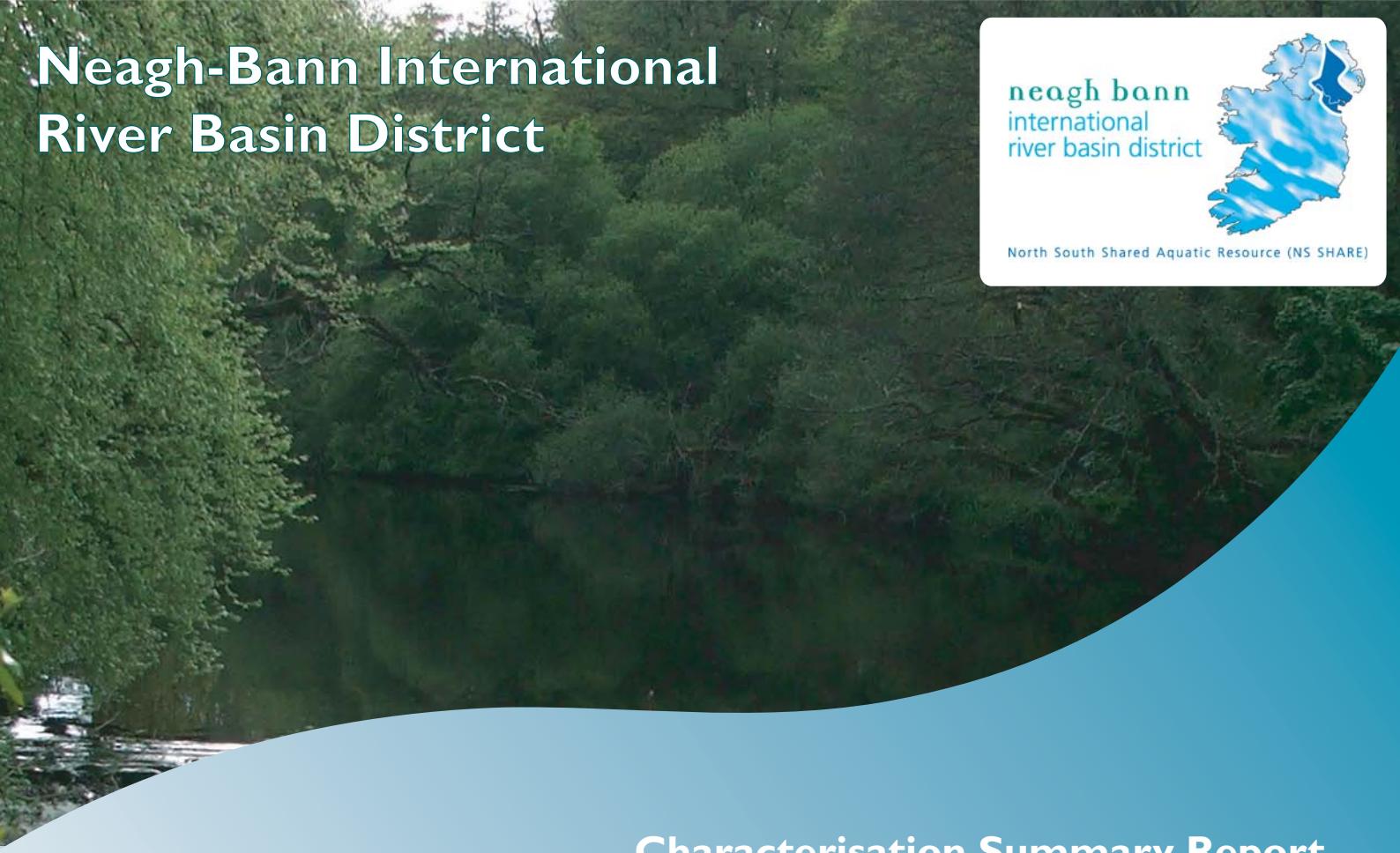
Neagh-Bann International River Basin District

neagh bann
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

INTERREG IIIA

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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.nbirbd.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 WFD, are used as the main unit for managing the water environment. A River Basin District (RBD) can include several individual river basins 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

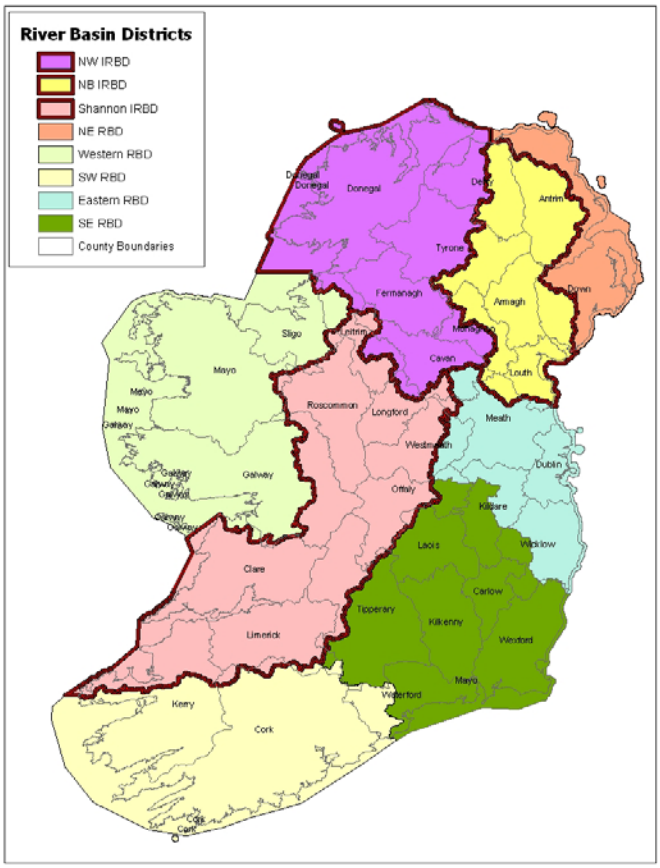
The WFD was transposed into Irish Legislation by the European Communities (Water Policy) Regulations 2003, (Statutory Instrument No. 722) in December 2003. Table 1.1 shows the implementation timetable as scheduled in Irish legislation.

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). 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	
22nd December 2003	Implementation of the WFD on a National level	Public Information and Consultation (ongoing)
22nd June 2004	Establishing of River Basin Districts as the fundamental unit for applying and co-ordinating the Directive's provisions	
22nd December 2004	Characterisation of River Basin Districts	
22nd 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)	
22nd June 2007	Prepare and publish an overview of the significant water management issues identified in each river basin	
22nd 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	
22nd 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 Neagh Bann IRBD (NBIRBD) 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 Neagh Bann International River Basin District

Eight RBDs have been established on the island of Ireland as indicated by Map 1.1. The Neagh Bann International River Basin District (NBIRBD) 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.

Map 1.2 illustrates the extent of the entire NBIRBD showing the main population centres and county boundaries. The Republic of Ireland (RoI) portion of the NBIRBD drains significant portions of Counties Louth and County Monaghan whilst counties Cavan and Meath have smaller drainage areas.

The river basins located within the NBIRBD include the Lough Neagh/River Bann System with smaller river basins draining into Carlingford Lough and Dundalk Bay.

The NBIRBD population within the RoI portion is 116,290. The main population centres include the towns of Dundalk, Monaghan, Ardee, Carrickmacross, Castleblaney and Ardee.

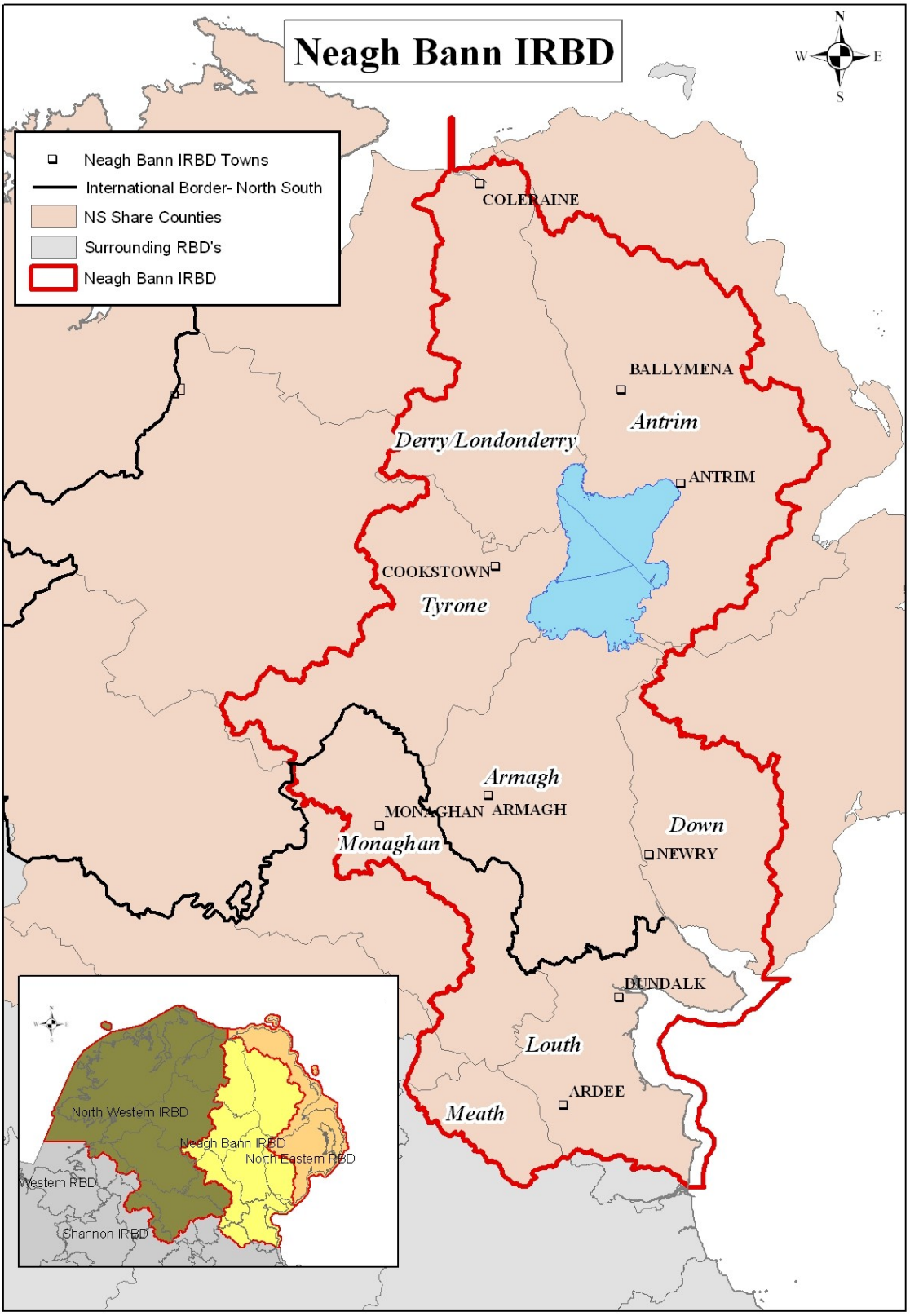
The land use in the RoI portion of the NBIRBD is typified by improved pasture but also includes extensive arable farming particularly in County Louth. To the northern extent of the RoI portion of the NBIRBD the landscape is dominated by drumlins that stretch across Monaghan and Louth and into Northern Ireland. Agriculture is also the

predominant land use in this area. There are pockets of peat bogs and coniferous forestry in upland areas surrounding Carlingford Lough and in Slieve Beagh in Co. Monaghan.

Ordovician/Silurian greywackes and mudstones, intruded by younger granites, occur in the southern extents of the RoI portion of the NBIRBD. In the west a variety of Devonian and Carboniferous mudstones, limestones and sandstones occur along with areas of Permo-triassic sandstones. There is extensive coverage of superficial deposits, mainly till but also sand and gravels.

Due to the varied nature of the terrain the different river basins range from lowland rivers with wide valleys and slow discharge velocities to upland rivers with steep valley slopes and a flashy flow regime.

The climate is temperate, with the average rainfall per year approximately 800 mm in the Lough Neagh Basin.



Map 1.2 Neagh Bann International River Basin District (NBIRBD)

2.0. Typology

2.1 Introduction

All waters within the NBIRBD were differentiated into water categories: groundwater, rivers, lakes, transitional waters (estuaries) and coastal waters. The waters in each of these categories were further 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, there are 28 groundwater bodies in the RoI portion of the NBIRBD, 5 of these are cross border bodies. Ongoing delineation and characterisation of these border groundwater bodies may result in some redefining of water body boundaries.

Table 2.1 Groundwater Body Types in the RoI portion of NBIRBD

Groundwater body types based on flow regime	Number of Water Bodies	% of number	% area of RBD
Karstic	2	7.1	4.7
Productive fissured bedrock	7	25.0	17.9
Gravel	7	25.0	2.0
Poorly productive bedrock	12	42.9	75.4

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 (Refer to 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

Rivers within the Republic of Ireland have been allocated to one of 12 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 combine 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 CaCO3/l
2	1-25% Calcareous (Mixed Geology)	Medium hardness	35-100 mg CaCO3/l
3	>25% Calcareous	Hard water	>100 mg CaCO3/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 71 river water bodies in the RoI portion of the NBIRBD. Approximately half of these are calcareous (or hard water) types covering a range of channel slope conditions. In addition, 74 cross-border river water bodies exist within the NBIRBD. These have not yet been assigned a typology or included in the pressure and impact analysis. Table 2.3 summarises the portions of channel within each of the major river types for the RoI portion of the NBIRBD

Table 2.3 Breakdown of the river types for the RoI portion of the NBIRBD (excluding cross-border river water bodies)

River Water Body Type		Number of draft River Water Bodies	Channel Length (km)	Channel Length (%)
Hardness	Slope			
Soft	Low Slope	9	43.44	10.47
Soft	Medium Slope	8	33.32	8.03
Soft	Very High Slope	4	6.37	1.54
Medium	Low Slope	2	2.54	0.61
Medium	Medium Slope	11	68.44	16.50
Medium	High Slope	2	8.37	2.02
High	Low Slope	23	179.44	43.25
High	Medium Slope	12	72.98	17.59

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 16 lake water bodies in the Republic of Ireland portion of the NBIRBD. Typology information is available for one of these lakes which has moderate alkalinity. The typology for the remaining lakes will be confirmed once more data becomes available.

