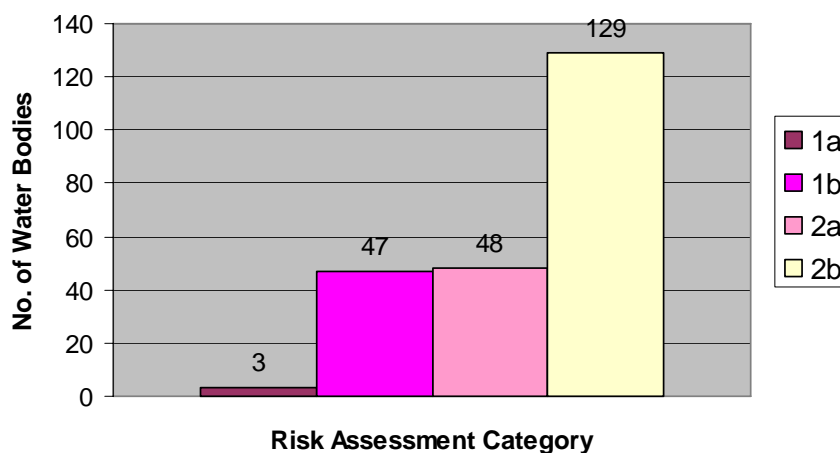


Figure 4.17 Diffuse source pressures risk assessment for NWIRBD lakes within Rol

diffuse source pollution to lakes are, as for rivers, associated with intensive land use practices, predominantly intensive agriculture.

4.4.5 Lake Impact Assessment

The lake impact assessment is similar to the river impact assessment in that it is based on national monitoring data. The impact data used relates predominantly to the identification of eutrophication pressures, including phosphorus concentrations and mean and maximum Chlorophyll *a* values. Expert judgement was used to refine the risk category. Figure 4.18 illustrates the NWIRBD lake risk assessment results. Impact data is available for 191 lakes in the RoI portion of the NWIRBD. The results indicate that over 10% of the lake water bodies are considered to be at risk based on the impact data available.

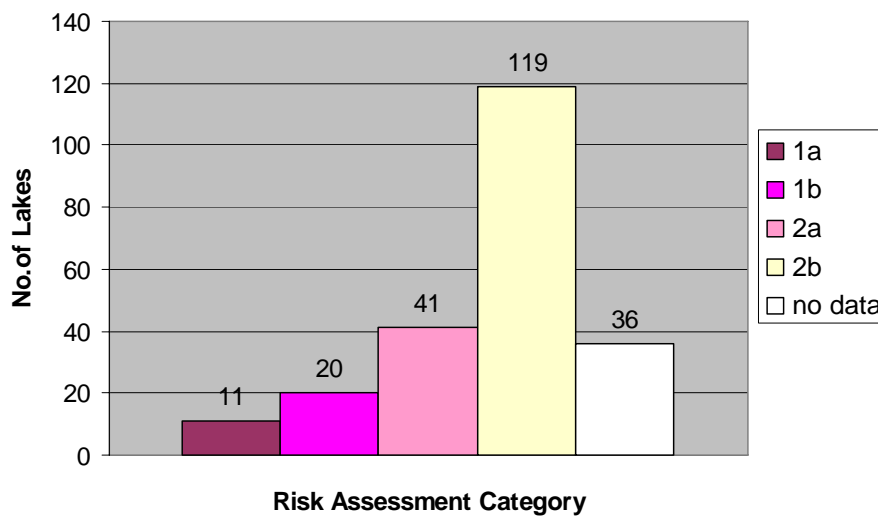


Figure 4.18 Lake Impact Risk Assessment for NWIRBD within RoI

4.4.6 Lake Risk Assessment Summary

As is the case with all water bodies the process employed to obtain the overall lake risk assessment is precautionary in that a single pressure can cause a water body to be classified at risk. The component elements for the lakes risk assessment (abstraction, morphology, point, diffuse and impact data) are considered and the worst case scenario is selected.

Map 4.3 illustrates the combined lake risk assessment summary results. Table 4.6 and Figure 4.19 summarise the NWIRBD lake water bodies assessment results within the RoI. The lake risk assessment has established that, for the most part, water abstraction and diffuse source pollution associated with intensive land use practices are the most significant pressures in relation to the lake water bodies contained within the RoI portion of the NWIRBD. Morphological pressures and point source pressures, predominantly associated with water treatment works, also contribute to those lakes considered at risk.

Table 4.4 Lake water bodies risk assessment summary

Reporting Category	Number of Water bodies	% of Number	% area of RBD (Rol portion only)
1a at risk	56	25	29.9
1b probably at risk	28	12	32.7
2a probably not a risk	26	11	22.1
2b not at risk	117	52	15.3
Total at risk (1a & 1b)	84	37	62.6

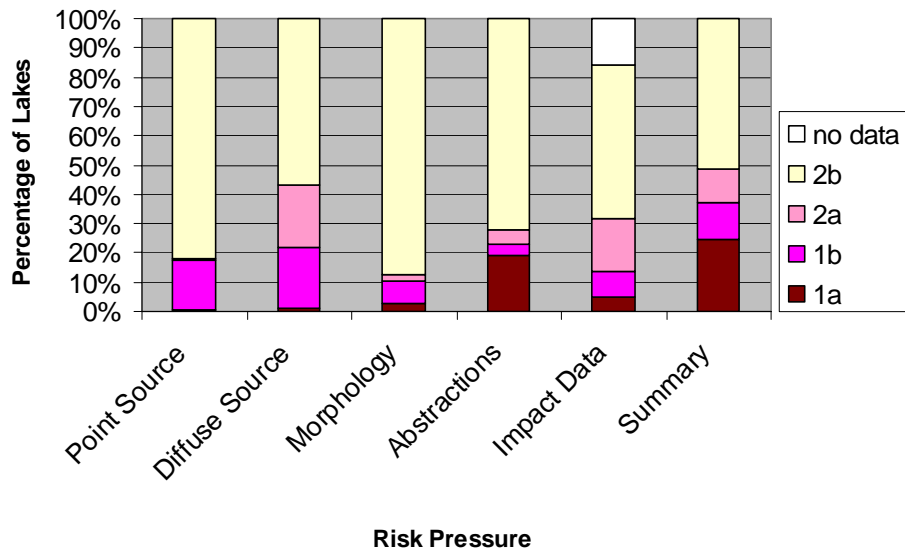
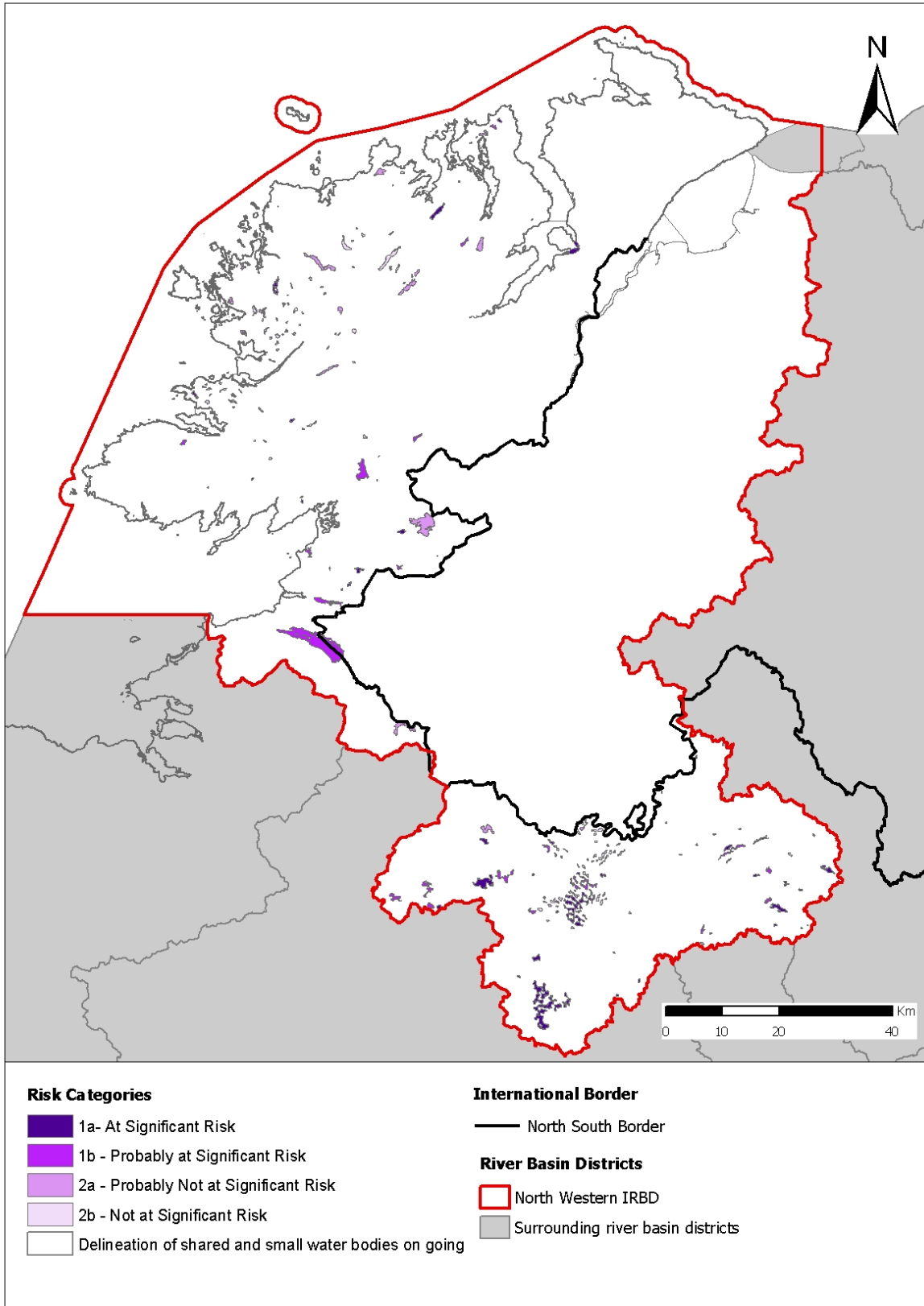


Figure 4.19 Overall risk assessment results for NWIRBD lakes within Rol



Map 4.3 Lake Combined Risk Assessment – Rol portion of NWIRBD

4.5. Transitional and Coastal Water Bodies Risk Assessment

The risk assessment for transitional and coastal water bodies incorporates abstraction and flow regulation, morphological and direct pollution pressures. The assessment also includes marine monitoring impact data to address indirect pollution from both diffuse and point sources upstream of marine waters.

Lands adjoining transitional and coastal waters have provided important sites for industrial and urban development and thus these water bodies have been subjected to morphological alterations in places. They also are the downstream part of the water cycle, with all the waters from the rivers draining into the sea. Therefore they ultimately receive pollutant loads arising from all inland pressures.

Transitional Water Bodies: the 22 transitional water bodies in the Rol portion of the NWIRBD were assessed for abstraction, morphology and direct point source pressures and an impacts assessment was also applied.



