

# From Evidence to Opportunity

## A Second Assessment of the State of Northern Ireland's Environment





# Ministerial Foreword



Our rich and varied natural environment and built heritage lie at the heart of our lives and are central to building a strong economy and sense of well-being.

This second report on the State of the Environment in Northern Ireland brings together recent information on how our environment is performing across land, water, sea and air. The indicators and emerging trends show complex interactions between different parts of our environment and how our activities in one area can impact on another.

In some areas, such as in water quality and recycling, we are making steady progress whilst in others, such as reversing the decline in our biodiversity, significant challenges remain. We recognise that there are shortfalls and gaps in our knowledge but the evidence highlights how we need to respond.

A better understanding of the pressures we face will help us to make the right decisions in creating a healthy and prosperous society which is resilient to change. This report will make a valuable contribution to this process.

The challenges identified in our first report on climate change, biodiversity and land use have been brought into even sharper focus as we adopt new approaches to stimulate growth following the global economic downturn. To address these challenges we need to recognise in all our decision-making the full value of the services our natural environment and built heritage provide in underpinning a healthy economy, prosperity and well-being.

All of us have a role to play in shaping the environment we want for our future. Working together I believe we can realise the opportunities to deliver the right conditions for the benefit of the economy, the environment and the people of Northern Ireland.

A handwritten signature in black ink that reads "Mark Durkan". The signature is written in a cursive, flowing style.

**Mark H Durkan MLA**  
Minister of the Environment

December 2013



# Acknowledgements

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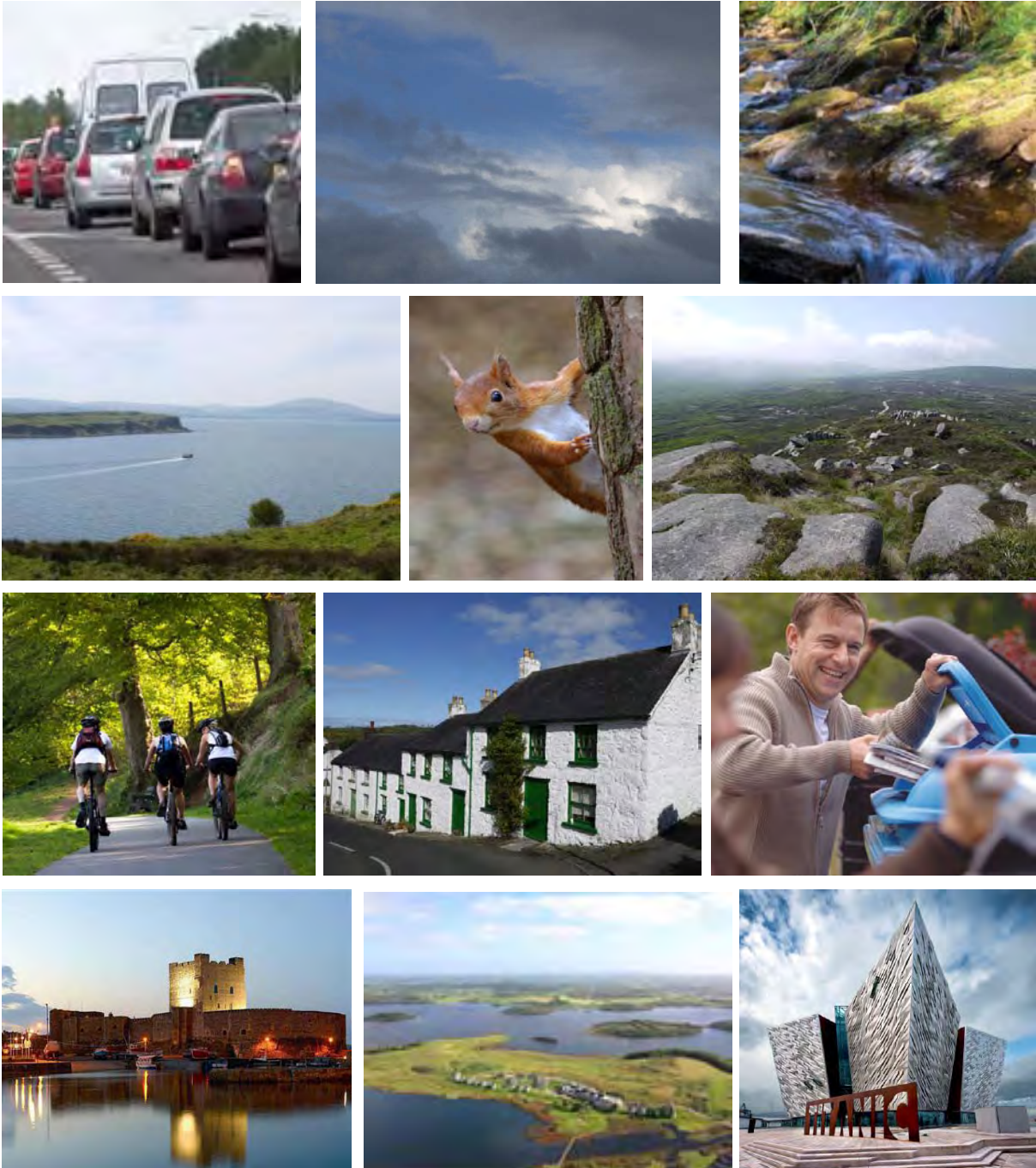
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## A Second Assessment of the State of Northern Ireland's Environment 2013: Executive Summary



### Editors

Pat Corker and Caroline Barry



*“From Evidence to Opportunity”* is Northern Ireland’s second State of the Environment report. The first report *“Our environment, our heritage, our future”* was published in 2008 and presented baseline indicators across six themes to provide an evidence-based assessment of the state of the environment. The introduction of annual Northern Ireland Environmental Statistics reports in 2009 means that we now have an extensive set of indicators on the Northern Ireland environment.