2.3.3 Transitional and Coastal

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 NBIRBD has resulted in 9 transitional water bodies (falling into two types) and 5 coastal water bodies (falling into three types). Table 2.4 summaries the transitional and coastal water bodies by type in the NBIRBD.

Table 2.4 Transitional and Coastal water bodies by type in the RoI portion of the NBIRBD

Type	Description	Number of Water Bodies
TW2	Transitional: Meso or Polyhaline, Strongly Mesotidal, Sheltered	6
TW6	Transitional: lagoons: Oligo or Polyhaline, Mesotidal, Sheltered	3
CW2	Coastal: Euhaline, Mesotidal, Exposed	1
CW5	Coastal: Euhaline, Mesotidal, Moderately Exposed	3
CW8	Coastal: Euhaline, Mesotidal, Sheltered	1

3.0 Register of Protected Areas

Protected areas are defined as 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 EC water related 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 waters within the RoI portion of the NBIRBD. 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 (SAC) and Special Protection Areas (SPA). 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 NBIRBD.

Table 3.1 Areas designated under the Register of Protected Areas in the RoI portion of the NBIRBD

Protected Area	River Water Bodies	Lake Water Bodies	Transitional Water Bodies	Coastal Water Bodies	Groundwater Bodies	Number of Designated Areas
Drinking Waters	5	11			28	
Economically Significant Aquatic Species	1					
Recreational and Bathing Waters				4		
Nutrient Sensitive Waters	3	2	1			
Protection of Habitats						
Water Dependent Special Areas of Conservation (SAC)						4
Water Dependent Special Areas of Protection (SPA)						2

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 NBIRBD 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 NBIRBD 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

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 NBIRBD 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 were used to determine the degree of risk associated with a groundwater body (GWB) 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 28 groundwater bodies in the RoI portion of the NBIRBD. The results of this risk assessment indicated that one groundwater body, Knockatallon, was at risk. There has been evidence of groundwater level decline from several EPA monitoring points with no apparent recovery. Another groundwater body, Carrickmacross 1, is probably at significant risk (1b) because of one large groundwater abstraction in a small GWB. Just over 7% of the groundwater bodies i.e. 3.4% of the total area of the RBD, are under threat from significant abstractions. Figure 4.1 indicates that in general, groundwater abstractions do not represent a significant pressure on the quantitative status of groundwater bodies within the RoI portion of the NBIRBD.

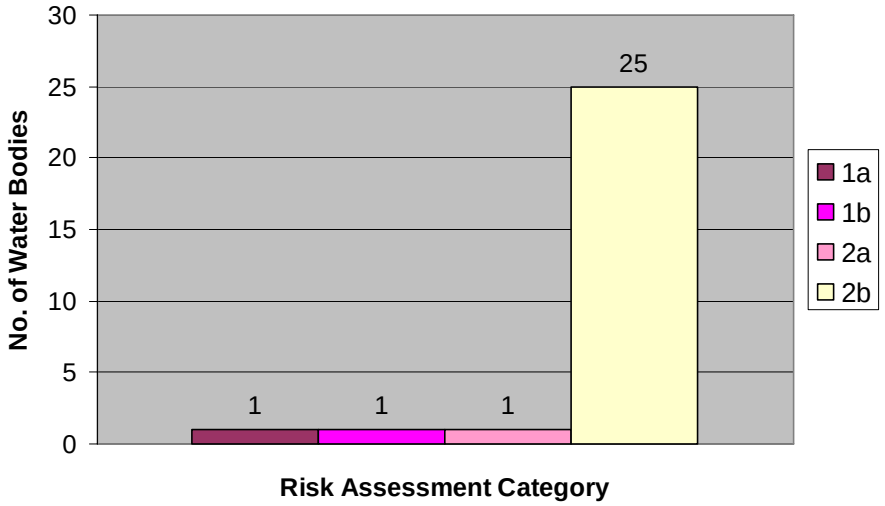


Figure 4.1 Groundwater bodies affected by abstractions and saline intrusion in the NBIRBD within RoI

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 4.2 illustrates the number of groundwater bodies impacted by diffuse source pollution within the RoI portion of the NBIRBD. The assessment demonstrates that none of the groundwater bodies are considered at risk; however 8 have been classified as 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 result from the mobile organic substances assessment, e.g. certain pesticides and Poly-aromatic Hydrocarbons (PAHs). These include groundwater bodies that underlie urban areas such as Dundalk Gravels, Carrickmacross_1, Castleblayney_1 and Dundalk Town_2. Mobile inorganic substances, such as nitrates also account for a significant number of the water bodies that are probably at risk.

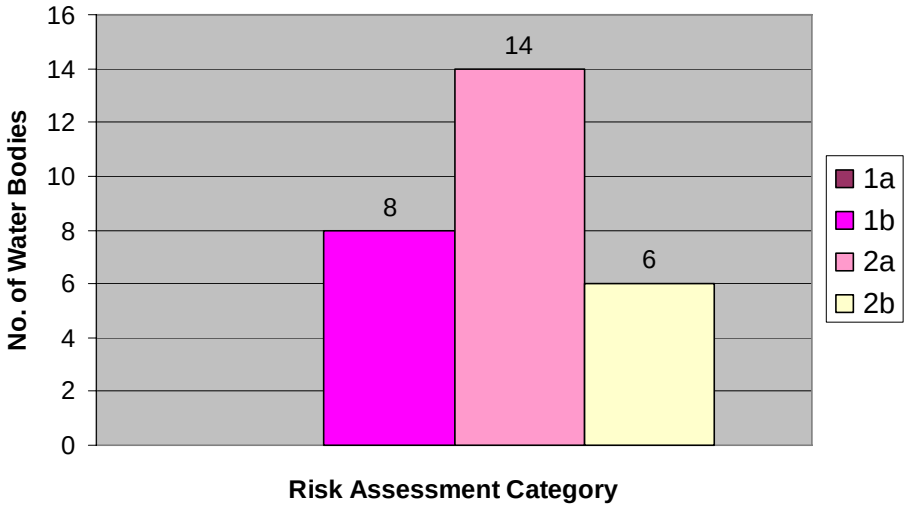


Figure 4.2 Diffuse pressures risk assessment for NBIRBD groundwater bodies within the RoI

4.2.5 Significant Point Source 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 4.3 presents the results of the point source risk assessment for groundwaters. Eleven Groundwater Bodies (GWBs) are probably at risk (1b) due to contaminated land. Two GWBs, Newtown and Emyvale, are industrial sites. Nine GWBs are known or suspected to be at risk due to towns of certain size which include Dundalk,

Monaghan, Ardee, Carrickmacross, Castleblaney and Ardee. These towns have a Population Equivalent (PE) of between 10,000 and 40,000 people. These are given an automatic risk of 1b. Two GWBs, Clarderry and Whiteriver, are probably at risk due to the presence of landfills.

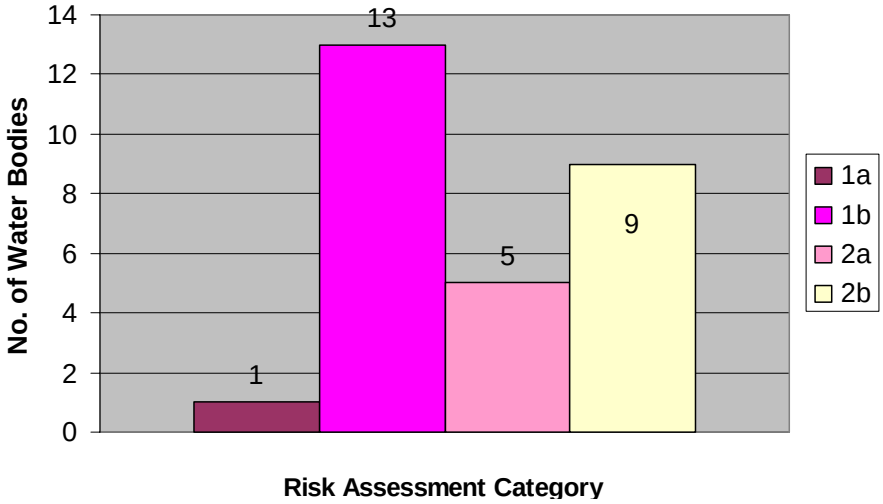


Figure 4.3 Point source pressures risk assessment for NBIRBD groundwater bodies within RoI

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 4.2 and Figure 4.4 summarise the findings of the risk assessments carried out for groundwater bodies throughout the NBIRBD. 75% of groundwater bodies in the NBIRBD are considered to be at risk of failing to meet the environmental 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 RoI portion of the NBIRBD

Reporting Category	Number of Water bodies	% of Number	% area of RBD
1a at risk	2	7.1	3.5
1b probably at risk	19	67.9	15.3
2a probably not a risk	6	21.4	78.4
2b not at risk	1	3.6	2.8
Total at Risk (1a+1b)	21	75.0	18.8

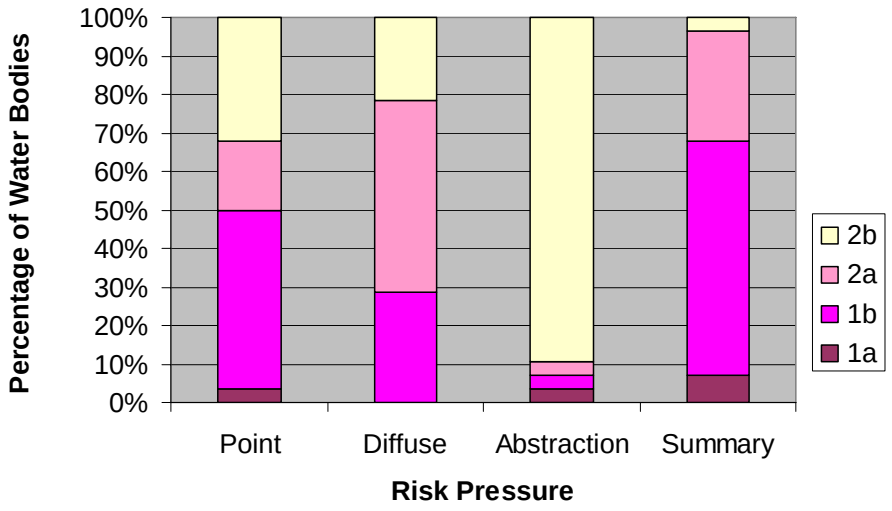
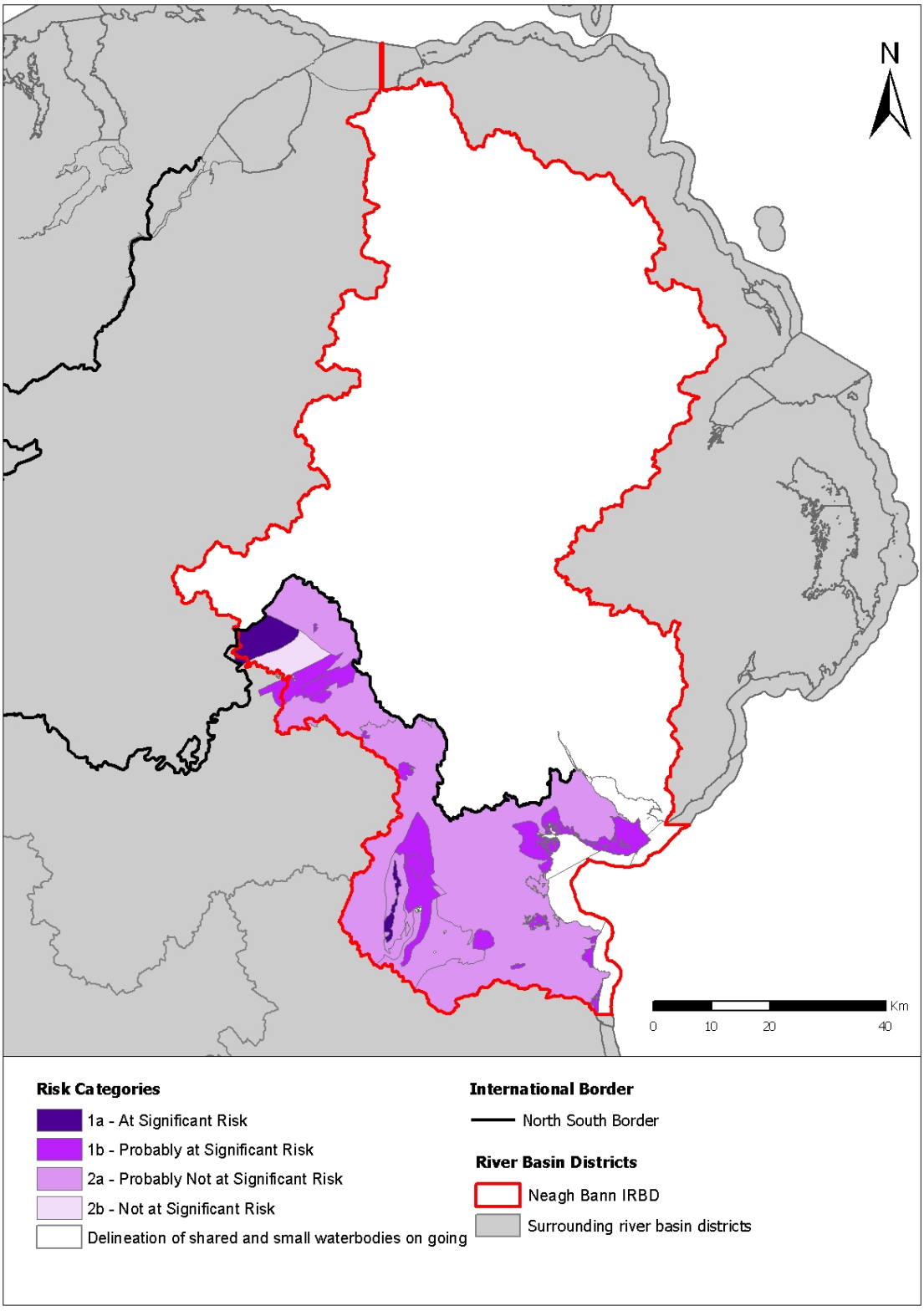


Figure 4.3 Overall risk assessment results for NBIRBD groundwater bodies

4.2.5 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 (GWG). The GWG recommended that the entire sub-crop of the Kinscourt Gypsum Formation be designated as an LSO. The Kinscourt Gypsum GWB was delineated as a result. LSOs are assigned an automatic risk category of 1a. 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 – NBIRBD within RoI

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.