Slieve League : coastal water body

Coastal Water Bodies: the 23 coastal water bodies in the Rol portion of the NWIRBD were assessed for morphology and direct point source pressures. An impacts assessment was also applied.

4.5.1 Significant Flow Regulation and Abstraction Pressures

The risk assessment of significant abstraction pressures on transitional water bodies considered water balance in a similar manner to the rivers and lakes assessments. There are no major flow regulations structures present in transitional waters in the Rol portion of the NWIRBD. Figure 4.20 presents the risk assessment results for the 22 transitional water bodies in the NWIRBD. Three transitional water bodies, 14%, are identified as probably at risk due to water abstraction.

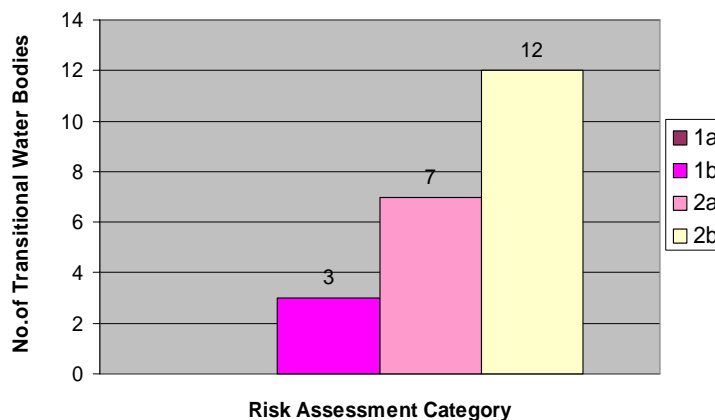


Figure 4.20 Flow regulation and water abstraction pressures in the transitional water bodies of the NWIRBD within Rol

The abstraction pressure assessment does not apply in coastal water bodies since it is not possible for these to be at risk from over abstraction.

4.5.2 Significant Morphological Pressures

This assessment addressed significant alterations to the water body including channelisation, dredging and disposal of dredged spoil, flood protection, embankments and built development on the shoreline. Figure 4.21 shows the results for the morphological risk assessment for transitional and coastal water bodies. Over one third of the transitional water bodies within the RoI portion of the NWIRBD are at risk, or probably at risk from morphological pressures. Morphological pressures in coastal waters are less than those associated with transitional waters in the NWIRBD with less than 20% of the water bodies at risk or probably at risk.

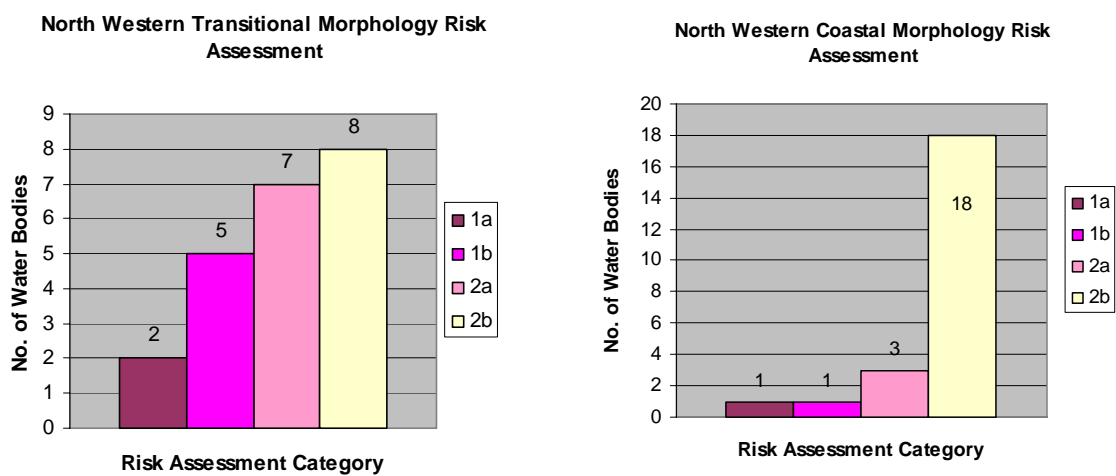


Figure 4.21 Morphological pressures risk assessment in NWIRBD transitional and coastal waters within the RoI

The analysis indicates that channelisation is the greatest pressure to transitional water bodies in the NWIRBD with intensive land use practices also potentially impacting upon them. Built structures, such as ports and shoreline development, e.g. Killybegs Harbour, and coastal defence works are the main morphological pressures in coastal waters in the RoI portion of the NWIRBD (Figure 4.22).

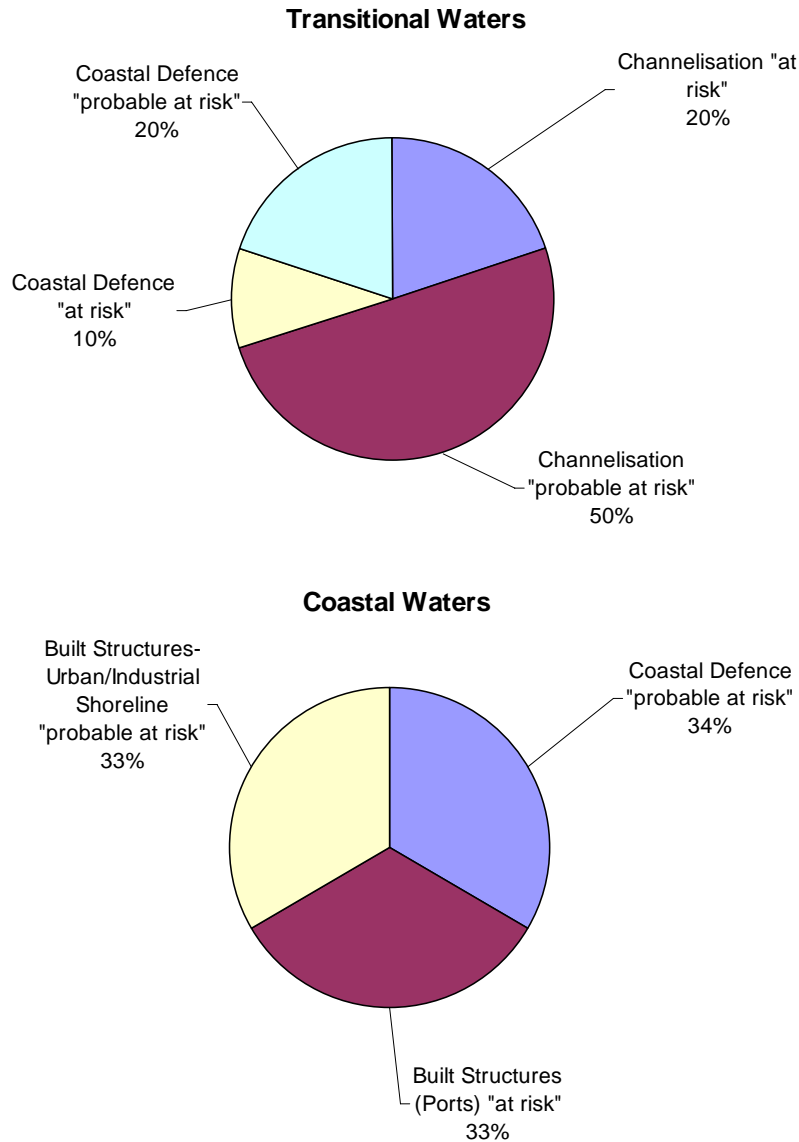


Figure 4.22 Proportion of transitional and coastal waters at risk and probably at risk from morphological pressures in NWIRBD within RoI

4.5.3 Significant Point Source Pressures

The marine impact assessment was considered to represent the upstream point source and diffuse source pressures on marine water bodies on the basis that it included the point and diffuse load assessment. However supplementary point assessments were undertaken for discharges and aquaculture activities in all transitional waters and coastal embankments and lagoons. Expert opinion was also incorporated into the risk assessment where point related impacts were identified.

A range of point source pollution pressures were assessed within, or close to transitional water bodies, or in coastal embankments and lagoons. These include wastewater treatment plants and industrial discharges, combined sewer overflows, water treatment works and aquaculture. In the RoI portion of the NWIRBD there are no confined coastal water bodies which could be put at risk by a direct point source pressure so the assessment was applied only to transitional water bodies.

Figure 4.23 presents the point pollution assessment results. Two transitional water bodies are considered at risk from point source pollution, representing 9% of the water bodies by number, and 28% of the total transitional water body area. Discharges from waste water treatment plants is the point source pressure that places the two transitional water bodies as probably at risk in the Rol portion of the NWIRBD

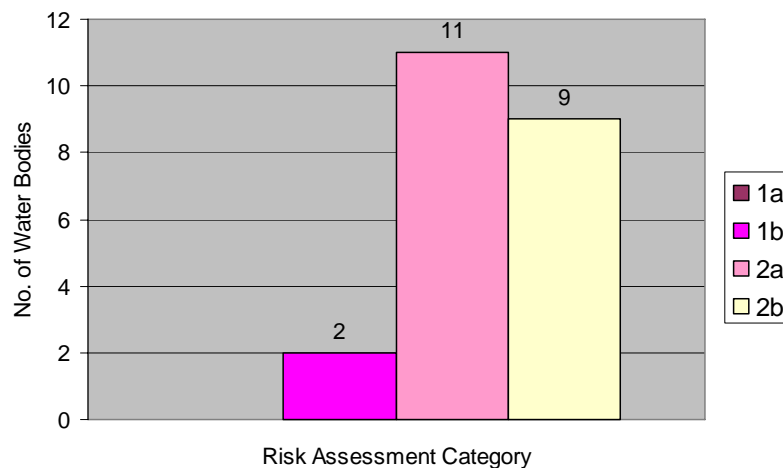


Figure 4.23 Point pressure risk assessment in NWIRBD transitional waters within Rol

4.5.4 Pollution Impacts Assessment

The marine impact assessment comprised of two elements, nutrient/organic enrichment and hazardous substances. Available monitoring datasets were obtained from the relevant competent authorities to identify impacted NWIRBD marine water bodies in Rol. As discussed earlier the marine impact assessment was considered to represent the upstream point and diffuse pressures on marine water bodies on the basis that it included the point and diffuse load assessment.

There was no marine impact data available for the NWIRBD’s transitional water bodies; therefore the marine impact assessment was not applied to these water bodies. Direct marine impact data are available for 5 of the 23 coastal water bodies within the Rol portion of the NWIRBD. Figure 4.24 illustrates the results of the risk assessment and indicates that 1 water body, Killybegs Harbour, is considered at risk, whilst 3 water bodies are considered as probably at risk. The water bodies at risk and probably at risk represent 17.4% of the coastal water bodies by number, making up 9 % of the area of coastal waters within the NWIRBD.

Figure 4.25 illustrates that the main pressures associated with the marine impact data are due to hazardous substances, UWWT sensitivity designations, and pressures accounted for by the OSPAR procedure.