This second assessment provides a five year update and commentary on forty four indicators across eight themes. These indicators are drawn from the annual Northern Ireland Environmental Statistics Reports and information from a range of sources including the Northern Ireland Environment Agency and other public bodies.

This report draws together in one place an overall picture of our environment and identifies cross-cutting issues. As a result we are now better able to assess the effectiveness of our environmental policies over the longer term and to base decisions on how we manage and protect our environment on appropriate evidence.

The linkages between the environment and human activities are complex. Since 2008 we have experienced the effects of recession from a global economic downturn. This has lowered the pressure on the environment in some areas such as greenhouse gas emissions, but intensified the need to respond to new approaches to stimulate growth, use our natural and heritage resources more effectively and build resilience for the future. Significant updates in legislation and policy frameworks reflect the priorities for building a strong economy and delivering resource efficiency whilst protecting and enhancing our natural environment and heritage assets.

### Key Findings

Overall, the current picture of our environment is variable. On the positive side, air quality continues to improve, water quality has benefitted substantially from improved effluent controls and there has been a steady increase in municipal waste recycling rates. In other areas, such as reversing the decline in our biodiversity and meeting key objectives for the quality of our freshwaters, landscapes, habitats and heritage, significant challenges remain.

The key findings for each of the themes are as follows:

**Air:** Air quality continues to improve. Problems remain on nitrogen dioxide emissions, due to transport, and ammonia emissions, mostly due to livestock, which pose a risk to sensitive habitats and ecosystems.

**Climate:** There was an overall reduction of greenhouse gas emissions by 11% from 1990 baseline to 2007, but transport emissions are still increasing and greater reductions will be required to meet targets in the future. While some evidence is emerging to suggest that some temperature and rainfall patterns are changing in Northern Ireland, long term trends remain unclear. Implementation of the Northern Ireland Climate Change Adaptation Programme will be a key priority.

**Water:** Improvements have been reported in water utility discharges and drinking water quality and there has been a reduction in water pollution incidents. Water Framework Directive objectives remain a significant issue, with only around one quarter of our rivers and lakes currently meeting these objectives and little change in overall status since 2009. Particular challenges include diffuse nutrient pollution, chemical status of the water environment and measures to address physical modifications of beds, banks and shores of surface waters. However, we are broadly on track to implement the measures we identified through our river basin management plans and local management partnerships.

**Marine:** The overall quality of the marine environment around Northern Ireland's shores, including bathing water quality and beaches, is improving, assisted by improvements to waste water treatment. However, marine litter is a particular issue and systematic surveys have been introduced to help future assessments of the impacts on marine life. Implementing the Marine Strategy Framework Directive will be a challenge, with just one third of our marine bodies meeting objectives. Indicators for assessing the marine environment are still evolving.



**Land and Landscape:** Land use and landscape character in Northern Ireland is changing with the development of new upland wind farms. A significant decline in housing development since 2008 due to the economic recession has reduced pressures in recent years, but new strategies will be needed to help achieve the right balance between protecting the environment and encouraging economic growth. In particular, proposed investment in the agri-food sector will require innovative solutions and schemes to direct future development and maintain and enhance landscape and environmental quality.

**Biodiversity:** Broad habitat changes reported in the Northern Ireland Countryside Survey (2007) showed continued loss of semi-natural habitats mainly resulting from agricultural conversion and rural building, but the rate of loss had declined since the 1998 survey. Biodiversity continues to be under threat.



**Built Heritage:** Archaeological resources are still at risk from agricultural land use and urban activities, but protected sites have fared better. The Second Survey of Buildings of Architectural or Historic Interest has led to an increase in the number of listings, but also an increase in the number deemed to be at risk. New opportunities for the historic environment to provide a focus for regeneration, tourism and economic development are emerging.

**Waste and Resources:** There has been a steady increase in recycling rates in recent years. The new Northern Ireland Waste Management Strategy *Delivering Resource Efficiency* (2013) describes a greater focus on waste prevention and reducing consumption. Actions such as the single use carrier bag levy introduced in April 2013 is estimated to have reduced consumption of these bags by up to 80% within the first year of operation.

**Environment and Economy:** There is increasing recognition of the importance of our environment and heritage assets in supporting a strong economy. Northern Ireland's rich natural resources and built heritage create opportunities for sustainable development especially in the agri-food, tourism and renewable energy sectors. There is a need to focus effort on ecosystems management, developing green technology and delivering resource efficiency which can reduce costs to business and respond to climate change.

**Environment and Health:** Environmental protection, health and well-being are inextricably linked and in recent years there has been a policy shift away from addressing single environmental pollution issues towards overall ecosystem resilience. Exposure to naturally occurring radioactivity, hazardous chemicals and noise are regulated.

## Conclusion

The main threats identified in the first report, from climate change, land use, and socio-economic growth, continue to create pressures on Northern Ireland's environment. The impact of our population on the global environment, in terms of imports of goods, and issues of energy, food and water security should not be ignored. Living within our limits, both economic and environmental, locally and globally, is now the main challenge.

To address these challenges we need to recognise the full value of the services our natural environment and built heritage provide in underpinning a healthy economy, prosperity and well-being in all our decision-making. Taking advantage of new opportunities that protect and enhance our environment will not only provide a clean and safe place to live but will also make Northern Ireland an attractive place for investment in our key agriculture, food and tourism sectors.

Working together will bring us closer to the long term goal of using our finite natural resources and heritage sustainably for the benefit of everyone.