River Dee at Drumooglestown Bridge, Co. Louth

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.

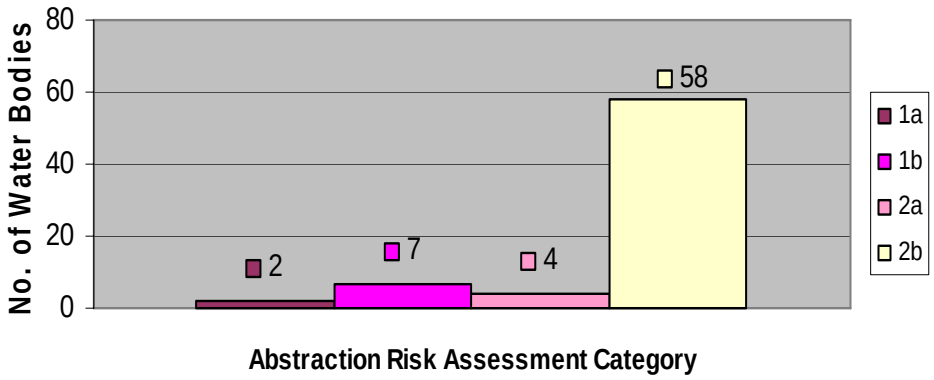


Figure 4.4 Flow regulation and water abstraction risk assessment for NBIRBD rivers within the RoI

Figure 4.4 presents the abstractions and flow regulation risk assessment results for the 71 river water bodies in the RoI portion of the NBIRBD. The graph highlights that 9 water bodies, some 12.7% 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 NBIRBD are illustrated in Figure 4.5. There are 60 river water bodies (84.5% of the rivers assessed) in the RoI portion of the NBIRBD at risk or probably at risk due to morphology pressures. The main pressure that river water bodies are subjected to is channelisation works. Land drainage pressures associated with agriculture and intensive land use also cause problems in relation to morphology (Figure 4.6).

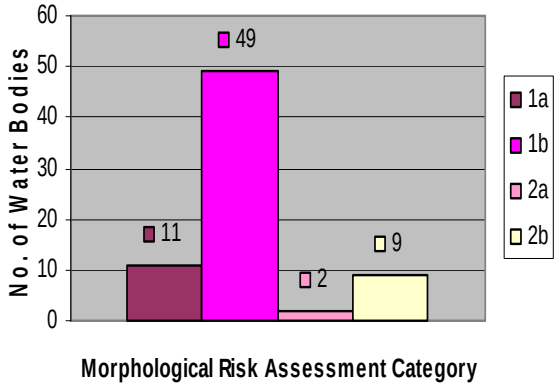


Figure 4.5 Morphological pressures risk assessment for NBIRBD Rivers within the RoI

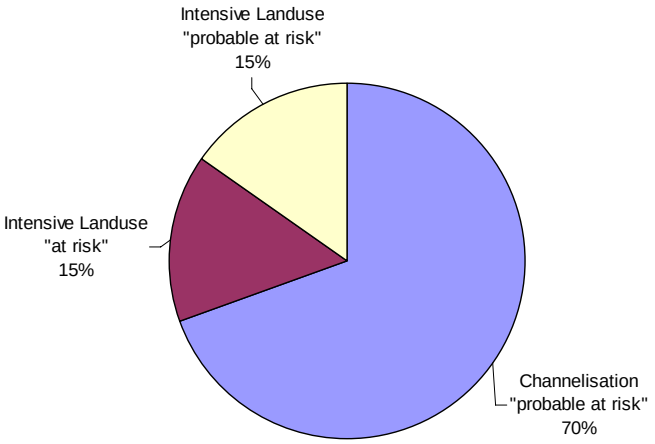


Figure 4.6 Morphological pressures for NBIRBD rivers within the RoI

4.3.3 Significant Point Source Pressures

The significant point source pressures addressed in the river risk assessment include discharges from Urban Waste Water 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 NBIRBD are presented in Figure 4.7. Point source pressures place approximately 20% of river water bodies in the “at risk” or “probably at risk” categories. The main sectors affecting those water bodies are waste water treatment plants and combined storm overflows and industrial discharges.

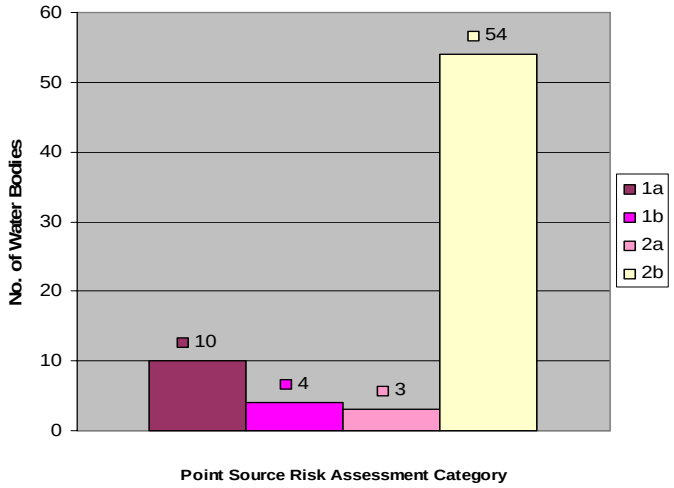


Figure 4.7 Point source pressures risk assessment for NBIRBD within the RoI

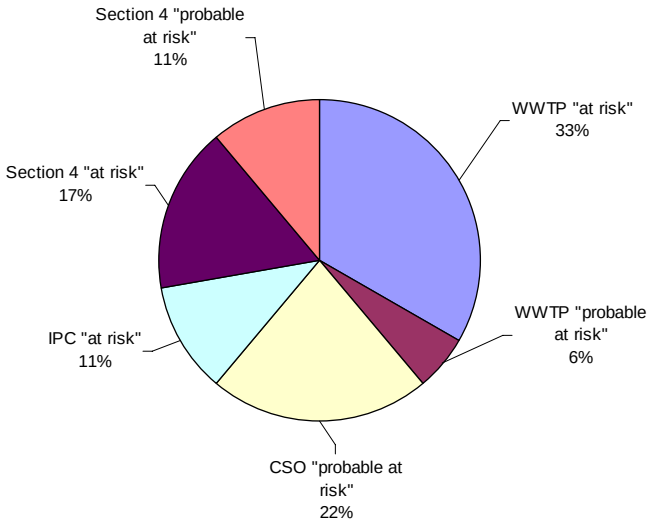


Figure 4.8 Proportion of NBIRBD river water bodies at risk from point source pressures (RoI portion only)

Figure 4.8 illustrates the main pressures associated with the point source risk assessment. The assessment highlights that point source discharges, for the most part, are centred around population clusters with waste water treatment plant, combined sewer overflows (CSOs) 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 through out the island of 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 NBIRBD 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 RoI portion of the NBIRBD are illustrated in Figure 4.9. The assessment highlights the significance of diffuse pressures, with 58 river water bodies in the RoI portion of the NBIRBD at risk or probably at risk due to diffuse source pollution. This figure represents 88 % of the total land area. In general, Agriculture is the sector found to be the largest contributor to diffuse source pollution pressures.

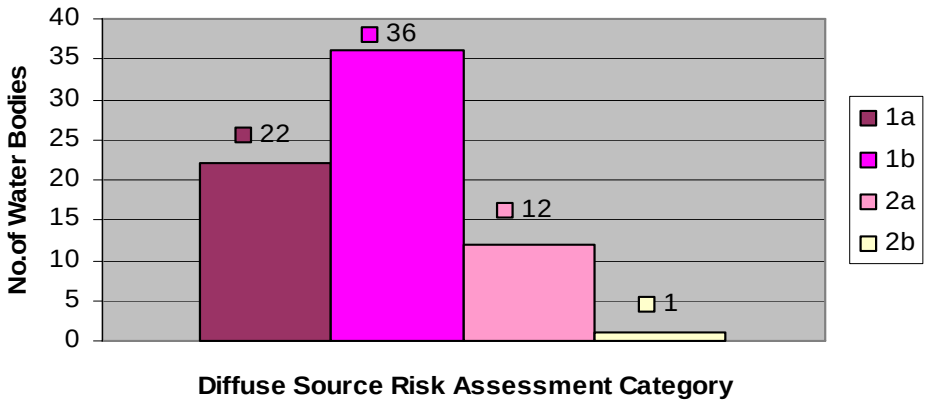


Figure 4.9 Diffuse source pressures risk assessment for NBIRBD rivers within the RoI

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).

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 NBIRBD are illustrated in Figure 4.10. The results indicate that of the 22 river water bodies that have available impact data, 17 are at risk - this equates to some 24% of the river water bodies within the RoI portion of the NBIRBD.

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

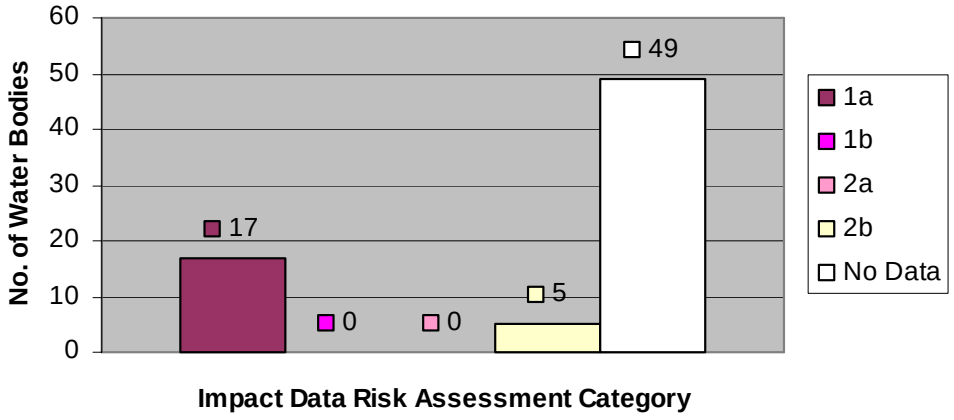


Figure 4.10 Impact risk assessment for NBIRBD rivers within the RoI

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 NBIRBD 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 areas.

Table 4.4 and Figure 4.11 summarise the risk assessment results. Table 4.4 indicates that of the 71 water bodies assessed in the RoI portion of the NBIRBD, 94% representing 98 % of the RBD area are considered to be at risk of not achieving good status or their environmental objectives under the WFD. Figure 3.6 demonstrates that the main sources of human pressures in relation to those river water bodies at risk are from diffuse and morphological pressures. This assessment is supported by impact data.