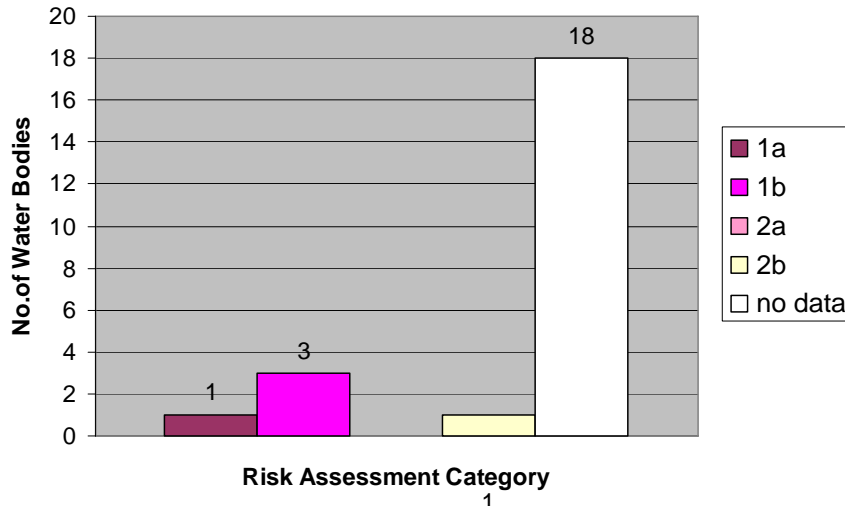


Figure 4.24 Impact Risk Assessment in NWIRBD Coastal Water Bodies with RoI

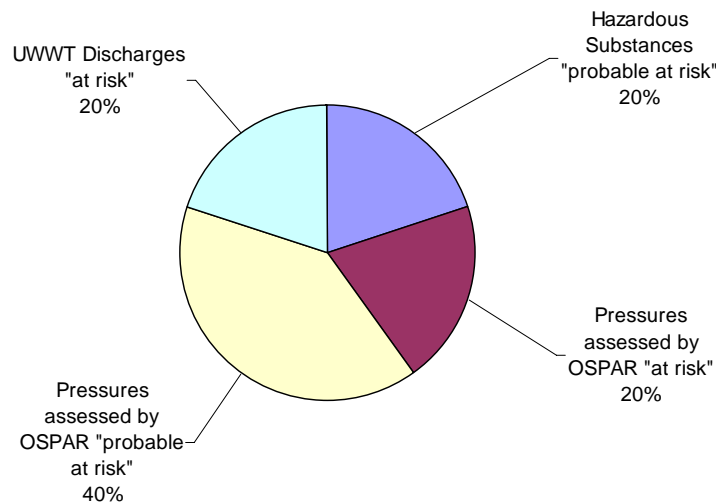


Figure 4.25 Proportion of transitional and coastal water bodies at risk and probably at risk from impact assessments

4.5.5 Transitional and Coastal Water Bodies Summary

The overall risk category was obtained by taking the worst case risk category for the abstraction and flow regulation, morphology, point and impact assessments for each of the transitional and coastal water bodies.

Table 4.5 and Figure 4.26 summarise the combined risk assessment results for those transitional water bodies in the RoI portion of the NWIRBD. Just under half of the transitional water bodies are considered at risk. Morphological pressures are the main pressure source with dredging (channelisation) posing the greatest threat to transitional waters.

Table 4.5 Transitional water bodies risk assessment summary for Rol portion of NWIRBD

Reporting Category	Number of Water bodies	% of Number	% area of RBD
1a at risk	2	9.1	0.3
1b probably at risk	7	31.8	76.5
2a probably not a risk	9	40.9	10.5
2b not at risk	4	18.2	12.7
Total at Risk (1a & 1b)	9	40.9	76.8

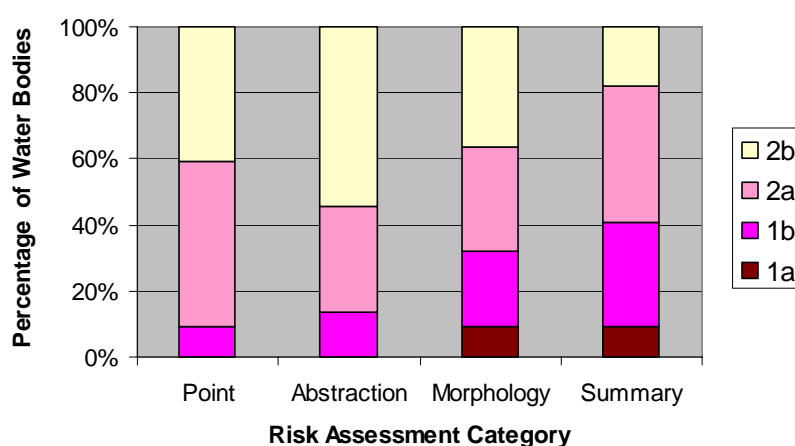
**Figure 4.26 Overall risk assessment results for NWIRBD transitional waters within Rol**

Table 4.6 and Figure 4.27 summarise the combined risk assessment results for coastal water bodies in the NWIRBD. Five (22%) of the coastal water bodies in the NWIRBD are at risk or probably at risk of failing to achieve the objectives of the WFD. The effects of pollution from diffuse and point sources (as indicated by the marine impact assessment) represent the main pressure on these coastal water bodies, however morphology, particularly built structures and shoreline development, also represent a pressure on the marine environment.

Table 4.6 Coastal water bodies risk assessment summary for Rol portion of NWIRBD

Reporting Category	Number of Water bodies	% of Number	% area of RBD (Rol portion only)
1a at risk	2	8.7	0.2
1b probably at risk	3	13.0	9.0
2a probably not a risk	2	8.7	1.9
2b not at risk	16	69.6	88.9
Total at Risk (1a & 1b)	5	21.7	9.2

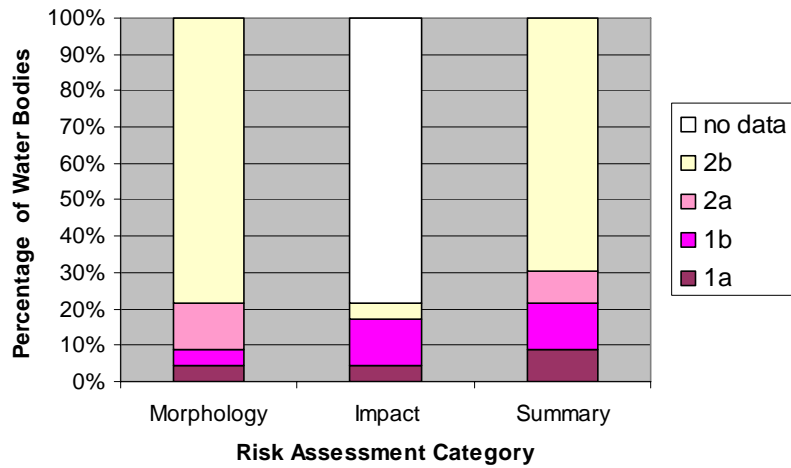
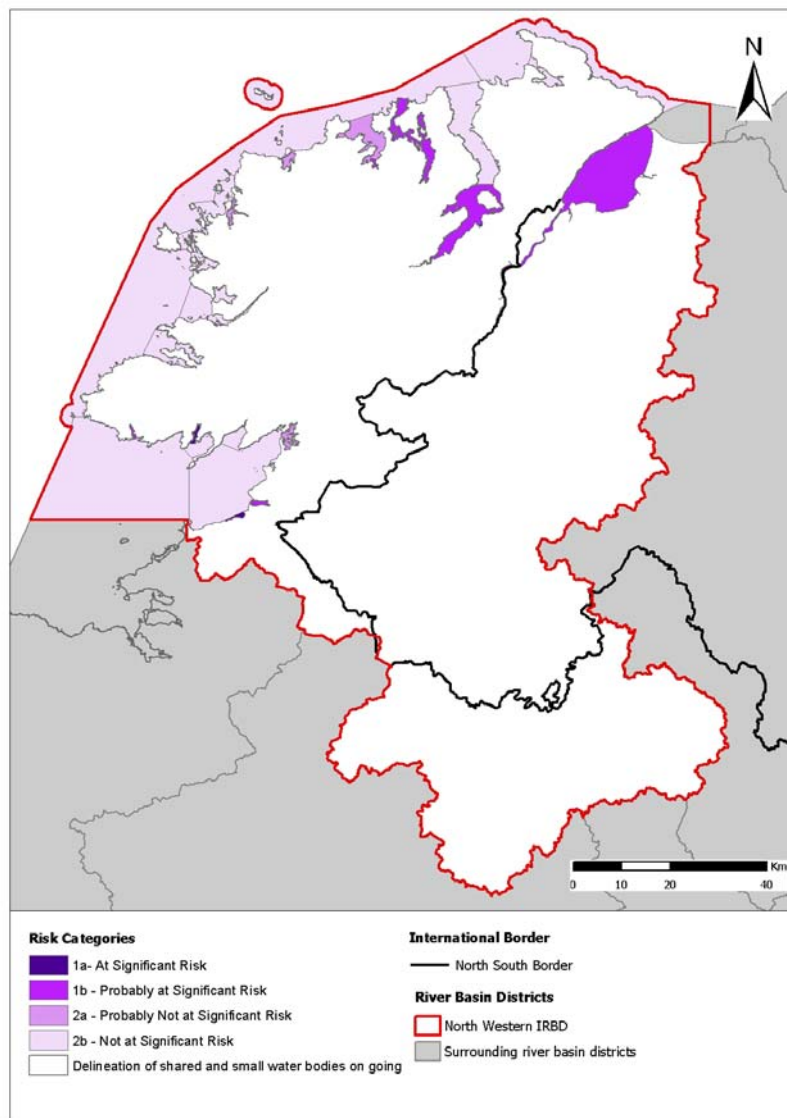


Figure 4.27 Overall risk assessment results for NWIRBD transitional waters



Map 4.4 Transitional and Coastal water bodies combined risk assessment – RoI portion of NWIRBD

4.6 Other Surface Water Risk Assessments

Pressures referred to as “other pressures” have also been included in the assessment.

- A catalogue of recordings of *alien species* has been generated. These alien species are non-indigenous invasive flora and fauna which threaten the NWIRBD’s native ecology by competing for habitats and/or food. Two species of concern are present in the NWIRBD; in particular the Zebra Mussel has been found on both the upper and lower Lough Erne, and common cord grass has been found in the coastal waters of Lough Foyle. Future management plans will have to take account of the presence of these alien species.
- *Fishery activities* have been addressed in the initial assessment. Amongst the freshwater fish species, salmon (and trout) are subjected to the greatest fishing /angling pressures in Ireland. The Scientific Committee of the Salmon Commission is developing models which allow salmon conservation limits to be set for Irish rivers. In the marine waters commercial activities have been considered in the risk assessment, however, further work is required and will be implemented through the NS Share Project. In the NWIRBD commercial aquaculture activities are located in Killybegs Harbour, Lough Foyle, Lough Swilly and Gweebarra Bay. Further offshore, Scallop Dredging and Otter Trawling are also undertaken. Management plans will have to consider how best to control these important economic activities.
- An assessment of compliance with existing water quality standards for designated *Bathing Waters* was undertaken. In the NWIRBD there is one compliance breach detected at Portstewart Bay and the reasons for this impact will have to be investigated and addressed in the management plan.