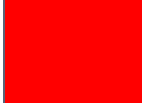
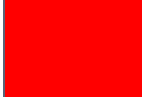
## Indicators and Trends





### Indicators included in State of the Environment Report

Also in [Northern Ireland Environmental Statistics Report 2013](#) unless otherwise stated

#### Key to trend and status

	Increasing trend		State Favourable
	Stable		State Neutral
	Decreasing trend		State Unfavourable
No trend	No trend discernible		State not discernible

Air			
A1: Nitrogen Oxides	Annual mean concentrations of nitrogen dioxide (2001-2011)		
A2: Sulphur Dioxide	Annual mean concentrations of sulphur dioxide at long-running sites in Northern Ireland (1990-2011)		
A3: Particulate Matter	Urban and rural annual mean concentrations of particulate matter less than 10 microns (PM <sub>10</sub> ) (2001-2011)		
A4: Ground Level Ozone	Urban and rural annual exceedences of 8-hour mean objective for ozone (2001-2011)	No trend	
A5: Ammonia	Annual ammonia emissions (1990-2011)		
A6: Polycyclic Aromatic Hydrocarbons	Annual mean concentration of benzo(a)pyrene (2001-2011)	No trend	

Climate			
C1: Greenhouse Gas Emissions	Total greenhouse gas emissions (1990-2011)		
C2: Temperature	Annual minimum and maximum temperature (1844-2011)	No trend	
C3: Rainfall	Percentage of annual rainfall falling in summer and winter (1854-2011)	No trend	

## Indicators and Trends

Water			
W1: River Quality	Water Framework Directive overall classification (% river waterbodies) (2008-2011)	↔	
W2: Lake Quality	Water Framework Directive status (lake waterbodies) (2008-2011)	No trend	
W3: Salmon Fisheries Monitoring	Compliance with conservation targets (2007-2011)	No trend	
W4: Groundwater Quality	Annual mean nitrate concentrations in groundwater (2000-2011)	No trend	
W5: River Quality – Nitrates	Annual mean nitrate concentrations (2000-2011)	No trend	
W6: Industrial Discharge Quality	Trends in annual private and trade discharge consent compliance (2001-2011)	No trend	
W7: Water Utility Discharge Quality	Summary of compliance of water utility sector Waste Water Treatment Works (WWTW) (2007-2011)	↑	
W8: Drinking Water Quality	Mean zonal compliance percentage failure with the Drinking Water Standards at consumers' taps (2004-2011)	↓	
W9: Water Pollution Incidents	Severity of substantiated water pollution incidents (2001-2011)	↓	

Marine			
M1: Bathing Water Quality	Bathing water compliance for microbial standards of EC Bathing Water Directive (2002-2012)	↑	
M2: Blue Flag Beaches	Number of Blue Flag Awards – Beaches and Marinas (2002-2012)	No trend	
M3: Marine Water Quality	Water Framework Directive overall status in transitional and coastal waters (% marine waterbody area) (2011 and 2012)	↑	
M4: Shellfish Waters	Compliance with more stringent guideline faecal coliform standard in shellfish waters (2011)	↔	
M5: Sea Temperature	Daily sea temperature, Irish Sea (April 1996-April 2012)	No trend	

## Indicators and Trends

Land and Landscape			
LL1: Soil Quality	Soil phosphorus (as Olsen-P) by P-index for managed grassland soils (2004/05 – 2010/11)	No trend	
LL2: Sustainable Land Management	Northern Ireland Agri-environment schemes, area under agreements (2001-2011)	↑	
LL3: Area of woodland	Area of new forest and woodland plantings (2000/01 – 2011/12)	No trend	
LL4: Housing	Housing completions (2000/01 – 2010/11)	↓	

Biodiversity			
BD1: Nature Conservation Designations – area	(a) Area of nature conservation designations (2000/01 – 2011/12) (b) Areas of Special Scientific Interest (ASSI), designated as at March 2012 (c) Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites, designated as at March 2012	↑	
BD2: Nature Conservation Designations – condition	Condition of features within ASSIs for six year rolling period ending March 2012	↑	
BD3: Wild Birds	Wild bird populations in Northern Ireland (1994-2011)	No trend	
BD4: Wetland Birds	Wetland bird populations in Northern Ireland (1994/95 – 2010/11)	↓	
BD5: Priority Habitats	Trends in the status of Northern Ireland priority habitats (2000-2012)	↓	
BD6: Priority Species	Trend for Northern Ireland priority species (2000-2012)	↓	

## Indicators and Trends

Built Heritage			
BH1: Monuments	Number of scheduled historic monuments (2001/02 – 2011/12)	↑	Green
BH2: Listed Buildings	Number of listed buildings by grade (2003/04 – 2011/12)	↔	Yellow
BH3: Built Heritage at Risk	Number of buildings and monuments at risk (2003/04 – 2011/12)	↑	Red
BH4: Listed Buildings Grant Funding	Value of grant paid and the number of buildings in receipt of grant in each listed building grade (2007/08 – 2011/12)	No trend	Grey

Waste and Resources			
WR1: LAC Municipal Waste Arisings	LAC municipal waste arisings (2004/05 – 2011/12)	↓	Green
WR2: LACMW Recycled or Composted	LAC municipal waste sent for recycling (including composting) (2004/05 – 2011/12)	↑	Green
WR3: LACMW Recycled or Composted by Material Type	LAC municipal waste material types collected for recycling 2011/12	N/A	Grey
WR4: LACMW Landfilled	LAC municipal waste landfilled (2004/05 - 2011/12)	↓	Green
WR5: Household Waste	Household waste collected per household per year (2004/05 – 2011/12)	↓	Green
WR6: Household Waste Recycled or Composted	Household waste sent for recycling (including composting) (2004/05 – 2011/12)	↑	Green
WR7: Household Waste Landfilled	Household waste landfilled (2004/05 – 2011/12)	↓	Green



# 1 Introduction

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This is Northern Ireland's second State of the Environment (SOE) Report. It contains comprehensive information of the condition of the environment and provides an assessment of progress made in the protection and conservation of our natural environment and built heritage since the publication of the first report in April 2008. It provides an evidence base to help us identify the key challenges to our environment from our activities. It is an important tool, assisting policy and decision makers prioritise actions for the environment to ensure a prosperous and healthy Northern Ireland in the future.

The State of the Environment Report '[Our Environment, Our Heritage, Our Future](#)' provided for the first time a set of thirty key environmental indicators which have enabled us to better understand the pressures and impacts our activities are having on our natural environment and built heritage.