Table 4.4 River water bodies risk assessment summary for NBIRBD within RoI

Reporting Category	Number of Water Bodies	% of number	Km Affected	% area of RBD
1a at risk	38	53.6	272.5	67.1
1b probably at risk	29	40.8	130.3	31.0
2a probably not at risk	2	2.8	2.4	0.5
2b not at risk	2	2.8	9.7	1.4
Total at Risk (1a+1b)	67	94.4	402.8	98.1

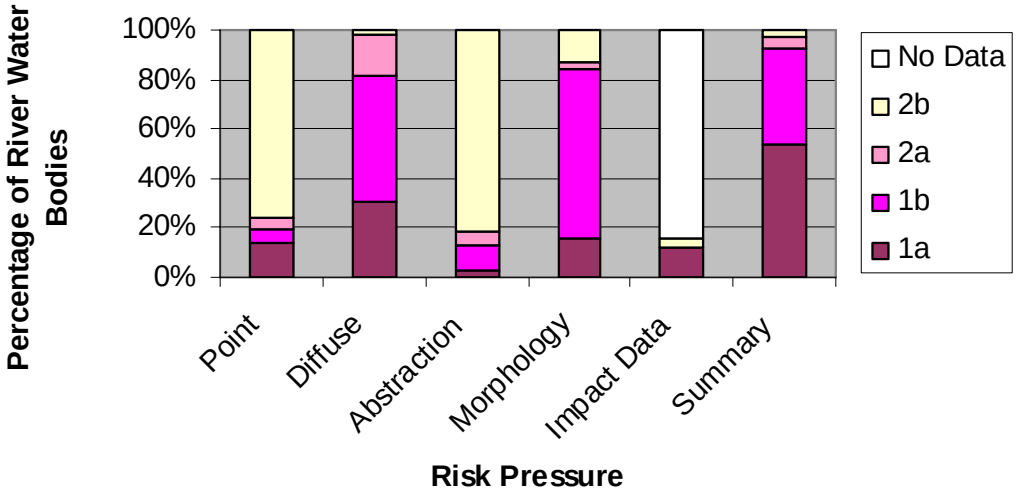
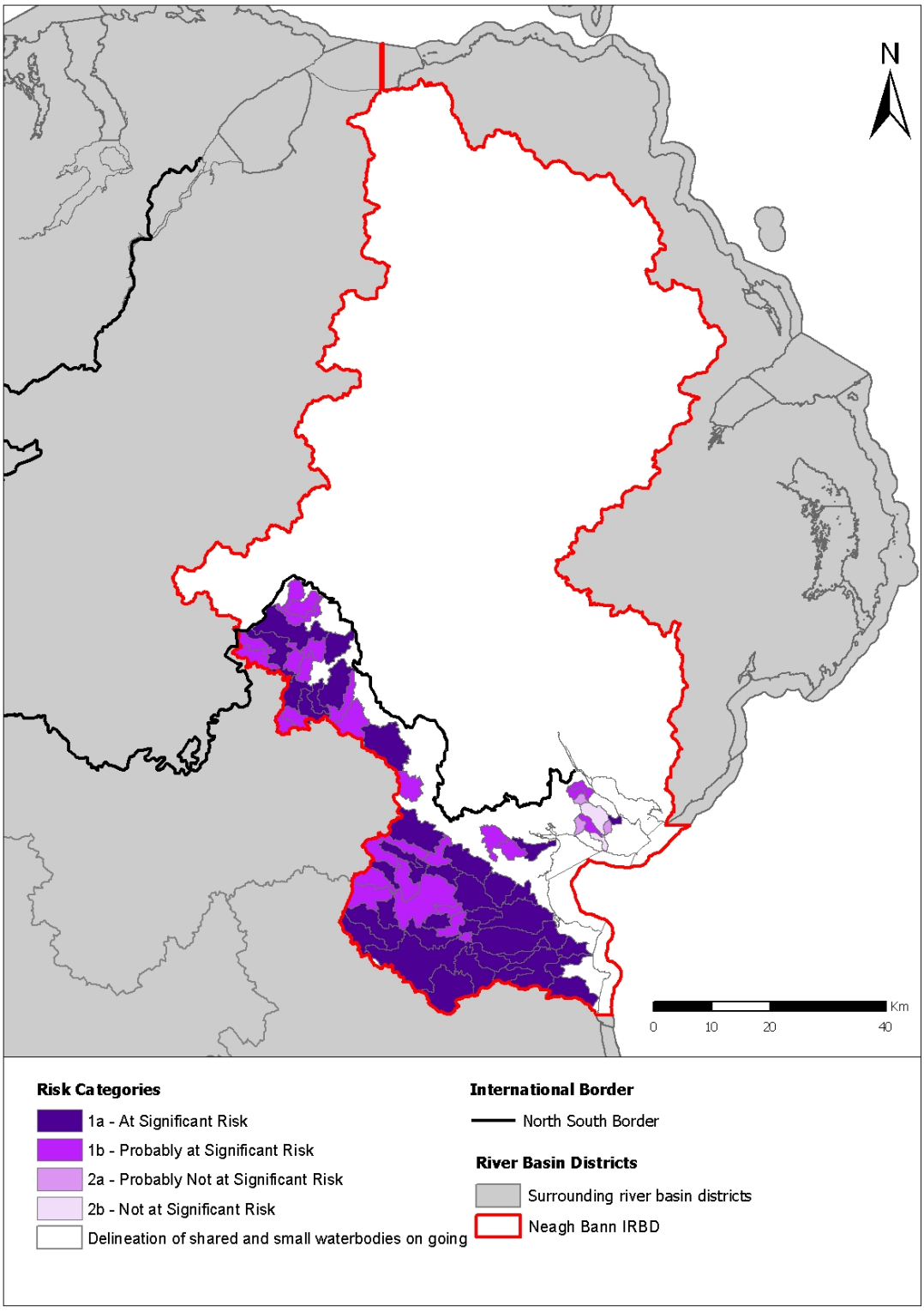


Figure 4.11 Overall risk assessment results for NBIRBD rivers within the RoI



Map 4.2 River Combined Risk Assessment – NBIRBD within RoI

4.4 Lakes Risk Assessment

The lake risk assessment closely parallels the river risk assessment procedure, involving a combination of both 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. This report summarises the result for lakes greater than 50 hectares and those lakes located within protected areas.

4.4.1 Significant Abstraction and Flow Regulation Pressures

The risk assessment of abstraction pressures and flow regulations mirrored the river water body assessment process comparing nett abstraction with low flow characteristics. The results of the assessment presented in Figure 4.12 indicate that 9 lake water bodies, approximately 56% of the lake water bodies within the RoI portion of the NBIRBD, are at risk or probably at risk. These pressures tend to be localised in small surface water lakes, particularly in County 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 NBIRBD.

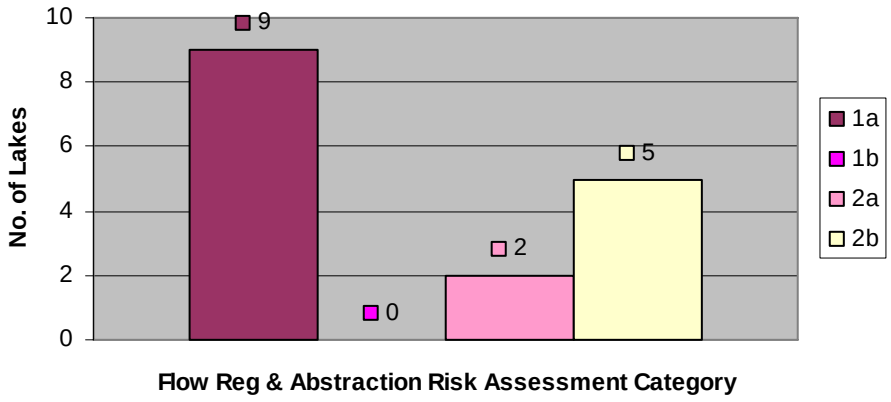


Figure 4.12 Flow regulation and water abstraction pressures risk assessment for relevant NBIRBD lakes within the RoI

4.4.2 Significant Morphological Pressures Assessment

The morphological pressures assessment was undertaken by determining the extent of various know 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 4.13 summarised the findings of the morphological pressures and illustrates that morphological pressures are not generally a significant pressure for lake water bodies within the RoI portion of the NBIRBD. Intensive land use is the morphological pressure acting on the two lakes that are considered to be at risk.

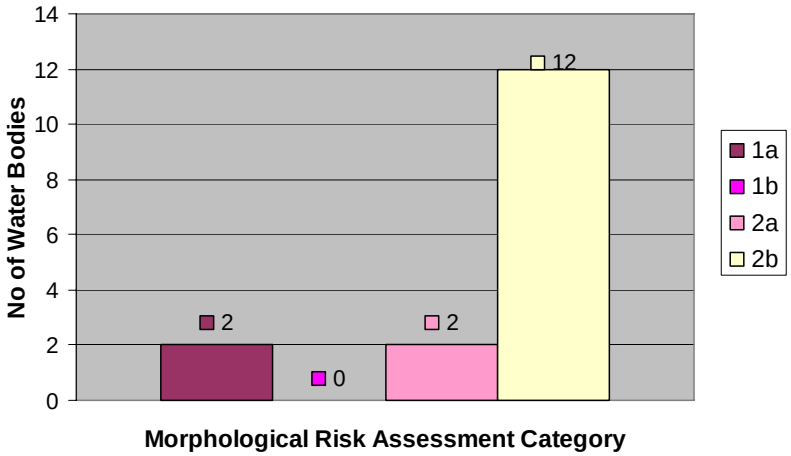


Figure 4.13 Morphological pressures risk assessment for NBIRBD lakes

4.4.3 Significant Point Source Pressures

The significant point source pressures methodology applied in the lakes risk assessment was similar to that for the river risk assessment with facilities such as WWTW and sludge treatment plants; storm overflows; industries with licensed discharges.. Figure 4.14 illustrates the results of the point source pressures analysis for lakes within the NBIRBD.

There are 9 lakes within the RoI portion of the NBIRBD that have been assessed as "probably at risk" and 1 lake that is considered 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 Muckno**,** at risk from point source pollution.

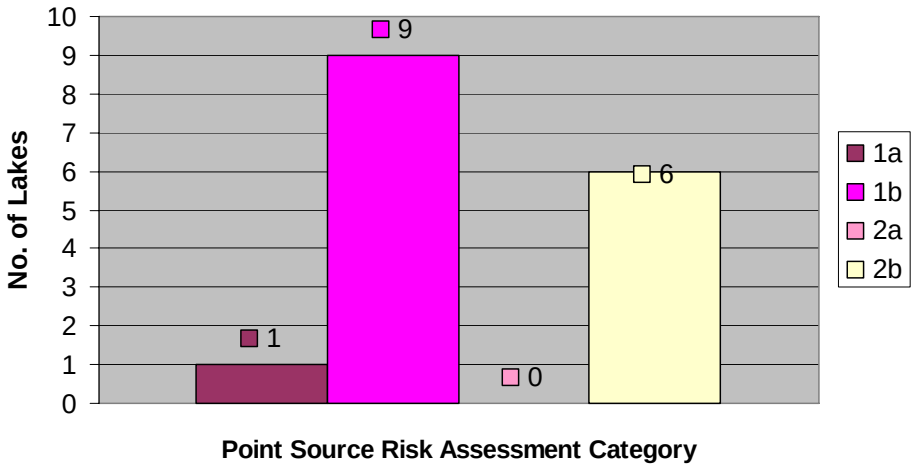


Figure 4.14 Point source pressures risk assessment for NBIRBD lakes within RoI

4.4.4 Significant Diffuse Source Pressures

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

The results of the diffuse source pollution risk assessment for lake water bodies Show that there are no lake water bodies within the RoI portion of the NBIRBD that are at risk from diffuse source pressures.

4.4.5 Lake Impact Assessment

The lake impact assessment is similar to the river impact assessment in that the results are based in 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 4.15 illustrates the lake risk assessment results. Impact data is available for 14 of the lakes in the RoI portion of the NBIRBD. The results show that 11 lake water bodies, i.e. over two thirds, are considered to be at risk or probably at risk based on the impact data available.

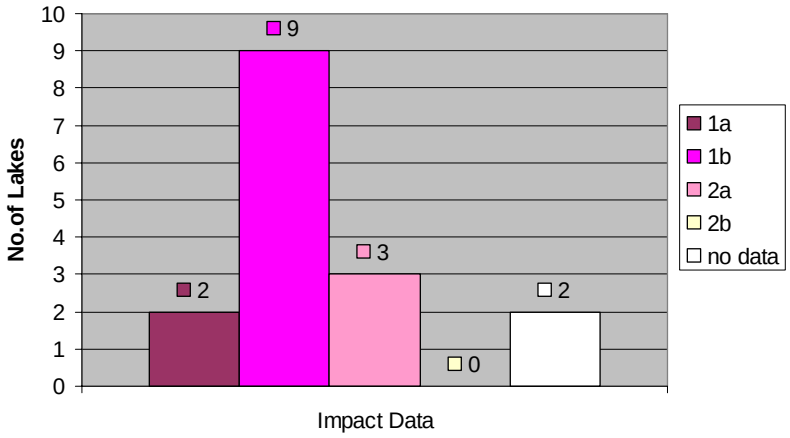


Figure 4.15 Lake Impact Risk assessment for NBIRBD within RoI

4.4.6 Lake Risk Assessment Summary

As is the case with all water bodies the process employed 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 (point, diffuse, morphology, abstraction and impact data) are considered and the worst case scenario is selected.

Map 4.3 illustrates the combined lake risk assessment summary results. Table 4.5 and Figure 4.16 summarise the NBIRBD lake water bodies assessment results within the RoI. The lake risk assessment has established that water abstractions and point

source pollution are the most significant pressures in relation to the lake water bodies contained within the RoI portion of the NBIRBD.