5.0 Artificial and Heavily Modified Water Bodies

5.1 Introduction

Surface water bodies that are unlikely to achieve good status because of physical alterations to facilitate human activities including navigation, water abstraction and regulation, flood protection and land drainage have been identified for special consideration under the WFD. The Directive recognises that there are cases where the benefits of such uses need to be retained, and permits identification and designation of Artificial Water Bodies (AWB) and Heavily Modified Water Bodies (HMWB).

- A **HMWB** is a water body which, as a result of significant physical alterations by human activity, is substantially changed in character.
- An **AWB** is a water body created by human activity.

Designation does not mean that mitigation measures will not be required. The procedure merely enables appropriate objectives to be set that allow the benefits of the use to be maintained but ensures that other pressures can be managed and where possible mitigated. A step by step process for the identification of these water bodies was applied in NWIRBD. The selection process to date has identified 'provisional' cases (pAWB and pHMWB). These water bodies will be subjected to more detailed examination during further characterisation.

5.2 AWB and HMWB designation

The results of the hydrology and morphology risk assessments for the RoI portion of the NWIRBD and existing EPA or CFB water quality information were reviewed, where available, to identify potential candidates for designation as AWB or HMWB. There are no Artificial Water Bodies designated in the RoI portion of the NWIRBD. Table 5.1 summarises the hydrological and morphological pressures leading to preliminary identification of HMWB water bodies in the NWIRBD within RoI.

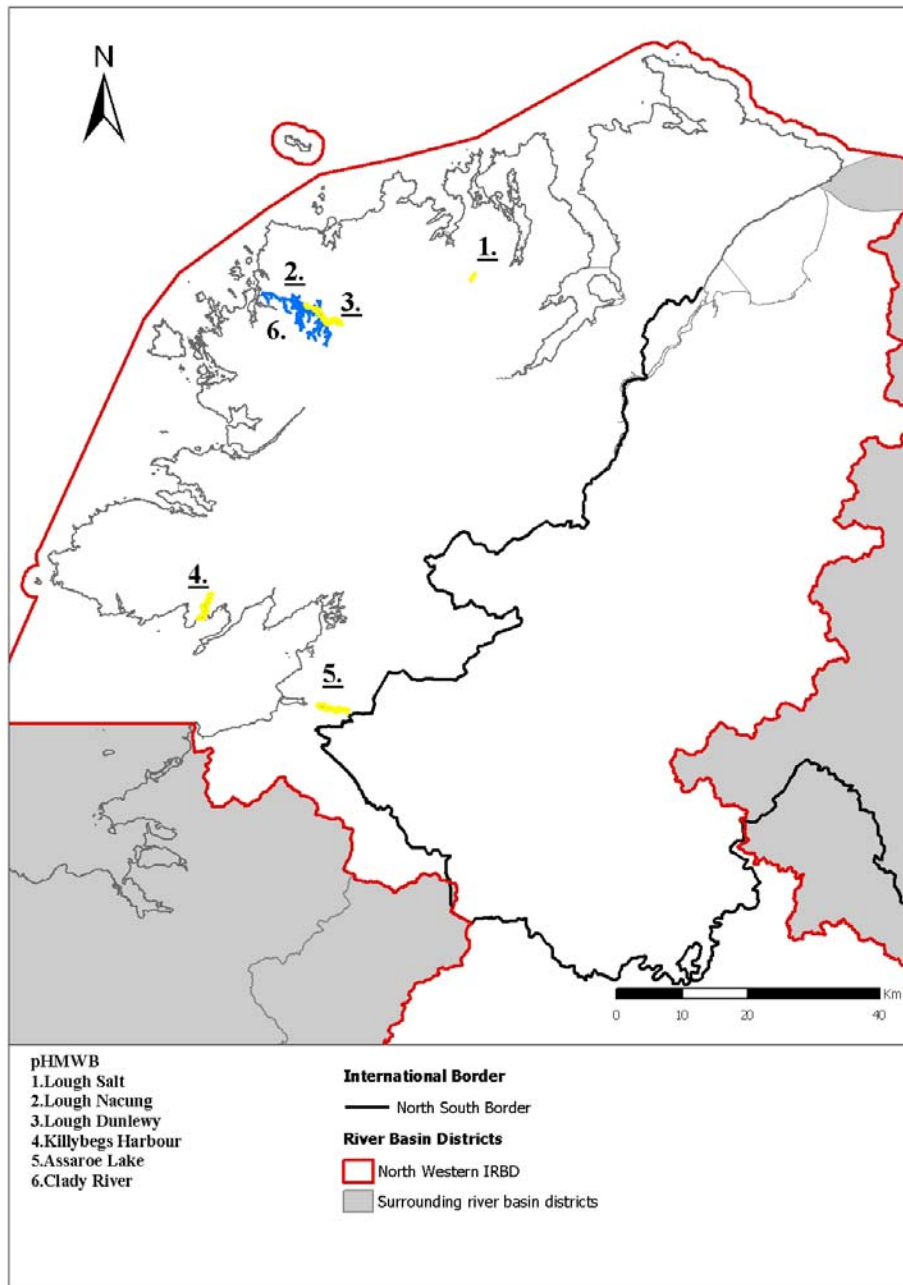
Water bodies at risk and probably at risk due to abstraction, flow regulation and morphology pressures were all considered as candidates for designation. However, expert review and consideration of water quality data screened out the majority of the candidate water bodies. Table 5.2 summarises the pHMWBs in the RoI portion of the NWIRBD. The process has identified 6 pHMWBs; 1 river, 4 lakes and 1 coastal. These are illustrated in Map 5.1. There are no pAWBs in the RoI portion of the NWIRBD. Nationally there were 37 pAWB and 37 pHMWB identified in total.

Table 5.1 Hydrological and Morphological Pressures leading to pHMWB designation in RoI

Hydrological & Morphological Pressures	Does the pressures 'substantially change' WB character and warrant further pHMWB consideration?
Rivers and Lakes	
Channelisation & Dredging	No
Flood Protection & Embankments	Yes If substrate is artificial
Impounding (dams)	Yes If ecological effects observed
Water Regulation (Locks & Weirs)	No
Intensive Land Use	No (Derogation for peat lands)
Abstractions	Yes If ecological effects observed
Coastal and Transitional	
Dredging	Combined affect of marine pressures to be considered for designation on a case by case basis
Dumping of Dredge Spoil	
Coastal Defence and Embankments	
Built Structures (ports, industrial intakes)	
Intensive Land Use	
Abstractions	

Table 5.2 pHMWB in NWIRBD

Description	pHMWB Name
River	Clady River
Lake	Lough Nacung
Lake	Lough Dunlewy
Lake	Lough Assaroe
Lake	Lough Salt
Coastal	Killybegs Harbour



Map 5.1 pHMWB in the Rol portion of the NWIRBD

5.3 pHMWB designation in NWIRBD

5.3.1 pHMWB – Rivers

Clady River Water Body

From the Gweedore Weir, the Clady River drops rapidly to the tidal estuary at Bunbeg approximately 5km away. The head of approximately 60m between Lough Na Cung and the sea was developed for hydroelectric power by diverting a major portion of the Clady flow at Gweedore Weir through a headrace canal approximately

2.7km long. The flow then passes through a penstock 0.5km long to a 4MW power station and onto the edge of the estuary of the Gweedore River.

The average annual long-term discharge of the Clady River at Gweedore is 3.9 cubic metres/sec. However, an average minimum flow of 0.33 cubic metres/sec is now maintained in the river downstream of Gweedore Weir (through Fish pass). Flood discharges also go down the Clady River, i.e. when the water reaches the level of the overflow weirs and has a discharge greater than approx. 8.5 cubic m/sec. This generally happens twice a year, and can be up to 30 cubic metres/sec.

5.3.2 pHMWB Lakes

Lough Na Cung Upper and Dunlewy Lough

Both of these lakes are situated at the foot of Mount Errigal, Donegal's highest peak. They both supply water for the ESB Generating Station in Gaoth Dobhair (Gweedore). Due to the presence of this hydroelectric power station impoundment both lakes were designated pHMWB's.

Lough Salt

Lough Salt lies to the North-West of Letterkenny town. It is approximately 60 hectares and 65 meters deep. Water is abstracted for drinking water purposes from this lake and as such was designated a pHMWB. It is prevented from overflowing into the adjoining Lough Reelan. It is in use since approximately 1945. The safe yield of the lake is of the order of 90m³/h and serves a population of 17,000 in the Letterkenny area. There are no wastewater or sewerage treatment plants located in the area that flow into the lake.

Assaroe Lake

Assaroe Lake is a large lake approximately 1,100 acres situated along the southern side of the Ballyshannon/Belleek road near the river Erne. It was created by the Cathleen Falls and Cliff power Hydro Stations. This lake supplies the Cathleen Falls ESB Generating station on the River Erne. The generating station is licensed by Donegal County Council to discharge effluent to the tidal waters of the River Erne.

5.3.3 pHMWB Coastal

Killybegs Harbour

HMWB designation is intended to be applied to major infrastructure projects and must be associated with the listed specified uses. The reason for a water body failing Good Ecological Status must be hydromorphological changes and not other pressures such as severe pollution effects.

In this regard ports exceeding 13,500 T/yr were to be considered for pHMWB. Killybegs Port had a gross tonnage of 80,594 T/yr in 2002. As this is a permanent change and not temporary or intermittent it was considered that Killybegs Harbour should be designated a pHMWB.

5.4 Next steps

Each pHMWB proceeds for more detailed examination, tests will be applied using economic information. If further characterisation reveals that any of the provisional cases are capable of achieving good ecological status they will be removed from the list and considered as natural water bodies. The full designation of water bodies will be included in the draft first River Basin Management Plan (RBMP) in 2008. On production of the draft, one year is available for consultation with stakeholders and interested parties before final plan publication in 2009.

6.0 Economics Baseline

6.1 Introduction

This chapter is based on the economics section of the National Characterisation Report with statistics extracted for the NWIRBD as appropriate. Existing and readily available data have been collated and analysed to provide an initial characterisation of the current and projected economic benefits and costs associated with the utilisation of water resources in Ireland's River Basin Districts (RBDs). This work, included in the Economic Analysis of Water Use in Ireland study (CDM 2004), details the following for the Republic of Ireland nationally and for each of its RBDs, as required by the WFD:

- Overview of socio-economic importance of water uses
- Assessment of costs and costs recovery of water services
- Projections of demand, supply capacity, and costs of water services
- Summary of work completed to establish baseline scenario
- Framework for conducting future economic analysis

The sections of this Chapter provide only a brief overview of key findings reported in the Economic Analysis of Water Use.

6.2 Overview of Socio-Economic Importance of Water Use

The socio-economic importance of water use in the RoI portion of the NWIRBD is characterised via reports of both economic impacts and water-use values of selected key water-using agricultural, industrial, and miscellaneous sub-sectors.