State of the Environment 2013 (SOE2013) considers the evidence from forty four indicators described in annual Northern Ireland Environmental Statistics Reports published from 2009 – 2013, together with information from a range of sources including the Northern Ireland Environment Agency (NIEA) and other public bodies.

The report outlines changes in local, national and European environmental policy and legislation since 2008 and the socio-economic activities connected with change. It provides a commentary on the emerging trends and changes in environmental quality linked to these developments. It also identifies where there are still shortfalls and gaps in our knowledge and assesses the key environmental challenges which currently pose the greatest threat to our environment.

The report is presented in three parts as follows:

**Section 1** summarises the baseline and forces driving change in Northern Ireland's environment and the approach to assessment. It includes a list of the indicators described in subsequent sections together with an assessment, where possible, of the current trends and status.

**Section 2** includes information about the condition of the environment in relation to Air, Climate, Water, Marine, Land and Landscape, Biodiversity, Built Heritage, and Waste and Resources.

**Section 3** considers the broader interfaces of the environment with economy and health and how we might use the evidence in shaping future policy and actions to address the priorities and opportunities identified in previous chapters.

# 1 Introduction

## Approach

### Challenges

- Environmental footprint
- Climate Change
- Nature and Biodiversity
- Natural Resources and Waste
- Environment, Health and Quality of Life

### Issues

- Driver Interdependencies
- Integrated Management Approach
- Resource Efficiency and Security
- Policy Implementation
- Green Economy



The [European Environment – State and Outlook 2010](#) published by the European Environment Agency provides an assessment of the state of Europe's environment, trends and prospects for the future, including how global megatrends might affect prosperity and well-being. A key message from this report is that accelerating global demands threaten the natural systems that sustain us. A complete shift to a resource efficient economy therefore requires all environmental resources to be fully considered in economic and social cohesion decision making.

Northern Ireland's assessment adopts an approach which is consistent with the European Outlook, and looks at indicators across eight main themes.

These indicators were developed using the DPSIR framework (driving force, pressure, state, impact and response) which allows processes and pressures to be teased apart and helps to explain the links between cause and effect.

Each of the forty four indicators in Northern Ireland's SOE2013 provides information and data on the condition of the environment in 2011, unless otherwise stated.

### Driving Force

Socio-economic and socio-cultural forces driving human activities, which increase or mitigate pressures on the environment, e.g. demographics, economics

### Pressure

Stresses that human activities place on the environment, e.g. emissions to air, land and water

### State

The current state of the environment

### Impact

Effects of environmental degradation, e.g. biodiversity loss, economic damage

### Response

Responses by society to the environmental situation e.g. legislation, policy and science

# 1 Introduction

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## What's new since 2008?

The following checklist provides an overview of new content and change since 2008:

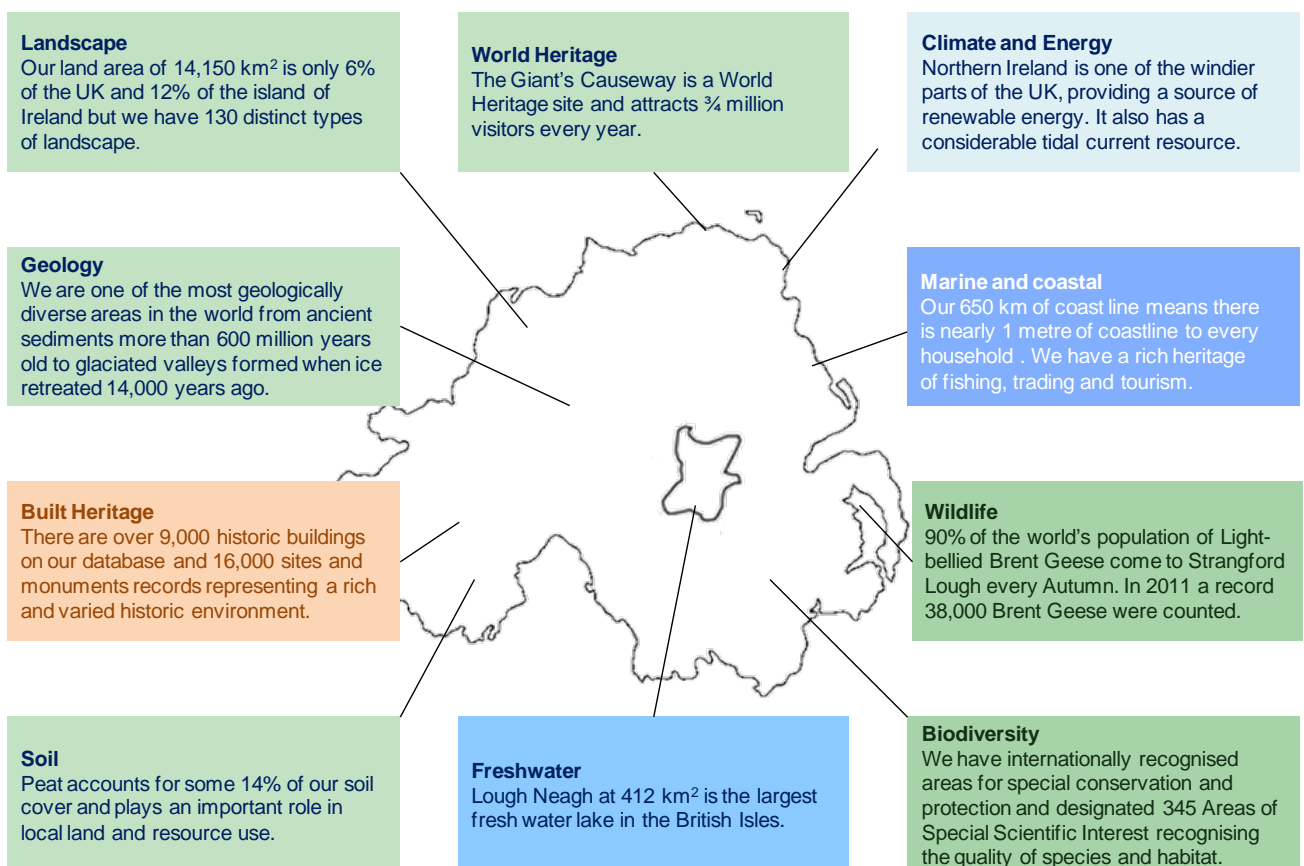
New Climate and Marine themes in separate chapters	✓
Updated definitions linked to European reporting requirements	✓
Initial trends and status assessment	✓
Commentary on current drivers, pressures and responses associated with indicators	✓
Case studies	✓
Easy access summaries of legislative and policy drivers by theme	✓
New section on linkages between the environment, prosperity and well-being	✓
Conclusions and key challenges	✓