Table 4.5 Lake water bodies risk assessment summary within RoI

Reporting Category	Number of Water bodies	% of Number	% area of RBD (RoI only)
1a at risk	12	75	87.4
1b probably at risk	4	25	12.6
2a probably not a risk	0	0	0
2b not at risk	0	0	0
Total at risk (1a & 1b)	16	100	100

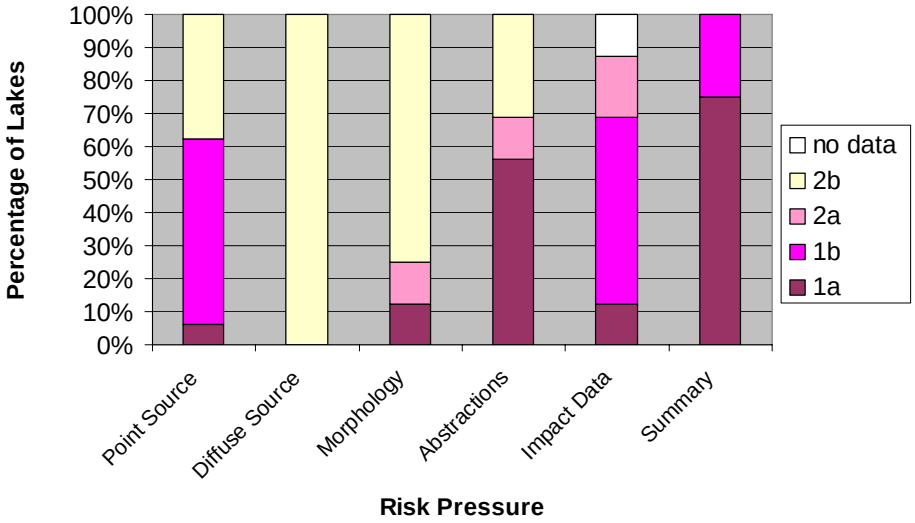
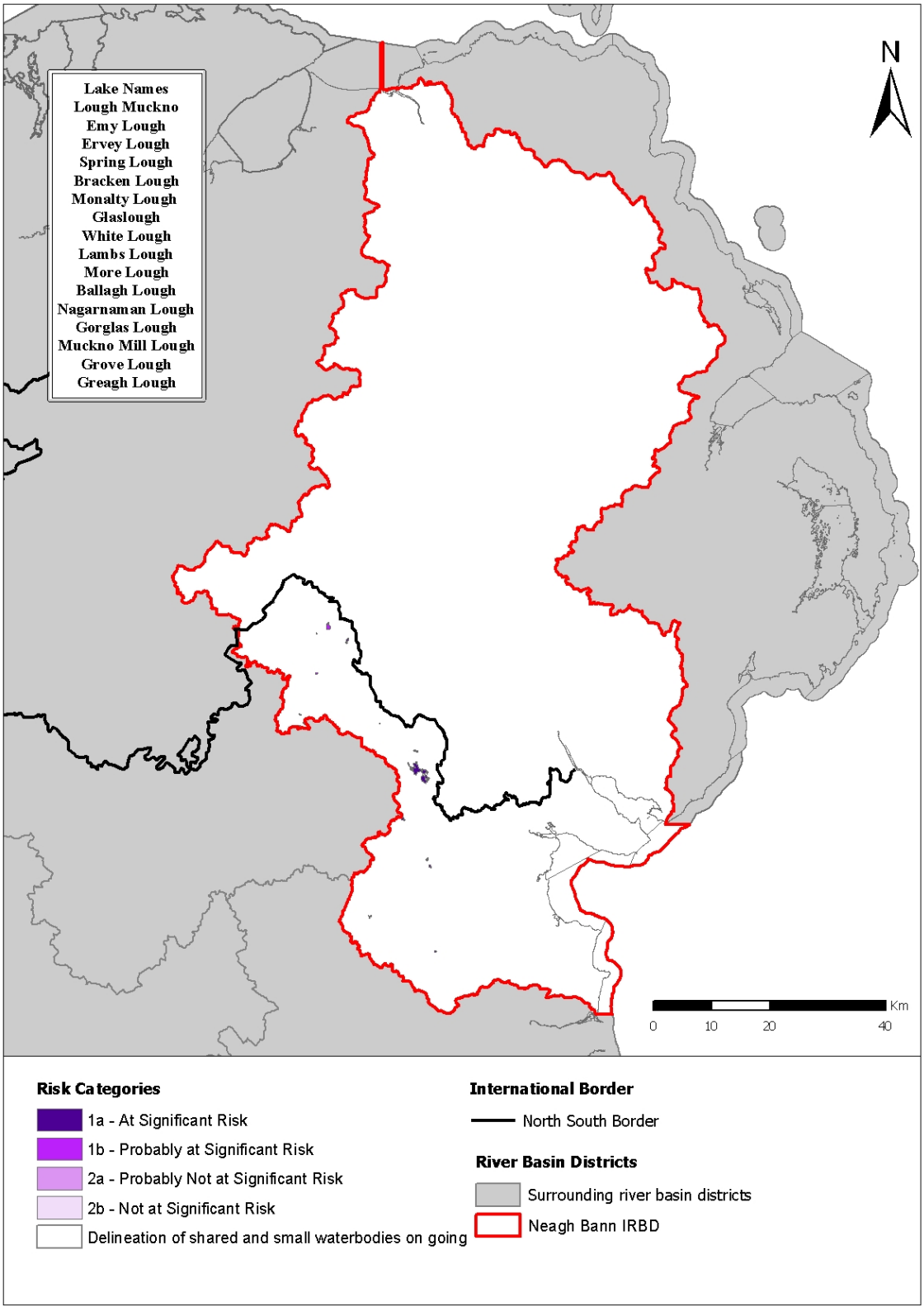


Figure 4.16 Overall risk assessment results for NBIRBD lakes within RoI



Map 4.3 Lake Combined Risk Assessment – NBIRBD within RoI

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 waters have been subjected to morphological alterations in places. They also are the downstream part of 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 9 transitional water bodies in the RoI portion of the NBIRBD were assessed for abstraction, morphology and direct point source pressures and an impacts assessment was also applied.

Coastal Water Bodies: The 5 coastal water bodies in the RoI portion of the NBIRBD were assessed for morphology and direct point source pressures. An impacts assessment was also applied.

Carlingford Lough – Coastal Water Body. ***(Source - John McKeown, www.lookaroundireland.com)***

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 NBIRBD within RoI. Figure 4.17 presents the risk assessment results for the 9 transitional water bodies in the RoI portion of the NBIRBD. The assessment has established that water abstraction and flow regulation do not present any significant pressures to the transitional waters.

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.

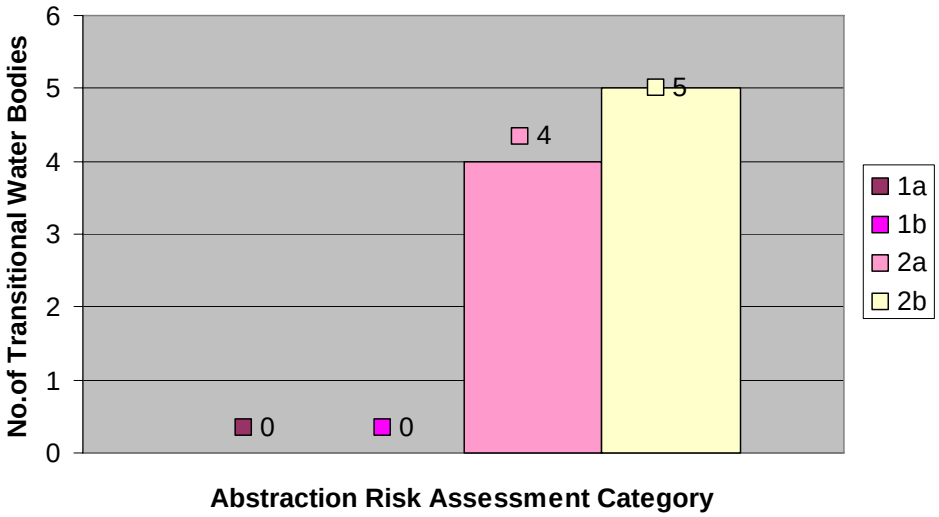


Figure 4.17 Flow regulation and water abstraction pressures in the NBIRBD transitional water bodies within RoI

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 4.18 shows the results for the morphological risk assessment for transitional and coastal water bodies. Two thirds (6) of the transitional water bodies within the RoI portion of the NBIRBD are at risk or probably at risk from morphological pressures. Morphological pressures in coastal waters are less significant than those in the transitional waters with 40% (2) of the water bodies probably at risk.

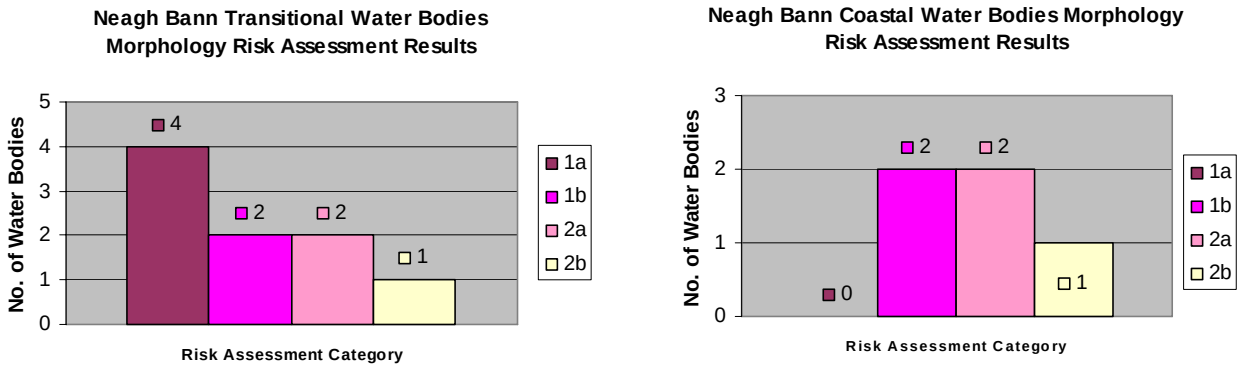


Figure 4.18 Morphological pressures risk assessment in NBIRBD transitional and coastal waters within RoI

The analysis indicates that there are numerous pressures acting on transitional waters within the RoI portion of the NBIRBD. Channelisation and intensive land use practices are the greatest pressures to transitional water bodies in the NBIRBD with

coastal defence works and built structures also impacting upon transitional water bodies (Figure 4.19).

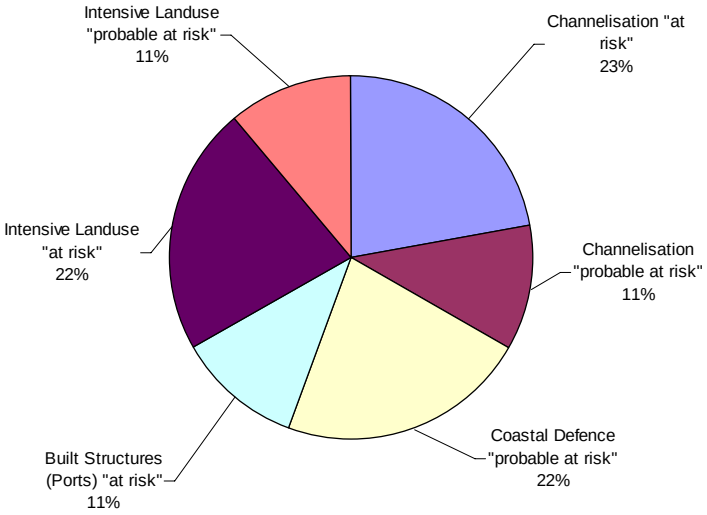


Figure 4.19 Proportion of transitional waters at risk and probably at risk from morphological pressures in the RoI portion of the NBIRBD

Built structures, such as ports and shoreline development, e.g. Carlingford Lough and Outer Dundalk Bay are the main morphological pressures in coastal waters in the NBIRBD

4.5.3 Marine Pollution Impact 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 marine water bodies.

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. However supplementary point assessments were undertaken for discharges and aquaculture activities in all transitional waters and coastal embayments and lagoons. Expert opinion was also incorporated into the risk assessment where point related impacts were identified at RBD level.

The Castletown Estuary is the only transitional water body with marine impact data for the marine waters within the RoI portion of the NBIRBD. The results show that this estuary is considered “at risk” from urban waste water treatment discharges. The point source risk assessment for transitional water bodies also classified Inner Dundalk Bay as probably at risk due to a WWTW discharge. The results of the marine pollution impact assessment are shown in Figure 4.20 and 22% (2) of the transitional water bodies representing 90% of the transitional water body area are classified as at risk or probably at risk.

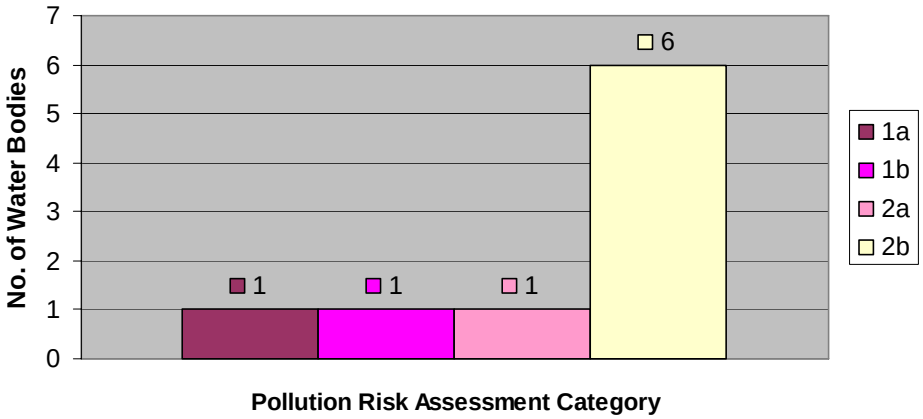


Figure 4.20 Transitional water bodies impacted by pollution (point & impact) within RoI portion of NBIRBD

The coastal water bodies have marine direct impact data available for 3 of the 5 coastal water bodies within the Irish portion of the NBIRBD. Expert opinion was used to refine the assessment and consideration was given to the Northern Ireland point source risk assessment for those coastal water bodies that were shared between the two jurisdictions. The results of the marine pollution impact assessment are shown in Figure 4.21. Carlingford Lough is considered as probably at risk due to dangerous substances. Portstewart Bay and the Mourne coast are both considered at risk due to point source pressures.

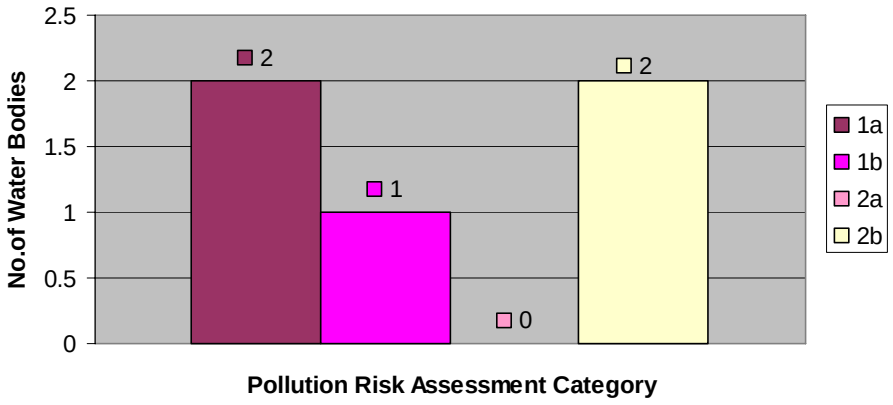


Figure 4.21 Coastal water bodies impacted by pollution (point & impact) within RoI portion of NBIRBD

4.5.4 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 assessment for each of the transitional and coastal water bodies.