Key water-using sub-sectors 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, industrial and miscellaneous sub-sectors that have been examined are listed below in Table 6.1.

Table 6.1 Key Water-using Sub-sectors

Agricultural Sub-sectors	Industrial Sub-sectors	Miscellaneous Sub-sectors
Cattle and Cattle Products	Mining and Quarrying	Forestry
Sheep and Sheep Products	Food Products and Beverages Mfg	Inland Commercial Fishing
Potatoes	Pulp, Paper, and Paper Products Mfg	Seaweed Harvesting
	Chemical and Chemical Products Mfg	Aquaculture
	Basic Metals Mfg	Water-Based Leisure
	Machinery and Equipment n.e.c. Mfg	
	Electrical and Optical Equipment Mfg	
	Transport Equipment Mfg	
	Thermoelectric Power Generation	
	Hydroelectric Power Generation	

See Chapter 9.0, Abbreviations and Glossary of Terms for Definitions

6.2.1 Economic Impacts of Water Users

Collectively, the key water-using industrial sub-sectors have a significantly higher economic impact, in terms of gross output value, than do those of the key agricultural sub-sectors or the miscellaneous sub-sectors, as shown in Figure 6.1. This economic dominance of industry over agriculture is also evident in comparing the agricultural and industrial sectors in their entireties.

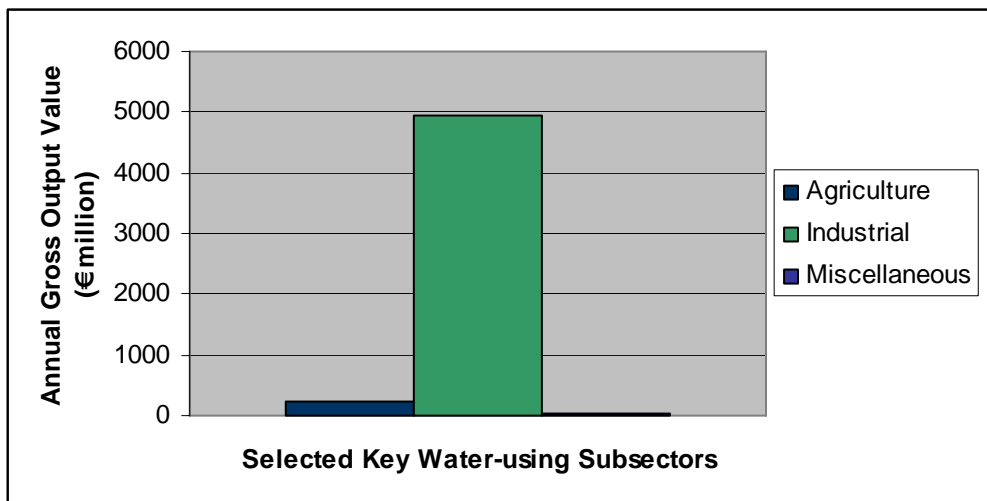


Figure 6.1 Estimated Annual Gross Output Values in Selected Key Water-using Agricultural (2002), Industrial (2001), and Miscellaneous (2002, 2003) Sub-sectors in the NWIRBD (Sources: Teagasc, CSO, ESB, ISC, BIM, ESRI)

The relative economic impacts of the key water-using agricultural, industrial, and miscellaneous sub-sectors vary significantly (Figures 6.2, 6.3 and 6.4).

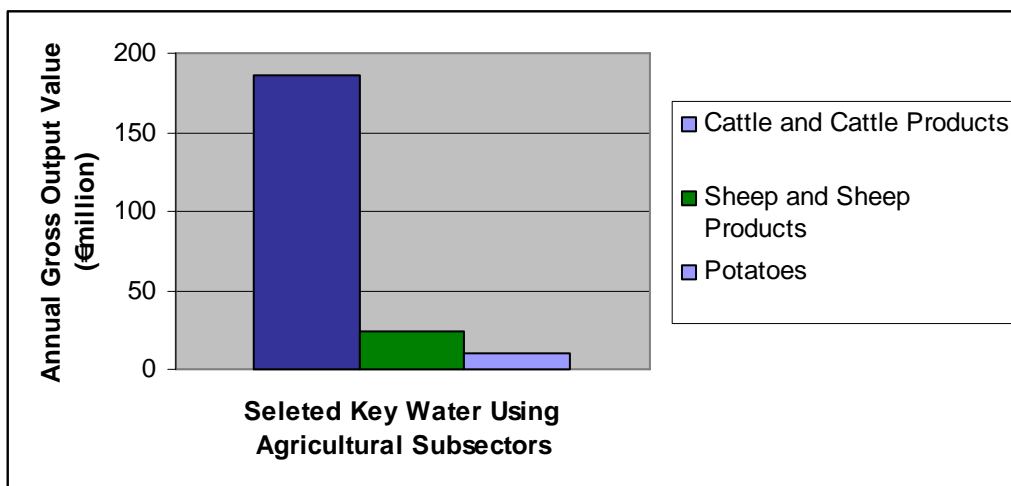


Figure 6.2 Estimated Annual Gross Output Values of Selected Key Water-using Agricultural Sub-sectors in the NWIRBD (2002) (Source: CDM)

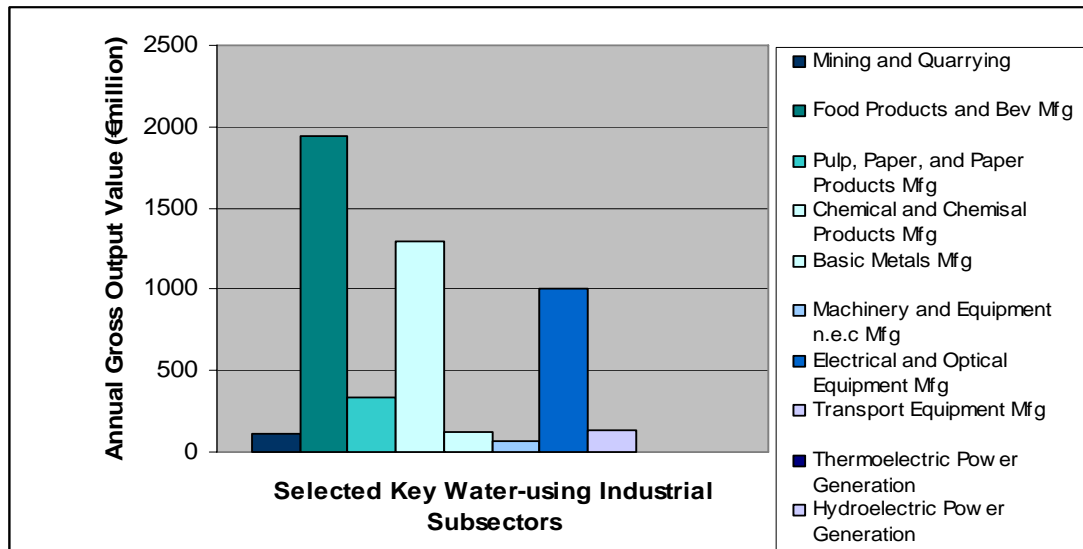


Figure 6.3 Estimated Annual Gross Output Values of Selected Key Water-using Industrial Sub-sectors in the NWIRBD (2001) (Source: CDM)

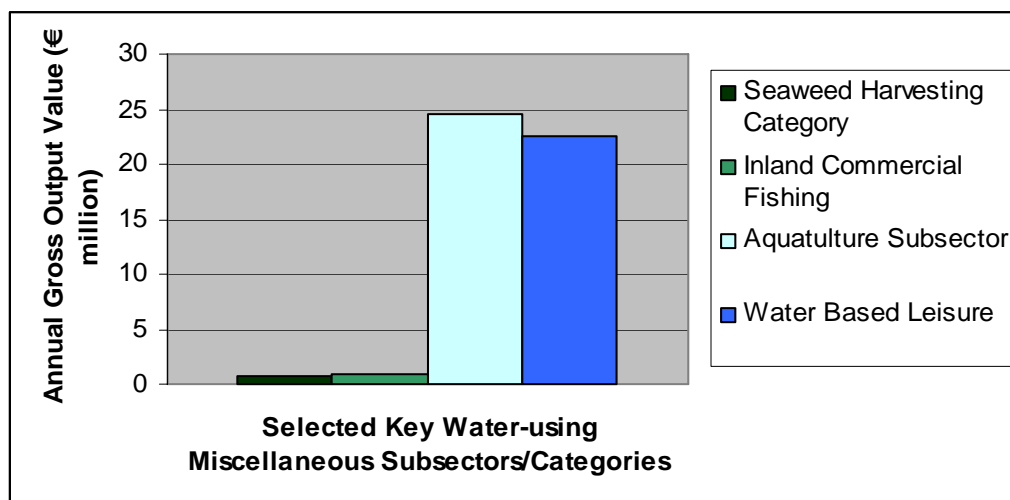


Figure 6.4 Estimated annual gross output values of selected key water-using miscellaneous subsectors in the NWIRBD (2002, 2003)

6.2.2 Values of Water Resources

The estimated value of abstractive water to the domestic sector exceeds that of both the agricultural and industrial key water-using sub-sectors (Figure 6.5). It is notable that water usage, and thus the value of water, to the agricultural sub-sectors generally exceeds that of the industrial sub-sectors although the economic impacts of the key water-using industrial sub-sectors significantly exceed those of the key water-using agricultural sub-sectors (Figure 6.1).

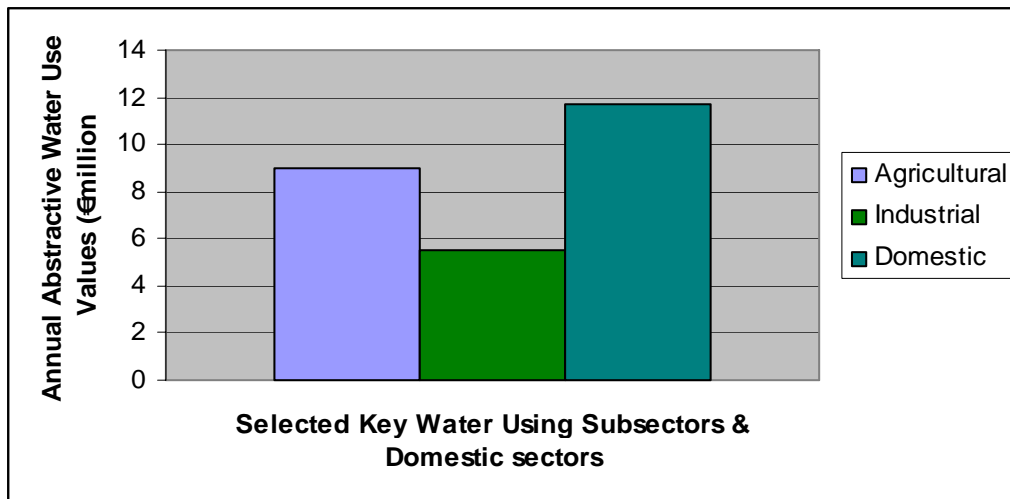


Figure 6.5 Estimated Annual Abstractive Water-use Values of Selected Key Water-using Sub-sectors (2001 Industrial, 2002 Agricultural) and the Domestic Sector in the NWIRBD (2003) (Source: CDM)

Figure 6.6 depicts the results of a study to estimate the value of water-based recreation in Ireland. The study, completed by ESRI for the Marine Institute (Williams and Ryan, 2004), analysed water-based leisure activities in Ireland, including those associated with domestic tourism. At the national level beach visits are highly valued by Irish residents and recreational fishing; boating; aquatic bird watching etc. are significant economic activities.