## 2 Our Changing Environment

The linkages between the environment and human activities are complex. This section summarises the physical attributes which make Northern Ireland special and the human activities which are forces for both positive and negative change. These include global socio-economic pressures and changes in environmental policy since the 2008 report which provides the framework for assessment and management of our environment.

### What makes Northern Ireland special?

The geographical area of Northern Ireland totals 14,150 km<sup>2</sup>, which is approximately 12% of the land area of island of Ireland and less than 6% of the UK. In addition it has a territorial sea area (to 12 miles) of 7,189 km<sup>2</sup>, extending its physical boundaries by half. Both our land and marine environments contain a wide variety and diversity of natural and historic features which influence our human activities and opportunities.





## 2 Our Changing Environment

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### Natural Capital and the Ecosystem Approach

Human well-being is dependent upon "ecosystem services" provided by nature for free. Such services include water provision, air purification, fisheries, timber production and nutrient cycling. These are predominantly public goods with no markets and no prices, so their loss often is not detected by our current economic incentive system and can thus continue unabated.

A variety of pressures resulting from population growth, changing diets, urbanisation, climate change and many other factors is causing our biodiversity to decline. As a result, ecosystems are continuously being degraded.



The [UK National Ecosystem Assessment \(UK NEA\)](#) published in 2011 was the first independent analysis of the UK's natural environment in terms of the benefits it provides to society and our economic prosperity.

It was an inclusive process involving many government, academic, NGO and private sector institutions and provides a comprehensive picture of past, present and future trends in ecosystem services, their values and response options.

The separate [UK National Ecosystem Assessment: Northern Ireland Summary](#) focuses on the aspects of ecosystem assessment most relevant to our physical and socio-economic environment in Northern Ireland.

The evidence in the UK NEA demonstrates the potential value of ecosystem assessment in decision-making at many levels of governance. It influenced "[The Natural Choice: Securing the Value of Nature](#)" the UK Government White Paper on the environment and this in turn has led to the establishment of the UK Natural Capital Task Force.

A variety of approaches are being advanced in response to current challenges, most significantly through the Northern Ireland Biodiversity Strategy (see **Chapter 8**) and the development of a policy for Natural Capital throughout Northern Ireland.

This policy will demonstrate the multiple socio-economic benefits that we derive from our environment and promote them to government, business and wider society. The aim is to translate an appreciation of ecosystems and the services they provide into shared and responsible decision making that ensures our environment is managed sustainably. This is vital in contributing towards the prosperity of current and future generations in Northern Ireland.

The historic environment can be understood as a similar finite resource. The value of our built heritage is being recognised in new opportunities for regeneration, tourism and economic development. See **Chapter 9**.

## 2 Our Changing Environment

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### Resource Efficiency

Resource efficiency means using the Earth's limited resources in a sustainable manner. We depend on natural resources – metals, minerals, fuels, water, land, timber, fertile soil, clean air and biodiversity – for our survival. Increasing resource efficiency is a central aim of European environmental policy set out in the [Europe 2020 Strategy](#), the European Union's growth strategy for the next decade. It brings major economic opportunities, improves productivity, drives down costs and boosts competitiveness.



The [Roadmap to a Resource Efficient Europe](#) published in 2011 outlines how we can transform Europe's economy into a sustainable one. It sets out a clear vision of an economy that, by 2050, has grown and developed in such a way that respects resource constraints and planetary boundaries, and thus contributes to a global economic transformation.

The Roadmap describes the structural and technological change needed to put Europe on a path to resource efficient and sustainable growth, with milestones at 2020 illustrating specific requirements. For example, a key milestone is not just to manage waste but to recognise it as a resource and thereby create a 'circular economy' with residual waste reduced as far as possible. This will require a greater focus on waste prevention.

The Resource Efficiency Roadmap provides a framework in which future actions can be designed and implemented coherently. It guides Northern Ireland's policies in developing new products and services and finding new ways to reduce inputs, minimise waste, change consumption patterns and optimise production processes, management and business methods. It is reflected in the indicators and emerging policies associated with the Department of the Environment's Waste Management Strategy "[Delivering Resource Efficiency](#)" described in **Chapter 10** and priorities for our economy set out in **Chapter 11**.

### Priorities for health and well-being

Priorities for managing environment related pressures and risks to health and well-being in the 7<sup>th</sup> EU Action Programme focus on the following policy initiatives:

- Significantly improving air quality, aligned with the latest scientific knowledge, and measures to combat air pollution at source.
- Decreasing noise pollution.
- Ensuring high standards for safe drinking and bathing water.

## 2 Our Changing Environment

- Developing an EU strategy for a non-toxic environment to address the combination effects of chemicals, safety concerns related to endocrine disruptors and risks associated with hazardous chemicals in products.
- Considering nanomaterials as part of a coherent approach, balancing safety concerns with encouraging innovation of sustainable substitutes.
- Making decisive progress in adapting to climate change impacts.