Table 4.6 and Figure 4.22 summarises the risk assessment results for transitional water bodies in the RoI portion of the NBIRBD. Over two thirds of the transitional water bodies are considered at risk which represents 92.5% of the transitional water body area. Morphological pressures are the main pressure source with dredging (channelisation) posing the greatest threat to transitional waters.

Table 4.6 Transitional water bodies risk assessment summary for RoI portion of NBIRBD

Reporting Category	Number of Water bodies	% of Number	% area of RBD
1a at risk	5	55.6	90.3
1b probably at risk	1	11.1	2.2
2a probably not a risk	2	22.2	7.4
2b not at risk	1	11.1	0.1
Total at Risk (1a & 1b)	**6**	**66.7**	**92.5**

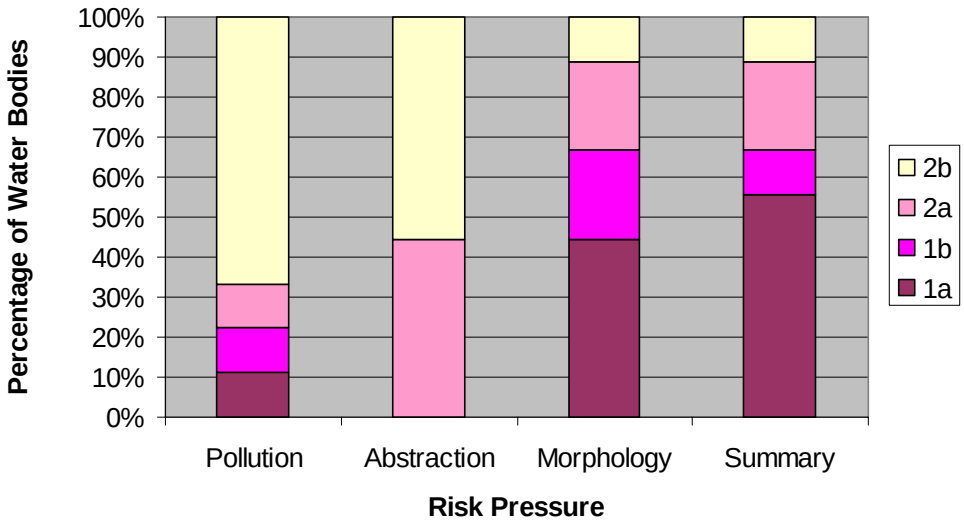


Figure 4.22 Overall risk assessment results for NBIRBD transitional waters within RoI

Table 4.7 and Figure 4.24 summarises the risk assessment results for coastal water bodies in the NBIRBD. Four (80%) of the coastal water bodies in the RoI portion of the NBIRBD 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 4.7 Coastal water bodies risk assessment summary within RoI

Reporting Category	Number of Water bodies	% of Number	% area of RBD
1a at risk	2	40.0	55.7
1b probably at risk	2	40.0	32.7
2a probably not a risk	0	0	0
2b not at risk	1	20.0	11.6
Total at Risk (1a & 1b)	**4**	**80.0**	**88.4**

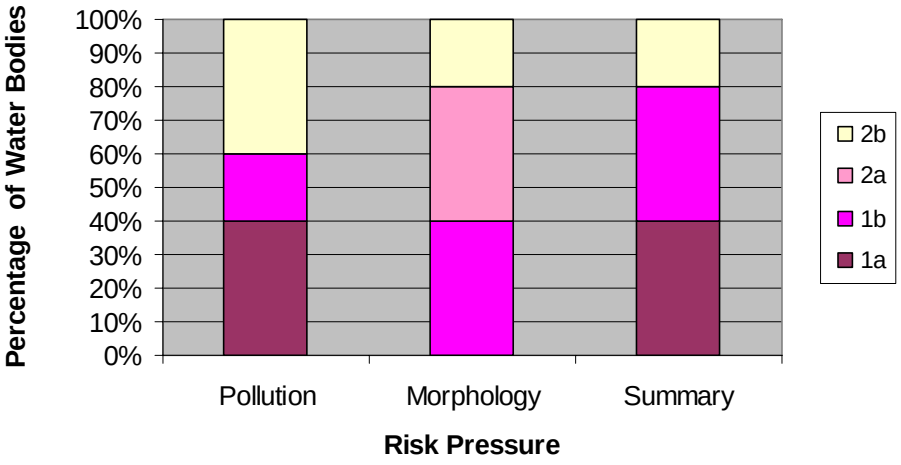
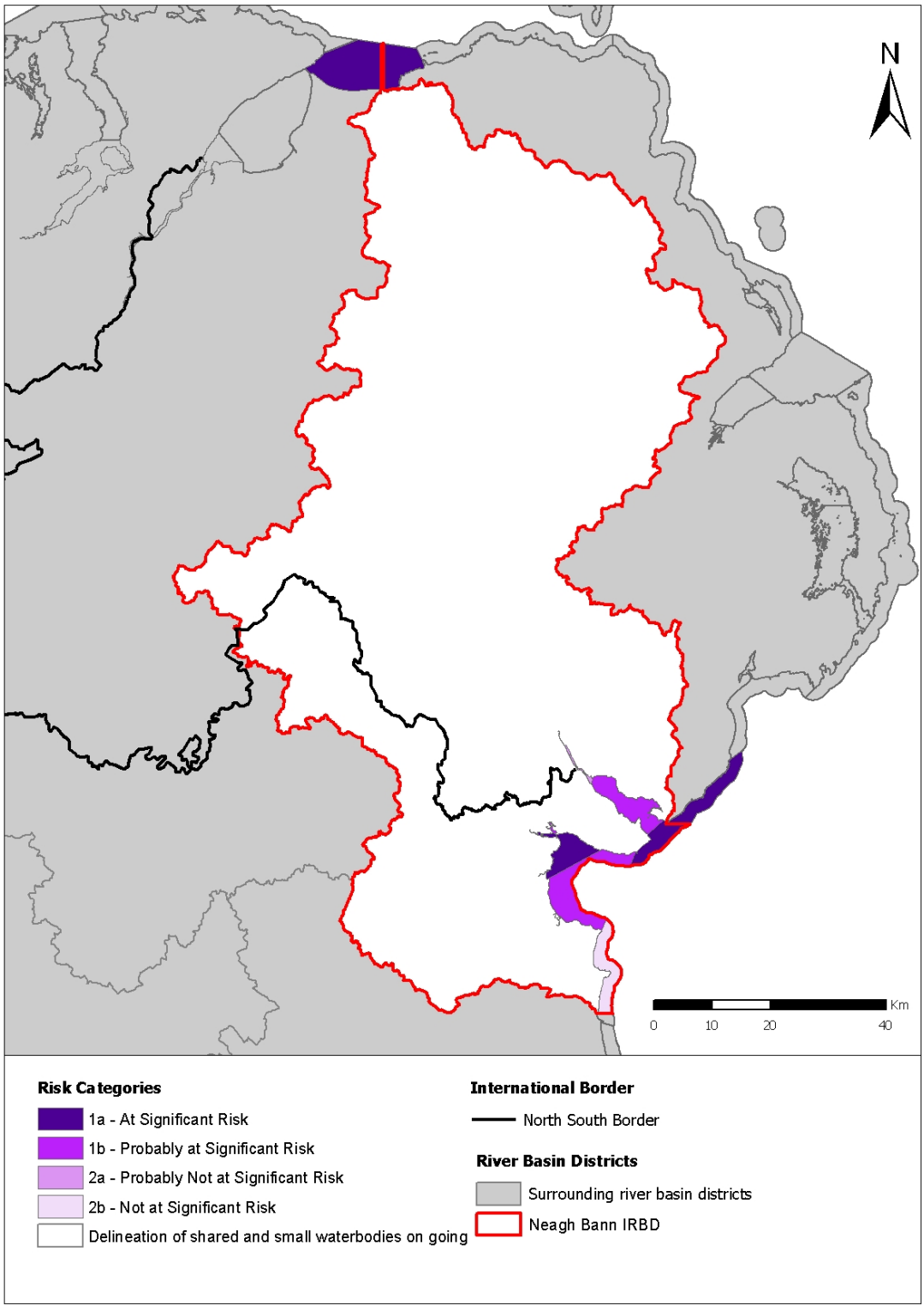


Figure 4.23 Overall risk assessment results for NBIRBD coastal water bodies within RoI



Map 4.4. Transitional and Coastal water Bodies combined risk assessment for RoI portion of NBIRBD

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 NBIRBD’s native ecology by competing for habitats and or food. Two species of concern are present in the RoI portion of the NBIRBD; in particular Common Cord Grass and Japanese weed have been found in the coastal waters of Carlingford Lough. Future management plans will have to take account of the presence of these alien species.
- *Fishery activities* have also been addressed in the initial risk assessments. 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 RoI portion of the NBIRBD commercial aquaculture activities are located in Carlingford Lough and Inner Dundalk Bay. Further offshore, in Outer Dundalk Bay, Hydraulic Dredging takes place and Otter Trawling is also undertaken in Portstewart Bay. 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 NBIRBD there is one compliance breech 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 NBIRBD. 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.

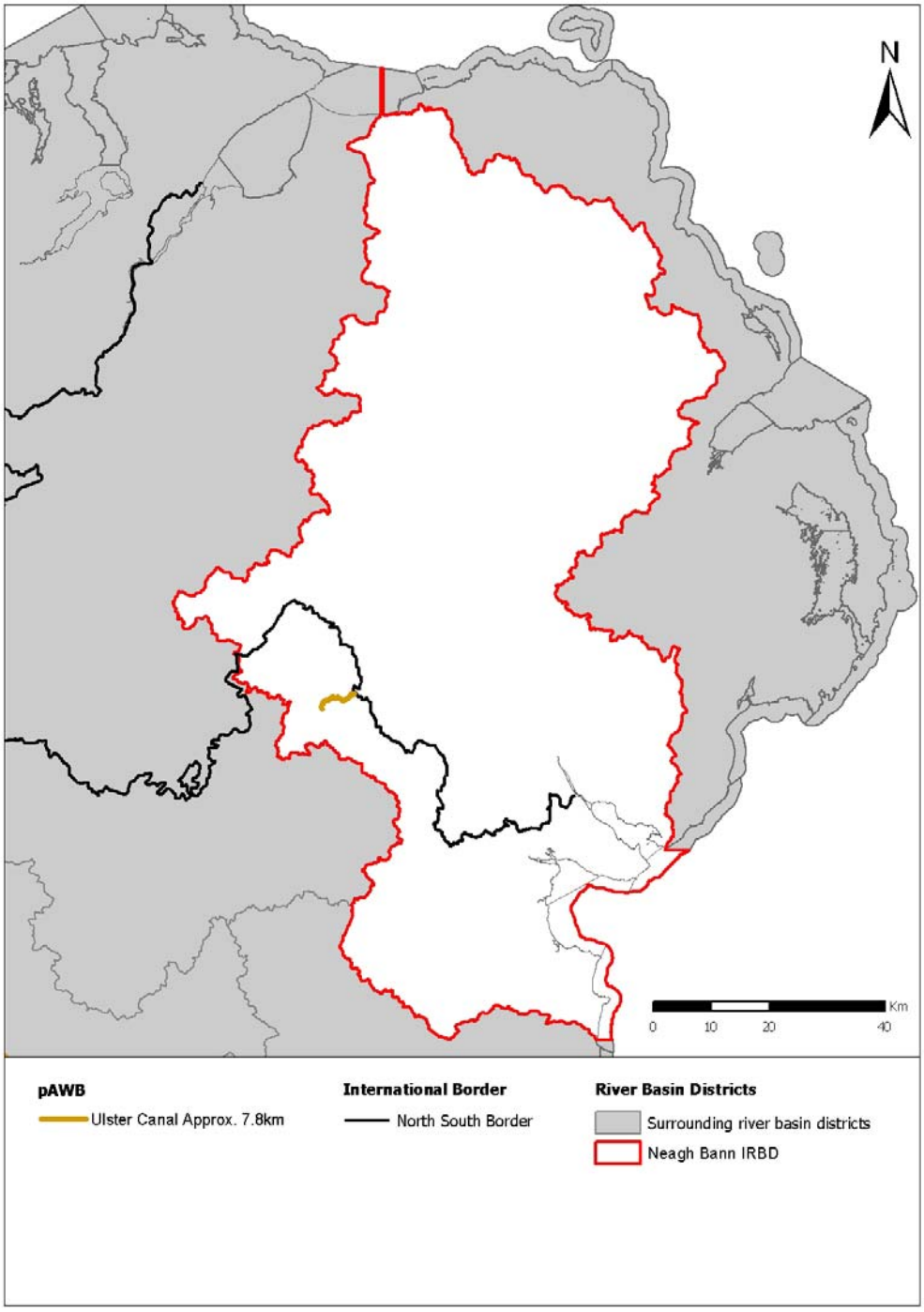
5.2 AWB and HMWB designation

The results of the hydrology and morphology risk assessments for the RoI portion of the NBIRBD and existing EPA or CFB water quality information were reviewed, where available, to identify potential candidates for designation as AWB or HMWB. Table 5.1 summarises the hydrological and morphological pressures leading to preliminary identification of HMWB water bodies in the RoI portion of the NBIRBD.