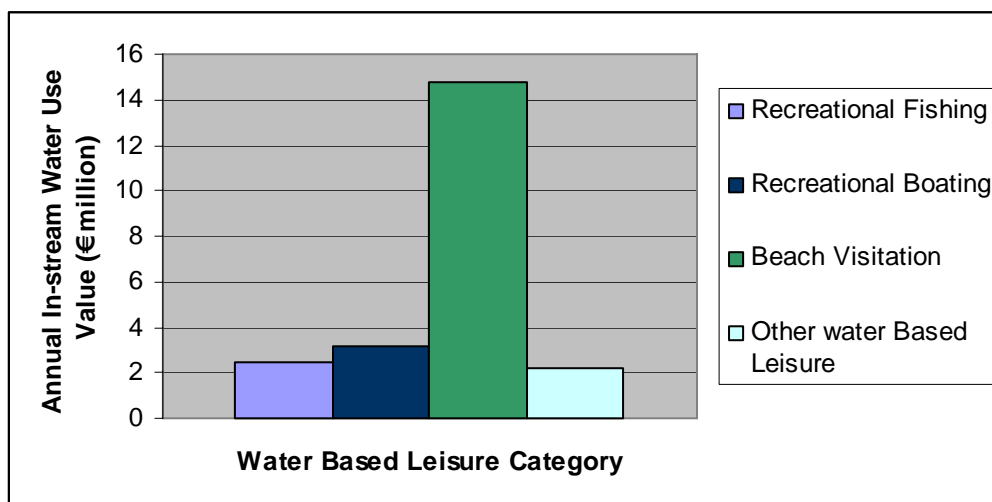


Figure 6.6 Estimated Values of Water-based Leisure in the NWIRBD (2003) (Source: (Williams and Ryan, 2004) & CDM)

National Heritage Areas, Special Protection Areas, and Special Areas of Conservation in Ireland were collectively deemed Special Riparian Areas (SRAs) for the purposes of estimating values associated with these areas in the Economic Analysis of Water Use in Ireland report. The values of wetlands were also estimated. Total monetary values of wetlands and SRAs were indeterminable due to the data constraints, but an attempt was made to estimate the partial values of these areas

with respect to non-uses such as wildlife habitat. Figures 6.7 and 6.8 illustrate the partial values of SRAs and wetlands for the RoI portion of the NWIRBD, respectively, in relation to the other RBDs in Ireland. The value range for Special Riparian Areas in the NWIRBD is €2.6 o €8.3 million and the Wetland value range is €2.4 to €25 million.

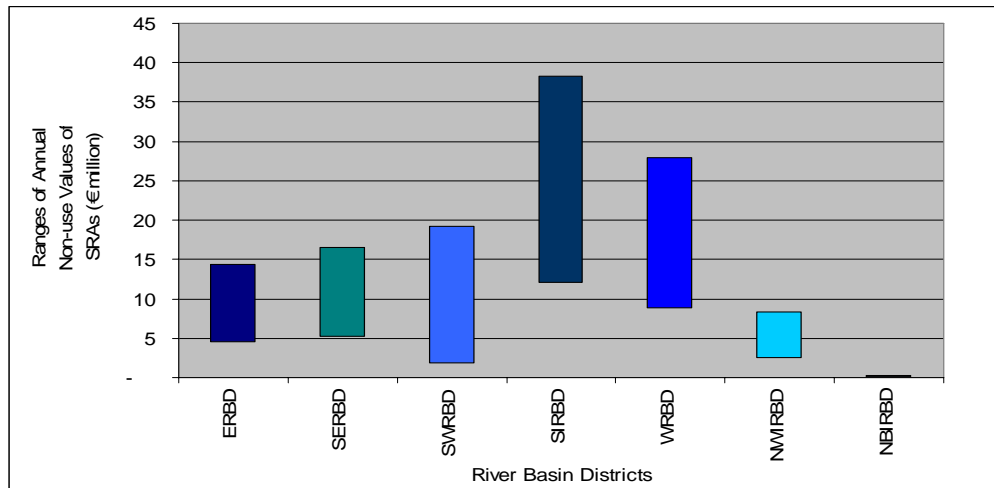


Figure 6.7 Estimated Ranges of Annual Non-Use Values of Special Riparian Areas in Ireland by (I)RBD (2004) (Source: CDM)

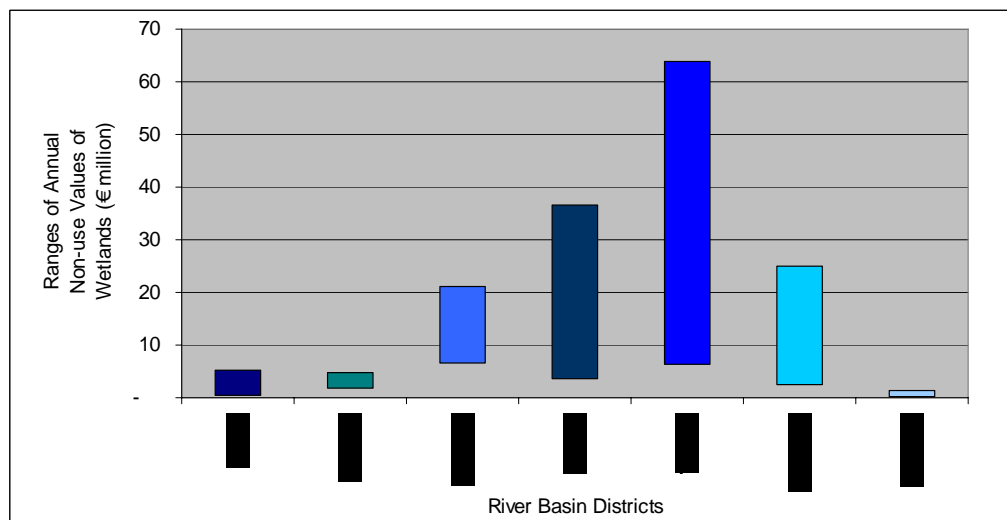


Figure 6.8 Estimated Ranges of Annual Non-Use Values of Wetlands in Ireland by (I)RBD (2004) (Source: CDM)

Inclusion of this preliminary work to estimate various user groups’ willingness to pay for water resources utilisation, conservation and/or restoration, in addition to the economic impact assessment (i.e., gross output value, employment, etc.) , is done in recognition of the need to begin building the knowledge base upon which user/polluter pays policies might in the future be systematically formulated. It is recognised that such policies cannot be formulated with economic impact assessment information alone.

6.3 Assessment of Costs and Costs Recovery of Water Services

The financial costs of water services – potable water supply and wastewater collection, treatment and disposal – are reported for each RBD, as are partial estimates of the environmental/resource costs associated with polluted wastewater discharges. The extent to which, and nature by which, the financial costs of water services are recovered by water service authorities are also reported where such information exists. The environmental/resource costs, by the nature of the fact that they are 'externalised' on parties without compensation, are not accompanied by cost-recovery information.

Data on the financial costs of water services are sourced generally with the local authorities. The local authorities summarise and report these data by 'Programme Group' to the Department of the Environment, Heritage and Local Government (DEHLG). Programme Group 3 reports detail expenditures (costs) and receipts (cost recovery) for public water supply (Group 3.1), public sewerage schemes (Group 3.2), private installations (Group 3.3), and for the administrative and miscellaneous category (Group 3.8). It is of note, however, that the costs and cost recovery figures under Programme Group 3 are not all-inclusive of even public water services expenditures. A portion of the costs associated with public water services are covered by local government borrowing, polluter-pays receipts, and development levies.

6.3.1 Financial Costs and Costs Recovery for Water Services

Financial costs of water services primarily include those associated with the provision of potable water supply and wastewater treatment. Table 6.2 summarises the most recent and available data detailing the partial financial costs and costs recovery associated with potable water and wastewater services in the NWIRBD.

Table 6.2 Partial Costs and Costs Recovery of Water Services in the Rol Portion of the NWIRBD (2003) (Source: DEHLG, CDM)

Water Services Investment Programme, 2003	Receipts €	Expenditures €	Cost Recovery
Public Water Supply	5,982,897	11,364,028	53%
Public Sewerage Schemes	376,207	4,709,956	8%
Private Installation	753,680	1,434,497	53%
Administration and Miscellaneous	657,660	5,243,444	13%

As shown in Table 6.2, there is a significant receipts shortfall across the public sewerage schemes and the administration and miscellaneous subgroups. It should be noted that 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 currently prohibit direct charges for the Domestic Sector.

Figure 6.9 illustrates the growing gap between the general Programme Group 3 costs of water services and the costs currently recovered. The source of funding for

addressing this deficit is the General Purposes Payments from central funds made to local authorities

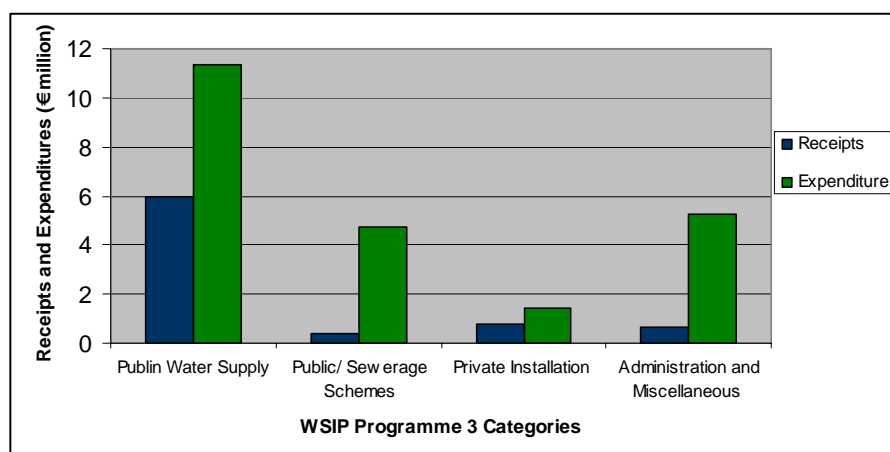


Figure 6.9 Programme Group 3 Annual Receipts and Expenditures in the NWIRBD (2003) (Source: DEHLG, CDM)

In 2003 there were an estimated 183,650 non-domestic users of public water and wastewater services in Ireland. The charge per cubic metre averaged across all local authorities was €0.96, however there was a considerable variance in this charge, and the local authorities with the highest per unit costs were not always those experiencing the highest average cost of producing water to non-domestic users.