In addition, our quality of life is increasingly affected by our lifestyle choices, modes of transport and a rapidly growing agenda on mental health and obesity in particular. Our environment plays a vital role in managing these issues and local policy initiatives for community involvement, physical activity and access to green space aim to contribute to a holistic view of health and well-being.

Indicators and progress for air quality are described in **Chapter 3**, drinking water in **Chapter 5** and bathing water in **Chapter 6**. General indicators, challenges and current responses for other relationships between environment and health in Northern Ireland are discussed in **Chapter 12**.

### Key strategies for Northern Ireland

Since 2011 a number of government strategies have been updated, initiated in part by new EU policies and also by the [Northern Ireland Programme for Government \(2011-2015\)](#).

Some of these have attempted to mainstream environmental challenges across sectors, incorporating the ecosystem approach along with acknowledgement of the major role climate change may play. Principles of sustainability underpin these strategies.



Source: NIEL Report 2013, adapted from Curry and Maguire 2011



## 2 Our Changing Environment

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### Socio-economic context

Pressure on the environment arises from social and economic developments that exploit natural resources, generate waste and provide enhanced and equitable standards of living for all our communities. Socio-economic trends of particular relevance for the state of Northern Ireland's environment include:

**Population and housing** The 2011 census results shows that the population continues to increase, reaching just over 1.8 million in 2011, and is expected to grow by another 10% by 2031. The number of households in 2011 was 703,275 and projected to increase to over 850,000 by 2013, reflecting long terms trends in population and smaller household size.

Key issues for our environment associated with urban and rural expansion remain loss of greenfield land, increased development in rural areas, loss of historic buildings and cultural heritage and increased pressures on resources. The economic downturn has slowed the rate of change since 2008 but has not reduced pressures on land as new priorities emerge toward stimulating the economy. A new indicator on housing completions is included in this update to track changes and inform responses and area planning. See **Chapter 7** Land and Landscape.

**Industry** Industrial activities have the potential to create pressures on the environment through the use of dangerous substances, production of waste, contamination of land, emissions to air and water, and impact on the existing landscape. Impacts are controlled through regulation and guidance. An important sector in Northern Ireland's economy is mineral extraction, which provides raw materials for building homes and infrastructure. This sector has been particularly hit by the recession, with output in the construction sector falling by 30% since the start of 2008 and 37% since its peak at the beginning of 2007. This has resulted in fewer pressures on the environment in some areas, for example, through reduction in demolition waste and greenhouse gas emissions.

**Agriculture** The agri-food sector includes agriculture, horticulture and food and drinks processing and is Northern Ireland's largest indigenous industry. It is our biggest manufacturing industry, our largest single employer and it is also a major exporter. Figures collated in 2010 indicated that the sector employs approximately 100,000 people and generates sales of £4.4 billion. Agri-food activity can have negative impacts on our environment through, for example, the release of greenhouse gases, loss of natural habitat, water pollution and use of pesticides.

This sector has continued to report increases in output during the economic downturn and has emerged as a sector with substantial potential for growth, as set out in the Executive [Programme for Government 2011-15](#) and supported by an industry led strategic action plan "Going for Growth" published in April 2013. Managing this growth sustainably will be a key challenge for our environment. See **Chapter 7** Land and Landscape and **Chapter 11** Environment and Economy.

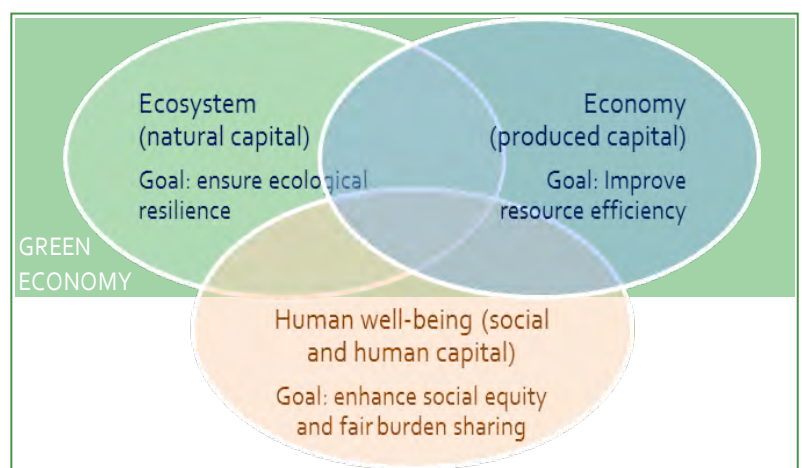
## 2 Our Changing Environment

**Tourism** The Northern Ireland Executive vision for the economy recognises [tourism as key driver of our economy](#). A summary of its contribution to the economy indicates that tourism supports over 40,000 jobs and has the potential to contribute £1 bn to the economy by 2020. Growing visitor numbers and revenue is one of the key priorities for business growth and the [Northern Ireland Economic Strategy](#) sets out associated targets for investment, economic infrastructure and landscape improvements to support development. Tourism, recreation and access will bring wider appreciation of our environment but also new pressures. Impacts and effects are noted in particular in respect of **Climate, Water, Marine, Landscape, Biodiversity** and **Built Heritage** indicators.

**Infrastructure and Transport** The infrastructure required to support population and economic growth impacts our environment directly through land take and associated extraction of raw material, energy provision, emissions and habitat damage. Communities and businesses depend on an effective transportation network to move people and goods quickly and reliably. Consequently there is a clear link between investment priorities for business growth and supporting economic infrastructure. See **Chapter 11**.

**Energy** Northern Ireland's renewable energy developments such as wind turbines, solar panels, hydropower schemes and tidal energy have shown a large increase in the last few years as we seek to secure new energy sources and meet targets for greenhouse gas emissions. Between 2010/11 and 2011/12, there was a 16% increase in the number of applications received (from 706 to 823), and the number of applications decided and approved more than doubled.

**Green Economy** The United Nations Environment Programme defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. The interfaces between economy, ecosystems and human health and well-being in Northern Ireland are important to developing sustainable measures for rebalancing the economy and encouraging business growth.