Table 5.1 Hydrological and Morphological Pressures leading to pHMWB designation within 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	

The process has identified 1 pAWBs; the man-made stretch of the Ulster Canal (7.8 km), as illustrated in **Map 5.1**.There is no pHMWB. Nationally there were 37 pAWB and 37 pHMWB identified in total.



Map 5.1 pAWB in the RoI portion of NBIRBD within RoI

5.3 pAWB designation in the NBIRBD

Ulster Canal

The Ulster Canal, linking Lough Neagh to Lough Erne, was opened in 1841. It is 45.7 miles long and has 26 locks. It was intended as part of a chain of waterways linking Limerick to Belfast via the Shannon. These are the Ballinamore & Ballyconnell Canal (Shannon to Erne); the Ulster Canal; Lough Neagh and the Lagan Navigation. However, it was relatively unsuccessful for three reasons: its locks were the narrowest in Ireland so that expensive transhipment was required, its water supply was inadequate and one of the other links, the Ballinamore & Ballyconnell Canal, closed after only a few years.

The route of the canal leaves the River Blackwater just below the village of Moy and climbs through 19 locks to the summit on the far side of Monaghan, descending through 7 further locks, dropping down to the Finn River where it enters Lough Erne near the Quivvy Waters. Shortly after leaving the Blackwater, the canal ascends seven locks, through the Benburb gorge, arguably the most spectacular yet the most difficult engineering and costly aspect of the waterway, then on to its first border crossing at Middletown. This stretch was one of the most picturesque stretches, journeying through the estates of Lord Caledon, the Strong estate at Tynan Abbey and the Leslie estate at Glaslough. The rise to Monaghan necessitated the building of 7 locks in quite close succession; the canal then skirted the town and headed for the village of Smithborough. Outside Monaghan a feeder was constructed to create a water supply from a small lake known locally as Quig Lough. The canal then winds its way to Clones through some striking rural countryside, then weaves in and out of the border four times before its destination.

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

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 NBIRBD 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.

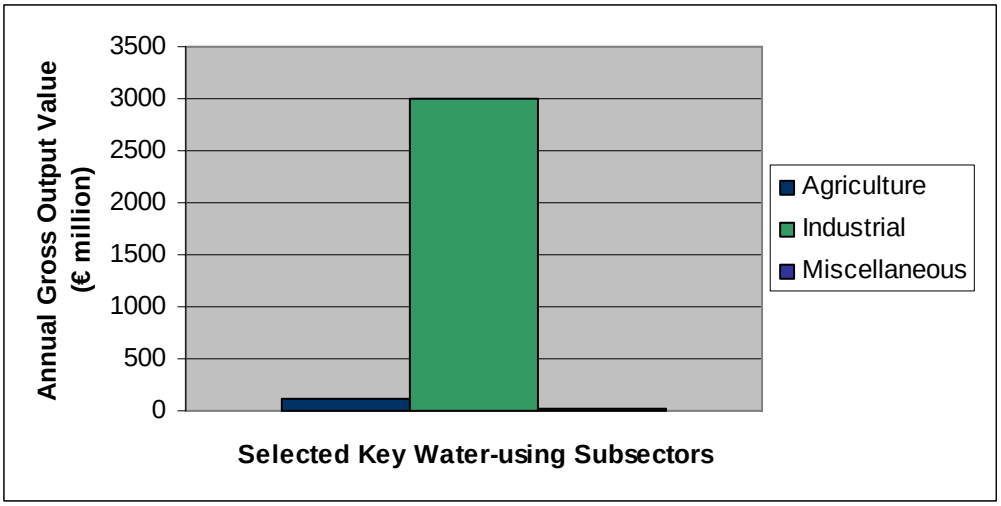


Figure 6.1 Estimated Annual Gross Output Values in Selected Key Water-using Agricultural (2002), Industrial (2001), and Miscellaneous (2002, 2003) Sub-sectors in the RoI portion of the NBIRBD (Sources: Teagasc, CSO, ESB, ISC, BIM, ESRI)

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).

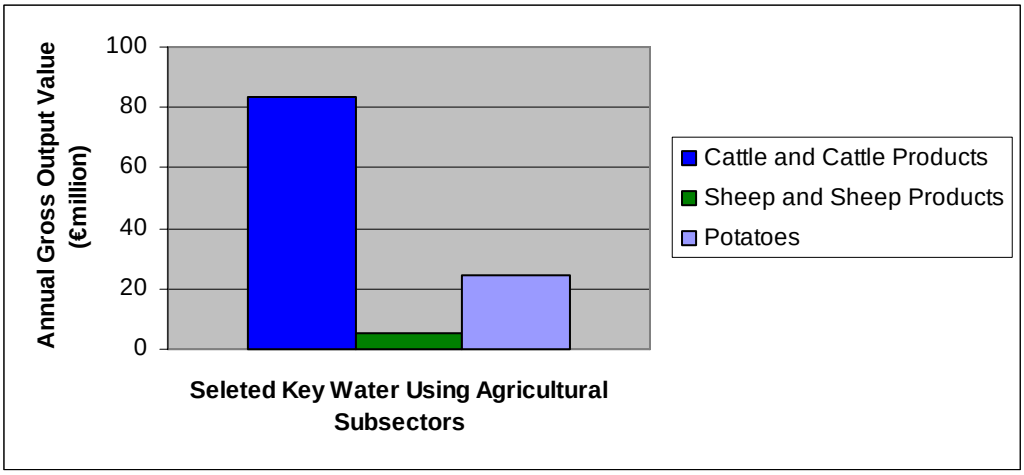


Figure 6.2 Estimated Annual Gross Output Values of Selected Key Water-using Agricultural Sub-sectors in the RoI portion of the NBIRBD (2002) (Source: CDM)

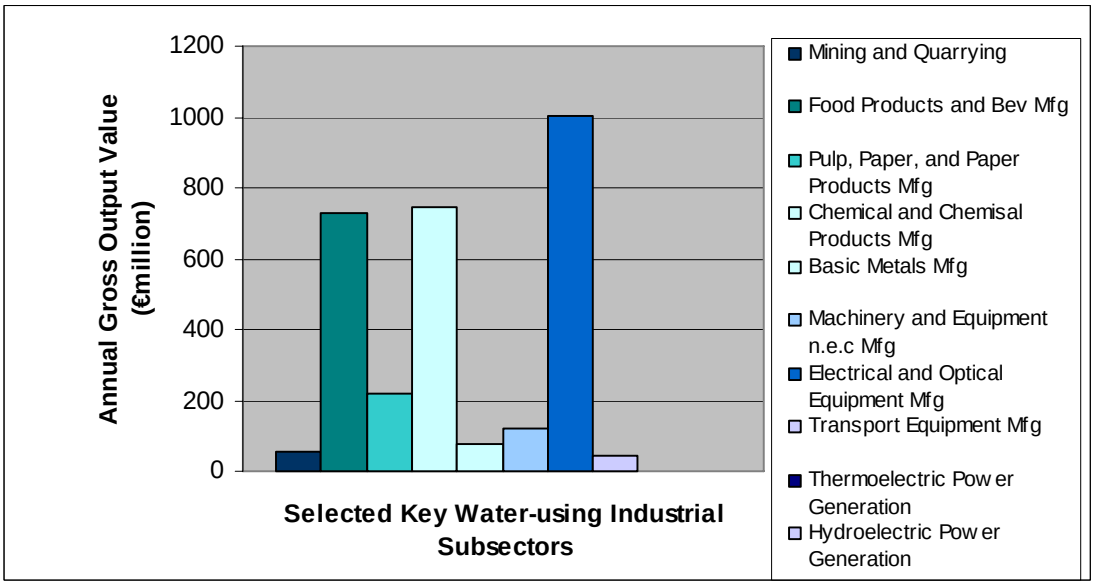


Figure 6.3 Estimated Annual Gross Output Values of Selected Key Water-using Industrial Sub-sectors in the RoI portion of the NBIRBD (2001) (Source: CDM)

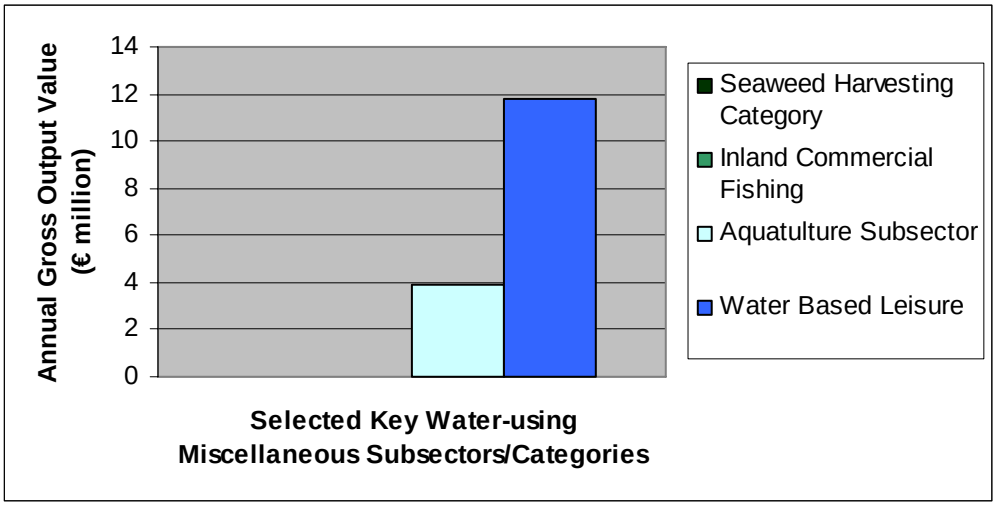


Figure 6.4 Estimated annual gross output values of selected key water-using miscellaneous sub-sectors in the RoI portion of the NBIRBD (2002, 2003)

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).

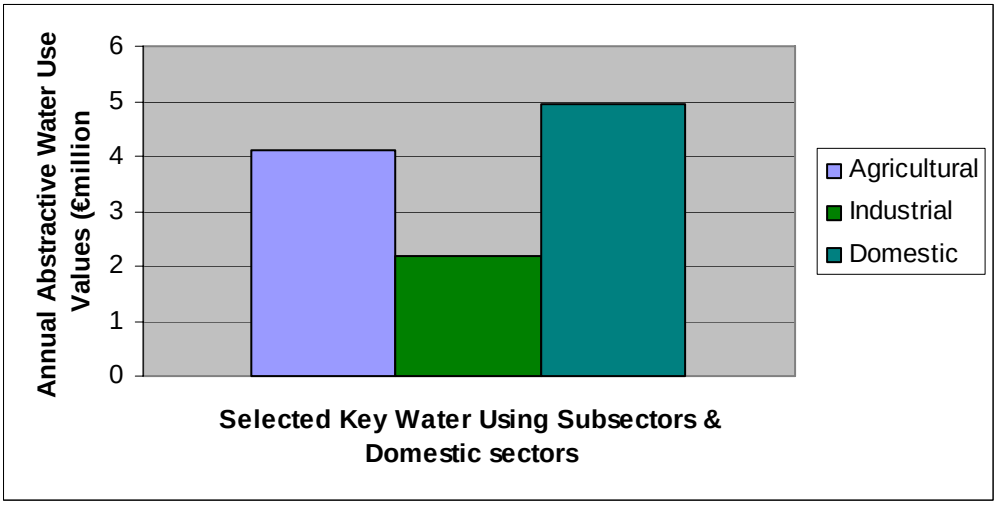


Figure 6.5 Estimated Annual Abstractive Water-use Values of Selected Key Water-using Sub-sectors (2001 Industrial, 2002 Agricultural) and the Domestic Sector in the RoI portion of the NBIRBD (2003) (Source: CDM)

Figure 6.6 depicts the results of a study to estimate the value of water-based recreation in Ireland. The study, completed by the ESRI for the Marine Institute (Williams, J. and Ryan, B, 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. In addition recreational fishing, boating, aquatic bird watching are also significant economic activities.

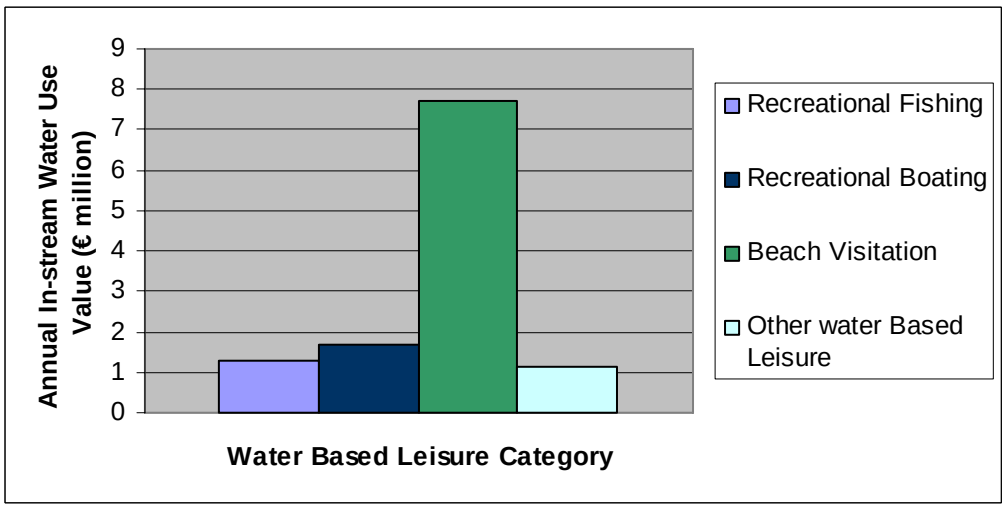


Figure 6.6 Estimated Values of Water-based Leisure in the RoI portion of the NBIRBD (2003) (Source: ESRI, CDM)

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 NBIRBD, respectively, in relation to the other RBDs in Ireland. The value range for Special Riparian Areas in the RoI portion of the NBIRBD is estimated at €80,824 and €257,069 (thousands) and the Wetland value range is estimated at €129,142 to €1,309,530.