6.4 Projections of Demand, Supply Capacity, and Costs of Water Services

Projections of demand, supply and costs of water services were undertaken to assess future water resources pressures and impacts and how they might influence the use and value of water. Information is currently not available to comprehensively project the extent to which, and nature by which, each of the major sectors will impact Ireland's water resources nationally and in each RBD through to 2015. However, existing trend data is adequate to project quantities of water demand by customer classes. In addition, information is available to describe future supply capacity for wastewater treatment services and to project the future costs of water services in general.

6.4.1 Projected Water Demand

The projected water demand for the RoI portion of the NWIRBD, through to 2015, which includes an estimate of unaccounted for water recovery, is presented in Figure 6.10.

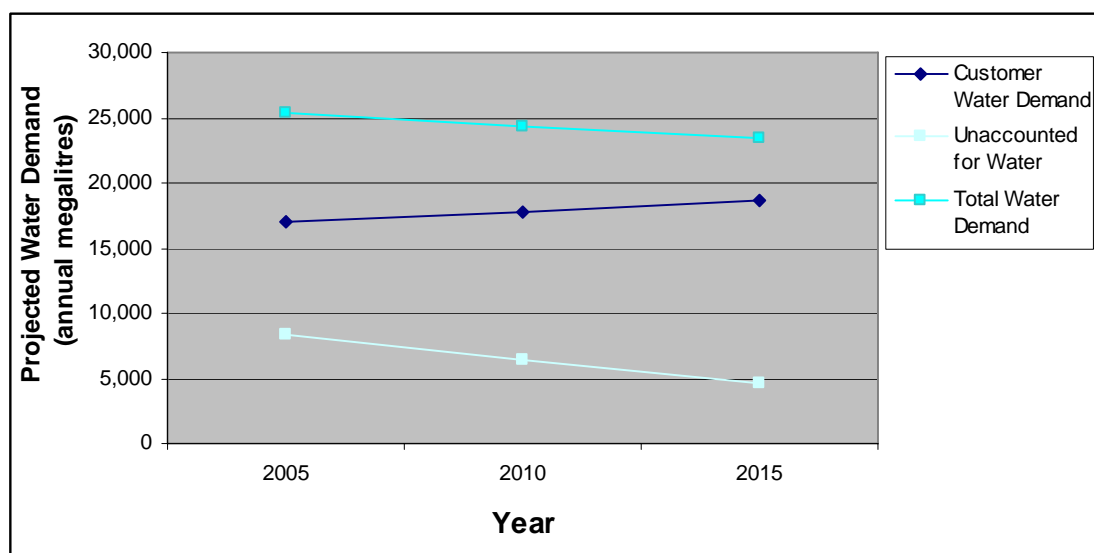


Figure 6.10 Projected Annual Water Demand and Unaccounted for Water in the NWIRBD (Source: CDM)

6.4.2 Future Supply Capacity of Water Services

Approximately half of the wastewater treatment plants examined in the National Urban Wastewater Study would be adequate to treat future projected loadings in year 2022 to the design standard used in the study. Also, according to the same study, 85% of applicable receiving waters studied in 2002 limit discharges based on their assimilative capacities. These findings are highlighted in Table 6.3.

Table 6.3 Supply Capacity of Wastewater Treatment Services (Source: DEHLG)

Classification	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)	
	Adequate	Under Capacity	Not Known	Restricted	Unrestricted
Percent	48%	49%	3%	85%	15%

Projected Costs of Water Services

The partial national projection costs of water services in the RoI portion of the NWIRBD through to 2015, estimated via trend analysis of Water Services Investment Programme (WSIP) and Rural Water Programme (RWP) data for 2000 – 2003, is presented in Figure 6.11. If trends hold, WSIP expenditures will increase by 45% while RWP expenditures will increase by 57%.

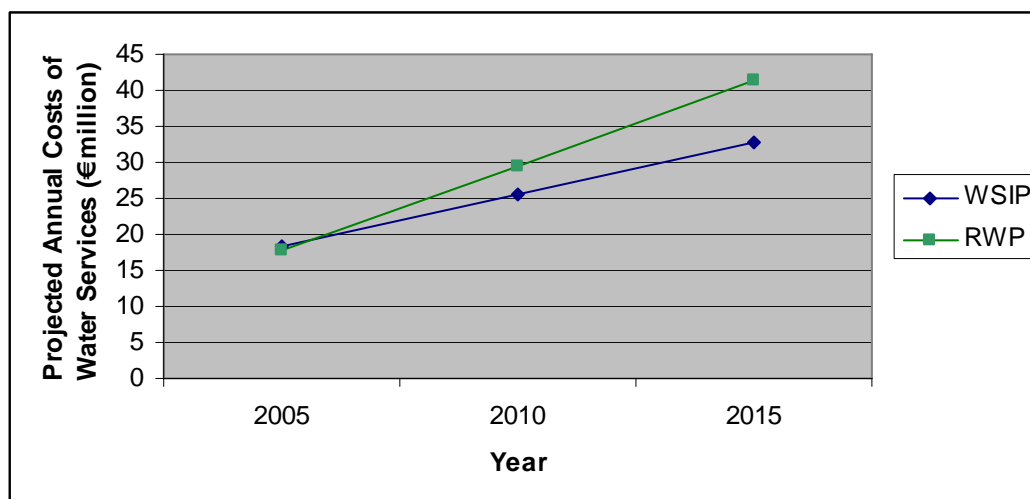


Figure 6.11 Partial Projected Costs of Water Services in the NWIRBD – Water Services Investment Programme (WSIP) and Rural Water Programme (RWP) Water and Sewerage Costs: 2005 and 2015

6.5 Summary of Work Completed to Establish Baseline Scenario

With the contents of the Economic Analysis of Water Use in Ireland study (CDM, 2000), as described in summary in this Chapter, a baseline scenario has been established that describes the current and future projected benefits and costs of water resources in the Republic of Ireland nationally and in each of its RBDs.

With respect to current benefits, this baseline includes information on the economic impacts of the Agricultural Sector, the Industrial Sector, and selected key water-using sub-sectors within those sectors. The economic impacts of other miscellaneous sub-sectors are also part of the baseline, as are estimates of the value of abstractive and in-stream water use to selected key water-using sub-sectors. Non-use values of water resources, namely wetlands and SRAs comprise a portion of the economic baseline. In regards to future beneficial uses of water, projections of water demand by customer class are detailed. This information is sufficient for the purposes of preliminary determination of the extent to which the expenditures associated with WFD compliance in each RBD will be cost-beneficial to the communities that lie in each RBD.

The baseline of costs include current and projected estimates of the financial costs of water services and environmental/resource costs. A major portion of the financial costs of water services in the NWIRBD, as accounted for in DEHLG's Programme Group 3 expenditures and receipts assessments, also have attached to them estimates of cost recovery. The economic baseline further includes summaries of rate structures and water services cost-recovery practices in each RBD. Although water services total cost and cost-recovery figures were unobtainable in establishing the baseline, and environmental/resource costs were largely indeterminable, a

usable baseline for analysing user/polluter pays policies at the national level is in place. It is evident that future analysis of user/polluter pays policies pursuant to WFD requirements may be more appropriately conducted for political jurisdictions within RBDs rather than for any given RBD as a single unit. Cost-effectiveness analysis of programmes of measures will similarly be needed at spatial scales sometimes different than the RBD scale. The economic baseline established in the Economic Analysis of Water Use in Ireland study is an adequate foundation upon which all future required analysis of costs can be conducted.

6.6 Information and Framework for Future Analysis

Despite the wide range of findings in the initial economic characterisation study, there remains a body of information potentially relevant to future economic analysis that currently does not exist. Supplementary information will be needed to support three general types of economic analysis:

- **Cost-effectiveness Analysis.** Only a ranking of impacting sources exists for each RBD; marginal remediation costs across sub-sectors or geographical groupings of water users need to be developed.
- **Cost-benefit Analysis.** The benefits estimations needed to conduct the cost-benefit analysis are only partially complete at the RBD level and absent at the water body or river segment level. These information 'gaps' are not necessarily information 'needs', which will only become apparent as the WFD planning process moves into the next phase.
- **Cost-incidence Analysis.** In Ireland, the information necessary to comprehensively assess the distribution of costs of water services in relevant hydrologic or political areas is not currently available.

There remains a substantial amount of peripheral information that can be generated to continue building the baseline. A framework has been developed that ensures the efficient allocation of data generation and analytical resources. The framework includes several key activities:

- Coordinate with other Member States to monitor methodologies and approaches
- Research potential management measures and implementation methods consistent with the polluter-pays and user-pays principles and with reference to their general types and spatial qualities
- Develop selection methodologies and criteria to support evaluation and comparison of alternative measures and programmes taking account of direct and indirect economic impacts, monetisation of environmental outputs, cost-effectiveness analysis of alternative programmes of measures and cost incidence of charging schemes

- Solicit cost and benefit estimates of achieving good status from stakeholders upon publication of proposed generic programmes of measures
- Based on the stakeholder input regarding the costs and benefits associated with the programme of measures, classify water bodies into one of the four major economic analysis strategy paths (i.e., (1) cost-effectiveness analysis only; (2) cost-effectiveness and cost incidence/impact analysis; (3) cost-effectiveness analysis and cost-benefit analysis; or (4) cost-effectiveness analysis, cost incidence/impact analysis and cost-benefit analysis
- Pilot test the methodologies on selected water bodies or groups of water bodies to evaluate the methods and determine additional data requirements
- Refine methodologies (if necessary) and develop a unified implementation strategy.

6.7 Conclusions

The industrial sector dominates the RoI portion of the NWIRBD in terms of economic impacts, although the true contribution of the agricultural sector is difficult to quantify due to the manner in which economic datasets are reported at the national level. Domestic water use exceeds that of both the key water-using Industrial Sub-sectors and Agricultural Sub-sectors in the RoI portion of the NWIRBD.

Local authority policies for costs recovery for water services vary considerably throughout the RoI portion of the NWIRBD. Like in the rest of Ireland, the domestic sector typically is not charged for water services. The industrial and agricultural sectors, to varying degrees, along with Exchequer funds, largely cover the costs of water services in the NWIRBD within RoI.

7.0 Summary of the Way Forward

7.1 Overview of the Characterisation Process

The initial characterisation process is the most comprehensive and systematic assessment of the surface and groundwater bodies undertaken in the NWIRBD. The process has identified surface water and groundwater bodies which are the basic management unit in reporting and assessing compliance under the WFD. An assessment of the human impacts on each water body has also been carried out to prioritise the activities and pressures within the NWIRBD that have potential to cause water bodies to fail in achieving the objectives of the WFD by 2015. This risk assessment has helped to identify and prioritise issues in relation to water quality management. The initial characterisation process represents the first phase of the River Basin District Planning cycle and will establish the best way forward in relation to monitoring programmes and the development of a programme of measures to address the main water management issues identified.

Water bodies have been classified based on natural factors such as altitude, geology or size. This system of classifying waters according to meaningful types is called typology. Surface and groundwater bodies have been typed nationally.