## 2 Our Changing Environment

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### Environmental goals and future challenges

The most significant change since the publication of the 2008 SOE report is the global economic downturn, its impact on housing and development and effects on energy, resource use and waste production. Evidence suggests that increasing population, more households and lifestyle choices are still creating pressures. The impact of our population on the global environment, in terms of import of goods and issues of energy, food and water security cannot be ignored. Living within our limits, both economic and environmental, locally and globally, is the challenge for our future growth and prosperity.



The Northern Ireland Environment Agency's (NIEA) [Strategic Priorities 2012-2022](#) focuses on four priority themes for managing these challenges to help ensure that we keep our high quality environment on which we depend.

Building on this, NIEA advanced a new strategic objective in 2013 "to create prosperity and well-being through environment and heritage excellence." Delivering this goal will require innovative approaches that move beyond the identification of environmental issues to unlock the potential within Northern Ireland in a sustainable way. A new delivery framework that prioritises the Agency's actions is scheduled for 2014.

## 2 Our Changing Environment

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Good air quality is essential for human health, habitats and the built environment. This chapter provides information on the main air pollutants, how they are monitored and what the measurements tell us about the quality of Northern Ireland's air.

### Key Messages

- **Air quality continues to improve**, with a long-term reduction in the number of days of moderate or worse air quality.
- **Nitrogen dioxide** levels (due to transport) remain a problem, with levels at some locations exceeding objectives.
- **Ammonia** emissions (mostly due to livestock) which have decreased only slightly in the last 10 years, pose a risk to sensitive habitats and ecosystems.
- Levels of **particulate matter (PM<sub>10</sub>)** are within EC limit values; however, localised high levels of PM are sometimes seen in cold, settled winter weather conditions.
- Whilst the introduction of Smoke Control Areas in urban centres has improved local air quality, levels of **Polycyclic Aromatic Hydrocarbons (PAHs)** have been found to be close and in some years exceeded the EU Target Value.
- **Weather** is occasionally a contributing factor to periods of poor air quality, with cold, calm weather conditions experienced during the winter period meaning that man-made pollutants do not disperse effectively.

## Introduction

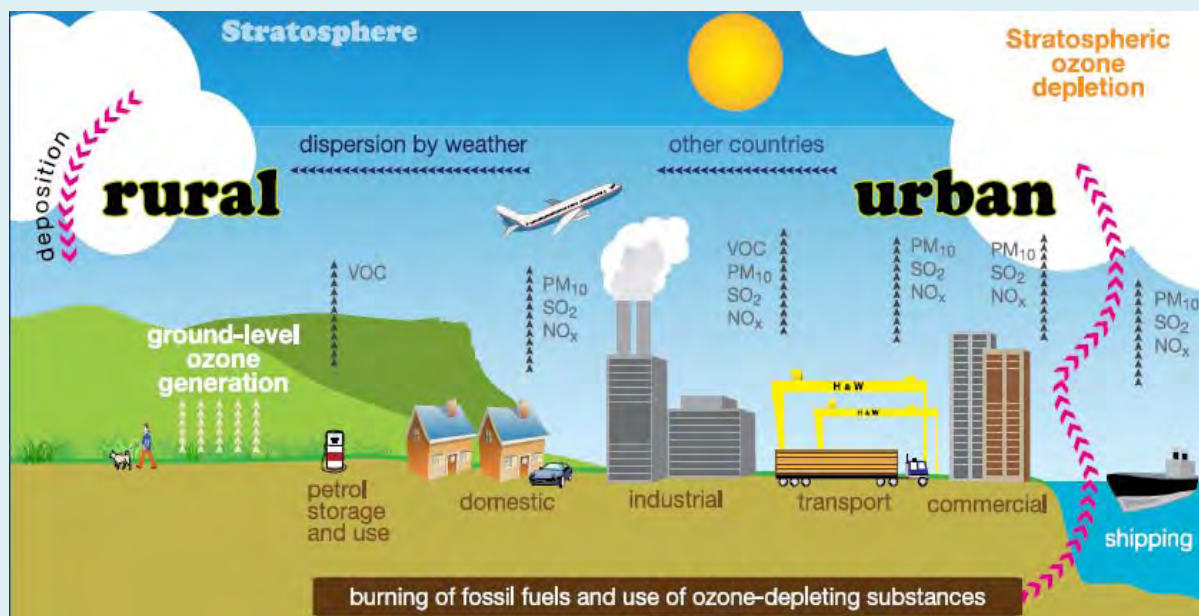
Air pollution was first identified as a significant problem during the 19<sup>th</sup> century, related to industrial activities which led to the formation of smog in urban areas. Air quality in Northern Ireland has shown substantial improvement in recent years, mainly due to the introduction of Smoke Control Areas in urban centres, tighter vehicle emissions standards, and tighter industrial pollution control. Policy objectives and measures to tackle air quality issues are set out in the [Air Quality Strategy for England, Scotland, Wales and Northern Ireland](#).

**Table A1** describes the main air pollutants in Northern Ireland and summarises their effects.

Some air quality pollutants, such as ozone, are transboundary in nature, meaning that they can be transported large distances from where they are produced. For example, background levels of ozone measured in Northern Ireland at Lough Navar have a transboundary component. It is therefore important that measures to tackle air quality pollutants are focussed at national and international levels, as well as at the local level.

### Air Quality and Climate Change

Air pollution can affect climate change and vice versa. Some air quality pollutants can take part in atmospheric processes which lead to formation of greenhouse gases, while the changing weather which is projected to occur as a result of climate change could lead to higher levels of air pollution in our atmosphere and an increased frequency of high air pollution events. See **Chapter 4 Climate**.