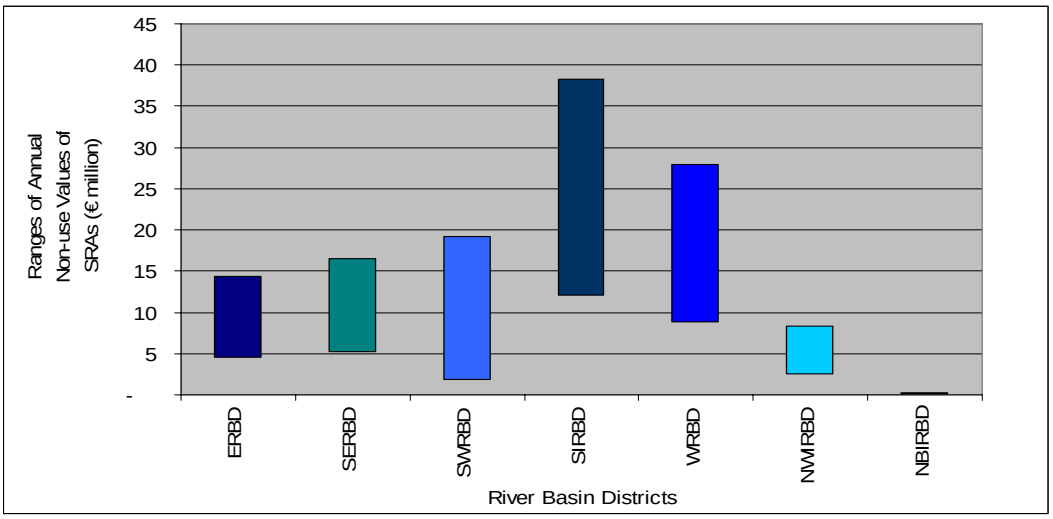


Figure 6.7 Estimated Ranges of Annual Non-Use Values of Special Riparian Areas in the RoI portion of the NBIRBD (2004) (Source: CDM)

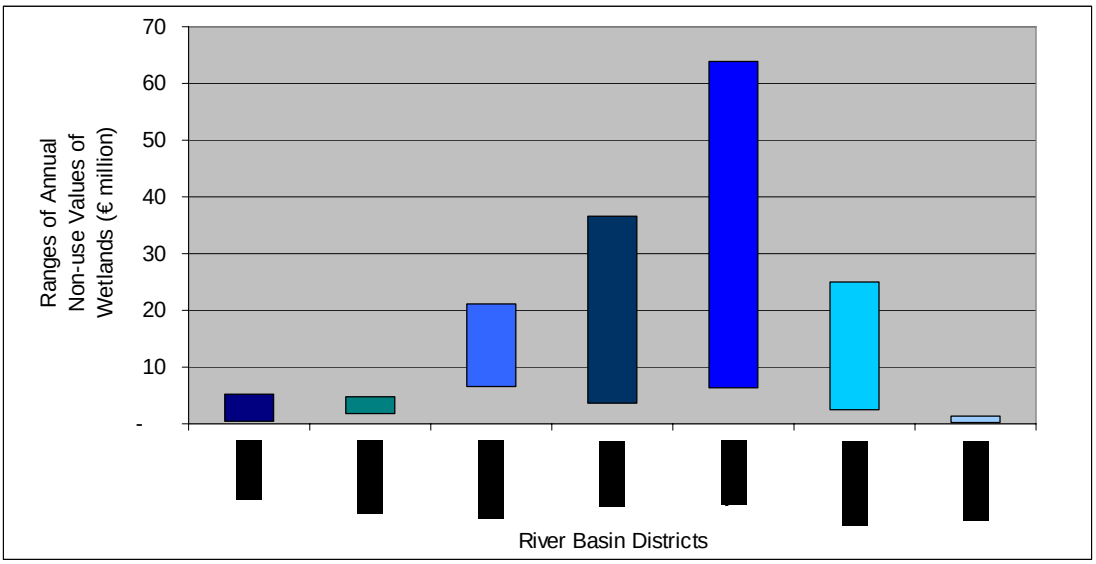


Figure 6.8 Estimated Ranges of Annual Non-Use Values of Wetlands in the RoI portion of the RoI portion of the NBIRBD (2004) (Source: CDM)

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 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 NBIRBD.

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

Water Services Investment Programme 2003	Receipts €	Expenditures €	Cost Recovery (%)
Public Water Supply	2,821,462	4,995,942	57
Public Sewerage Schemes	1,980.691	5,228,780	38
Private Installation	497,465	521.384	95
Administration and Miscellaneous	204,812	3,303,031	31

As shown in Table 6.2, there is a significant receipts shortfall across all Programme Group 3 reporting subgroups with the exception of the Private Installations subgroup.

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

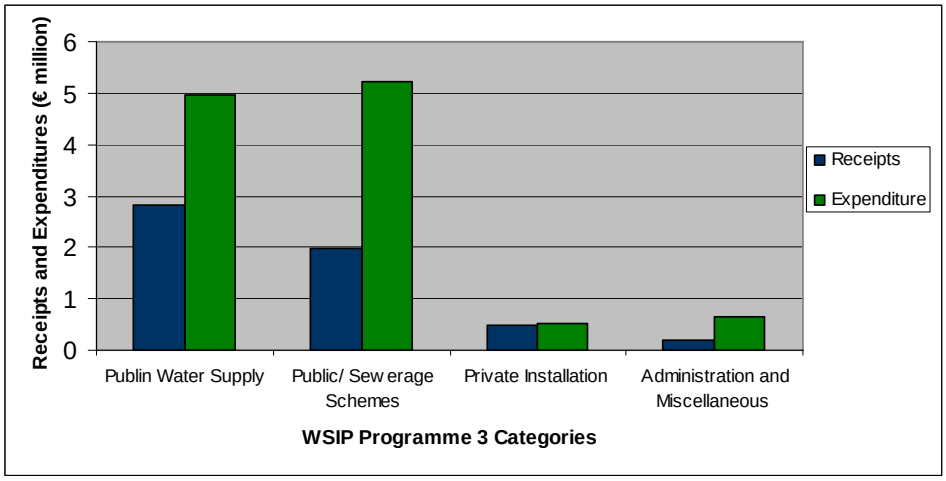


Figure 6.9 Programme Group 3 Annual Receipts and Expenditures in the NBIRBD (2003) (Source: DEHLG, CDM)

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.

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 Projected Water Demand

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 (I)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 NBIRBD through to 2015, including an estimate of unaccounted for water recovery, is presented in Figure 6.10.

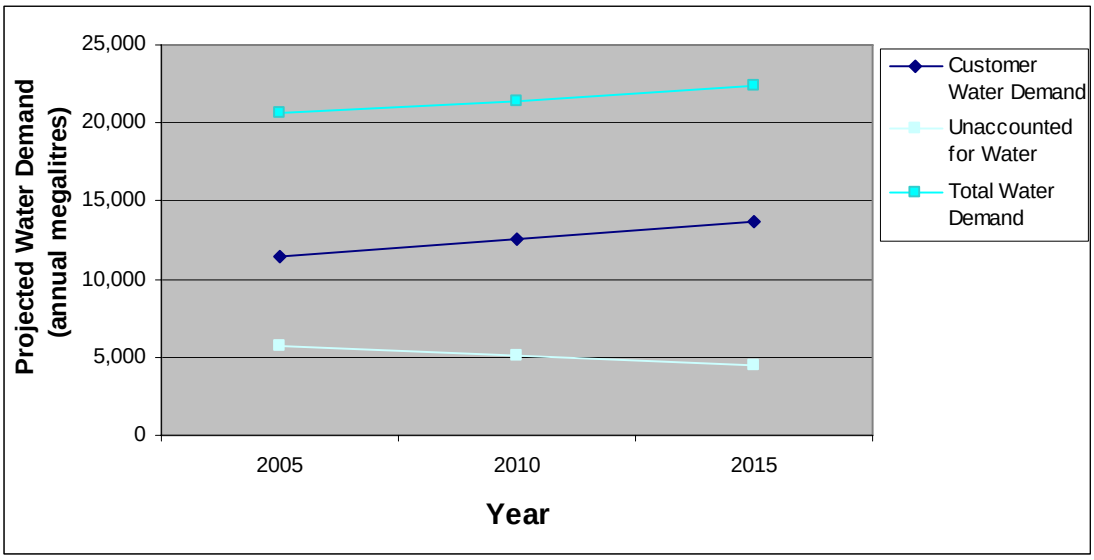


Figure 6.10 Projected Annual Water Demand and Unaccounted for Water in the NBIRBD (Source: CDM)

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)

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

6.4.3 Projected Costs of Water Services

The partial national projection costs of water services in the RoI portion of the NBIRBD 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 64% and RWP will increase by 154%.

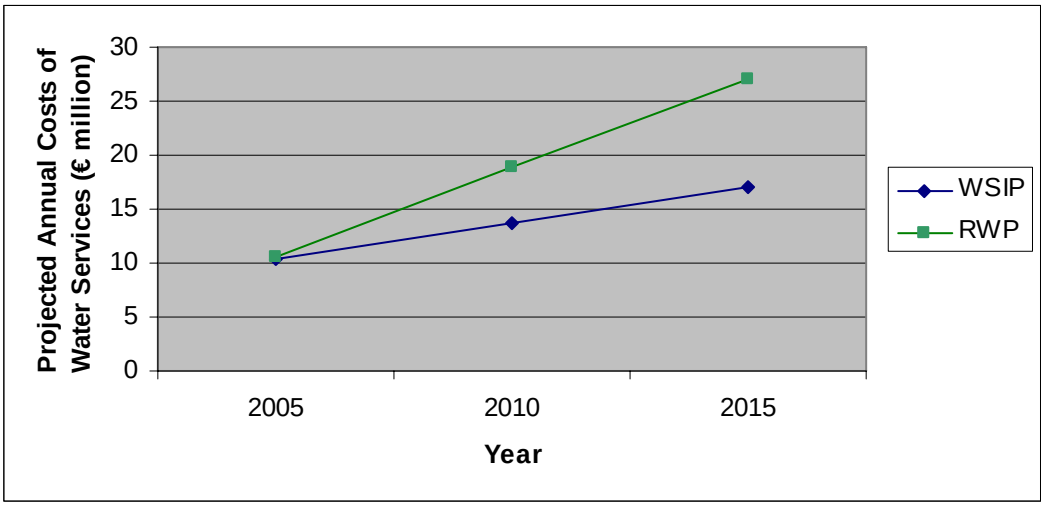


Figure 6.11 Partial Projected Costs of Water Services in the NBIRBD – Water Services Investment Programme (WSIP) and Rural Water Programme (RWP) Water and Sewerage Costs: 2005 and 2015

6.5 Summary of Work Completed to Establish Baseline Scenario

With the contents of the Economic Analysis of Water Use in Ireland study, 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 RoI nationally and in each of its (I)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 within 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 RoI portion of the NBIRBD, 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 listed (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 NBIRBD in terms of economic impacts, although the true contribution of the Agricultural Sector is difficult to quantify due to the way 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 NBIRBD.

Local authority policies for costs recovery for water services vary considerably throughout the RoI portion of the NBIRBD. 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 covers the costs of water services in the NBIRBD 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 NBIRBD. 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 NBIRBD 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 man 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 28 groundwater bodies in the RoI portion of the NBIRBD, and 5 of these are cross border groundwater bodies. The predominant type based on the classification system is the poorly productive bedrock.

There are 71 river water bodies in the Republic of Ireland portion of the NBIRBD. Approximately half of these are siliceous (or soft water) types covering a range of channel slope conditions.

There are 16 lake water bodies in the Republic of Ireland portion of the NBIRBD. Typology information is available for one large lake which places them into eight different types (mainly low and moderate alkalinity groups).

The typology exercise carried out for the marine waters in the RoI portion of the NBIRBD has resulted in the delineation of 9 transitional water bodies (falling into two types) and 5 coastal water bodies (falling into three types).

The key pressures on waters in the NBIRBD are:

Groundwaters

Three quarters of groundwater bodies in the portion of the NBIRBD within RoI 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

Of the 71 water bodies assessed in the RoI portion of the NBIRBD, 94% representing 98% of the RBD area are considered to be at risk of not achieving good status or their environmental objectives under the WFD. The main sources of human pressures in relation to those river water bodies at risk are from diffuse and morphological pressures.

Lakes

The lake risk assessment has established that water abstractions and point source pollution are the most significant pressures in relation to the lake water bodies contained within the RoI portion of the NBIRBD.

Transitional and Coastal Waters

Over two thirds of the transitional water bodies are considered at risk which represents 92.5% of the transitional water body area. Morphological pressures are the main pressure source with dredging (channelisation) posing the greatest threat to transitional waters.

Four (80%) of the coastal water bodies in the RoI portion of the NBIRBD 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.

Alien Species

Two species of concern are present in the NBIRBD; in particular Common Cord Grass and Japanese Weed have been found in the coastal waters of Carlingford Lough.

Fisheries Activities

In the RoI portion of the NBIRBD commercial aquaculture activities are located in Carlingford Lough and Inner Dundalk Bay. Further offshore, in Outer Dundalk Bay, Hydraulic Dredging takes place and Otter Trawling is also undertaken in Portstewart Bay.

Bathing Waters

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

HMWBs and AWB

The NBIRBD has identified one pAWB, the man-made stretch of the Ulster Canal. There are no pHMWB. 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 NBIRBD 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 NBIRBD. 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 NBIRBD. 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 NBIRBD. The first River Basin Management Plan (RBMP) for the NBIRBD 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)
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	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	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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INTERREG IIIA

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