There are 72 groundwater bodies in the Rol portion of the NWIRBD, and 29 of these are cross border groundwater bodies. The predominant type based on the classification system is the poorly productive bedrock.

There are 665 river water bodies in the Rol portion of the NWIRBD. Approximately half of these are siliceous (or soft water) types covering a range of channel slope conditions.

There are 227 lake water bodies in the Rol portion of the NWIRBD. Typology information is available for 49 large lakes which places them into eight different types (mainly low and moderate alkalinity groups).

The typology exercise carried out for the marine waters in the Rol portion of the NWIRBD has resulted in the delineation of 22 transitional water bodies (falling into two types) and 23 coastal water bodies (falling into four types).

The key pressures on waters in the Rol portion of the NWIRBD are:

Groundwaters

One quarter of groundwater bodies in the portion of the NWIRBD within Rol are at risk or probably at risk of failing to meet the objectives of the WFD. The main pressures on groundwater bodies are chemical pollutants from both point and diffuse source pollution.

Rivers

The risk assessment for rivers indicates that of the 665 water bodies assessed in the NWIRBD over half are considered to be at risk of not achieving their good status objectives. The main sources of human pressures in the portion of the NWIRBD within RoI are from diffuse and morphological pressures. This assessment is supported by impact data.

Lakes

The lake risk assessment has established that, for the most part, water abstraction and diffuse source pollution associated with intensive land use practices are the most significant pressures in relation to the lake water bodies contained within the NWIRBD.

Transitional and Coastal Waters

Just under half of the transitional water bodies in the portion of the NWIRBD within RoI are considered at risk. Morphological pressures are the main pressure source with dredging (channelisation) posing the greatest threat to transitional waters.

The effects of pollution from diffuse and point sources (as indicated by the marine impact assessment) represent the main pressure on coastal water bodies, however morphology, particularly built structures and shoreline development, also represent a pressure on the marine environment.

Alien Species

Two species of concern are present in the NWIRBD; in particular the Zebra Mussel has been found on both the upper and lower Lough Erne, and common cord grass has been found in the coastal waters of Lough Foyle.

Fisheries Activities

In the NWIRBD commercial aquaculture activities are located in Killybegs Harbour, Lough Foyle, Lough Swilly and Gweebarra Bay. Further offshore, Scallop Dredging and Otter Trawling are also undertaken.

Bathing Waters

An assessment of compliance with existing water quality standards for designated *Bathing Waters* was undertaken. In the NWIRBD there is one compliance breach detected at Portstewart Bay.

HMWBs and AWB

The NWIRBD has identified 6 pHMWBs; 1 river, 4 lakes and 1 coastal. There are no pAWB. Nationally there were 37 pAWB and 37 pHMWB identified in total.

7.2 Further Characterisation and the development of Programme of Measures

The next activity of the WFD, further characterisation, will involve collection of additional datasets to fill data gaps, additional monitoring, and use of modelling techniques in order to improve confidence in the risk assessment process. Targeted studies (e.g. fieldwork and modelling exercises) will be undertaken to verify the linkages between pressures and impacts, to enable environmental objectives to be set and to establish a rigorous basis for the development of programmes of measures. The scope of these studies will be directed by the results of the risk assessments. The NS Share project will facilitate this process in the NWIRBD through new data collection and the development of catchment models to allow a better understanding of the water quality issues.

Monitoring programmes must be established by 2006 for surface waters, groundwaters and protected areas. The objectives of the monitoring programmes are to determine the status of water bodies by validating and supplementing the initial risk assessments; assess the effectiveness of measures and to contribute to the development of programmes of measures within RBMPs. The design of these monitoring programmes will be assisted by the output of the characterisation process. The intention is that further characterisation will have addressed many of the uncertainties identified by the initial characterisation by mid-2006 before WFD monitoring programmes are designed and implemented. The outputs of the monitoring programmes will direct the development of a programme of measures aimed at achieving the WFD's objective of at least good status.

Identified water management issues represent a challenge for WFD implementation. Pressures that have been identified as posing significant risk to the attainment of WFD objectives are in many cases, the result of established human activity and practices. Proposed mitigation measures aimed at achieving "good status" for water quality may instigate changes to these practices and as a result raise social, economic and technical issues. Therefore, all mitigation proposals should be thoroughly reviewed with respect to their feasibility and implications.

Basic measures are the minimum requirements to be complied with and consist mainly of measures required to implement EU legislation in relation to the protection of water. In addition to the basic measures, supplementary measures will be designed and implemented in order to achieve the objectives of the WFD. Most importantly the further characterisation process will involve rigorous detailed studies which will verify the linkages between pressures and impacts. The subsequent activity will deliver decision making tools to support regulators with the implementation of the WFD.

The involvement of all stakeholders in the river basin management process is also critical to the overall success of the project and the full implementation of the WFD. It is essential that a common integrated approach to participation of interested parties

is developed throughout the entire NWIRBD. This will be achieved by communication of the significant water management issues within the study area through various media including the internet, reports and local meetings aimed at raising awareness of the project and the WFD.

This summary report has attempted to make the findings of the characterisation process available to all parties within the RoI portion of the NWIRBD. Public participation is a cornerstone of the WFD and the next deliverables are geared towards strengthening this role. The next major reporting deadline under the WFD is the publication of a “significant water issues report” in 2007. The report will further inform the public of the water management priorities in the NWIRBD. The first River Basin Management Plan (RBMP) for the NWIRBD will be drafted during 2008 and finalised after a year’s consultation in 2009.

8.0 References

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9.0 Abbreviations & Glossary of Terms

EU INTERREG IIIA	A €182 million programme which addresses the economic and social disadvantages that can result from the existence of a border. It does this by promoting the creation of cross border networks involving, and benefiting local communities. The Ireland/Northern Ireland INTERREG IIIA Programme covers all of Northern Ireland and the six border counties of Ireland. The NS SHARE project is funded by EU INTERREG IIIA. (Website reference http://www.seupb.org).
Alkaline	any substance with a pH greater than 7. (also, 'basic')
Aquifer	water-bearing sand, gravel, or rock layer yielding usable water quantities
AWB	Artificial water Body (pAWB indicates provisional AWB)
Brackish water	a mixture of fresh and salt water
Calcareous	geological term for rocks containing calcium carbonate
CFB	Central Fisheries Board
CSO	Combined Storm Overflow
EaRBD	Eastern River Basin District
Euhaline	fully saline (salty) marine waters (30 to 35 ppt [‰])
EPA	Environmental Protection Agency
GSI	Geological Survey of Ireland
Hard water	water with a high concentration of calcium, magnesium, and other minerals
HMWB	Heavily Modified Water Body (pHMWB indicates provisional HMWB)
IPPC	Integrated Pollution Prevention & Control (Protection of the Environment Act)
Karstic	heavily eroded & channelled outcropping limestone rocks (Origin: Kras, Slovenian limestone plateau region)
Macrotidal 4 m	Coastal ocean or waterway with a high mean tidal range, e.g. > 4 m
Mesohaline	Moderately brackish water with a salinity range of 5-18 ‰
Mesotidal	Coastal ocean or waterway with a moderate mean tidal range, e.g. 2-4m
Microtidal <2m	Coastal ocean or waterway with a low mean tidal range, e.g. <2m
MRP	Molybdate-reactive Phosphate
NBIRBD	Neagh-Bann International River Basin District
NPWS	National Parks and Wildlife Service
NS Share	North South Shared Aquatic Resources
NWIRBD	North Western International River Basin District
OSPAR	Commission for the Protection of the Marine Environment of the NE Atlantic
Polyhaline	mixed or highly brackish water with a salinity of range 18-30 ‰

POM	Programme of Measures
P&I	Pressures and Impacts
RBD	River Basin District
RBMP	River Basin Management Plan
Section 4s	licensed discharges to water courses (Local Government Water Pollution Act)
Section 16s	licensed discharges to sewers (Local Government Water Pollution Act)
SERBD	South Eastern River Basin District
ShIRBD	Shannon International River Basin District
Siliceous	geological term for rocks containing a large percentage of silica
Soft water	water with a low concentration of calcium and magnesium ions
SWRBD	South Western River Basin District
TP	Total Phosphorus
Transitional	term referring to estuarine waters (Water Framework Directive)
Water body	the basic compliance, reporting and management unit for the Water Framework Directive into which all rivers, lakes, ground, transitional and coastal waters are divided.
WRBD	Western River Basin District
WFD	Water Framework Directive
WTP	Water Treatment Plant
WWTP	Waste Water Treatment Plant

Glossary of Economic Terms

Cattle and Cattle Products – All activities reported under the NACE classification system definition for ‘Section A.1.21 - Farming of cattle, dairy farming’.

Cost-benefit analysis – A method that aims to estimate an appropriate level of additional public expenditure (i.e. one that is consistent with establishing benefits greater than or equal to the costs incurred). The WFD requires only that programmes of measures be ‘cost-effective’, and the benefits associated with achieving or maintaining good water status need not necessarily be estimated unless the costs of achieving the good status goal for a water body are suspected to be highly disproportionate to the benefits. (For a derogation to be granted for any period of time for any water body, it must be demonstrated that the cost-effective programme of measures is not cost-beneficial.)

Cost-effectiveness analysis – A method that considers the implementation costs of individual measures that can potentially be employed to achieve a predetermined water status objective and that reveals the combination of those measures that will achieve the objective at the least cost. In order for cost-effective programmes of measures to be identified (as required by the WFD), the relative costs of each measure which can address issues currently contributing (or potentially contributing) to the failure to achieve this goal must be estimated and compared.

Cost-incidence analysis – A measure of ‘who pays’ under various resource use scenarios. Critical to any policy application of the user/polluter pays principle is an investigation of the real redistribution of costs under various pricing/charging policy alternatives.

Gross Domestic Product (GDP) – In *Economic Analysis of Water Use in Ireland*, GDP at market prices is reported. GDP at market prices is an estimate of the total annual value of goods and services physically produced in Ireland and provided to consumers (not including the value of goods and services provided from one producer to another). In Ireland, GDP is a composite value produced by two methodologies to estimate consumer expenditures – one related to expenditures and the other to personal income.

Gross output value – The annual gross market value of the goods and services produced by a specified economic sector or sub-sector.

Gross value added – In *Economic Analysis of Water Use in Ireland*, gross value added at basic prices is reported. In simplest terms, gross value added at basic prices is total annual revenues attributable to a sector or sub-sector less the outlays for the inputs to production plus subsidies. Gross value added estimates are reported in the Enterprise Industrial Census.

Non-use value – The value associated with the component of a resource that is not used, such as the value people may place on being able to bequeath an undisturbed wetland to future generations or the value people may place on simply knowing that a population of an endangered species is being restored. These resources typically only have non-market values when the resources (such as wetlands) are not privately owned.

Sheep and Sheep Products – Activities related only to the sheep farming component (e.g., mutton, wool, etc.) reported under the NACE classification system definition for ‘A.1.22 - Farming of sheep, goats, horses, asses, mules and hinnies’.

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