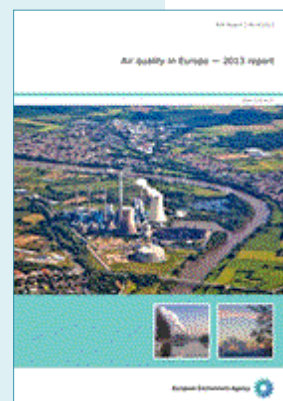
Source: DOE

**Table A1: Key Air Pollutants**

<b>Nitrogen Oxides (NO<sub>x</sub>)</b>	
<p>All combustion processes in air produce oxides of nitrogen (NO<sub>x</sub>). Nitric oxide (NO) is the major component emitted from the stack or exhaust and rapidly forms nitrogen dioxide when mixed with air. Nitrogen dioxide (NO<sub>2</sub>) is an odorous, brown, acidic, highly-corrosive gas.</p> <p>The main source of NO<sub>x</sub> is road transport, followed by electricity supply industry &amp; other industrial and commercial sectors.</p>	<p><b>Human health</b> – NO<sub>2</sub> can irritate and damage the lung tissue, aggravate respiratory conditions such as asthma.</p> <p><b>Photochemical smog and ground level ozone</b> – NO<sub>x</sub> contribute to formation of secondary particles and ground level ozone, both associated with ill-health.</p> <p><b>Acid rain</b> – NO<sub>2</sub> emissions contribute to acidification and eutrophication, which may damage sensitive habitats and buildings, often long distances from source.</p>
<b>Sulphur Dioxide (SO<sub>2</sub>)</b>	
<p>SO<sub>2</sub> is a colourless gas with a penetrating, choking odour. It dissolves readily in water to form an acid.</p> <p>Released when fuels containing sulphur - such as coal and heavy fuel oils - are burnt,</p>	<p><b>Human health</b> – Causes constriction of the airways and lung, particularly in children and people suffering from asthma and chronic lung disease.</p> <p><b>Acid rain</b> – Deposition of SO<sub>2</sub> emissions contributes to acidification of soils and water, which harms forests, crops and aquatic ecosystems.</p>
<b>Particulate Matter (PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub>)</b>	
<p>Refers to microscopic particles suspended in air where the particle size is less than 10 microns (PM<sub>10</sub>), 2.5 microns (PM<sub>2.5</sub>) or 1 micron (PM<sub>1</sub>). Sources are both man-made and natural, including combustion in domestic heating; industry and road traffic; chemical droplets; particles from construction and quarrying work. Dusts may travel long distances e.g. Saharan dust and volcanic emissions.</p>	<p><b>Human health</b> – Particulate matter is consistently associated with respiratory and cardiovascular illness and mortality and other ill-health effects. For very fine particles, there is thought to be no 'safe' exposure threshold below which there are no harmful effects.</p>
<b>Ozone (O<sub>3</sub>)</b>	
<p>Ground level ozone is not emitted directly from human sources. It arises from chemical reactions between air pollutants, primarily NO<sub>x</sub> and Volatile Organic Compounds (VOCs), in the presence of strong sunlight. Formation can take place over several hours or days. O<sub>3</sub> is a transboundary pollutant. A proportion of ozone found locally may have arisen from emissions many hundreds or thousands of kilometres away.</p>	<p><b>Human health</b> – Exposure to high concentrations may cause irritation to eyes and nose and reduce lung function. Very high levels can damage airways and cause inflammation.</p> <p><b>Vegetation damage</b> – Ground level ozone can cause damage to many plant species leading to loss of yield and quality of crops, damage to forests and impacts on biodiversity.</p>
<b>Ammonia (NH<sub>3</sub>)</b>	
<p>Mainly results from vapours arising during the decomposition of animal manure and slurry management. Emissions from manure spreading and storage as well as from fertiliser application are the biggest sources; a much smaller amount comes from non-agricultural sources such as transport and waste disposal.</p>	<p><b>Acid rain and eutrophication</b> – Ammonia contributes to acid rain and eutrophication which damages soils, vegetation and aquatic ecosystems.</p> <p><b>Human health</b> – Ammonia present in the air can lead to the formation of particulate matter, and contributes to the ill-health effects caused by PM<sub>10</sub> and PM<sub>2.5</sub>.</p>
<b>Toxic Organic Micro-Pollutants (TOMPs)</b>	
<p>Produced by the incomplete combustion of fuels. They comprise a complex range of chemicals some of which are highly toxic or carcinogenic. Compounds in this category include: PAHs (PolyAromatic Hydrocarbons), PCBs (PolyChlorinated Biphenyls), Dioxins and Furans.</p>	<p><b>Human health</b> – TOMPs can cause a wide range of effects, from cancer to reduced immunity to nervous system disorders, as well as interfering with child development. There is no safe amount which can be tolerated without adverse effects.</p>

Both air quality pollutants and greenhouse gases are often emitted from the same sources - for example, road transport, power generation and home heating. Measures to tackle one type of pollutant can therefore have beneficial effects on the other. On the other hand, measures which are intended to reduce carbon emissions can have negative impacts on air quality, for example, diesel engines emit less CO<sub>2</sub> than petrol ones, but more fine particles such as PM<sub>10</sub>.

[Air quality in Europe — 2013 report](#) presents an overview and analysis of air quality in Europe from 2002 to 2011. It reviews progress towards meeting the requirements of the air quality directives and gives an overview of policies and measures introduced at European level to improve air quality and minimise impacts. An overview of the latest findings and estimates of the effects of air pollution on health and its impacts on ecosystems is also given.



Policy objectives and measures to tackle air quality issues are set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published on 17th July 2007. Those with limit values required by EU Daughter Directives on Air Quality have been transposed into Northern Ireland law through the [Air Quality Standards Regulations \(Northern Ireland\) 2010](#).

The Environment Order (Northern Ireland) 2002 places a duty on district councils to periodically review and assess the air quality within their districts. Where air quality is poor, they must declare an Air Quality Management Area and put in place. Action Plans to tackle pollution and improve air quality. Action Plans may involve the cooperation of prescribed Relevant Authorities, such as DRD Roads Service (for emissions related to transport).

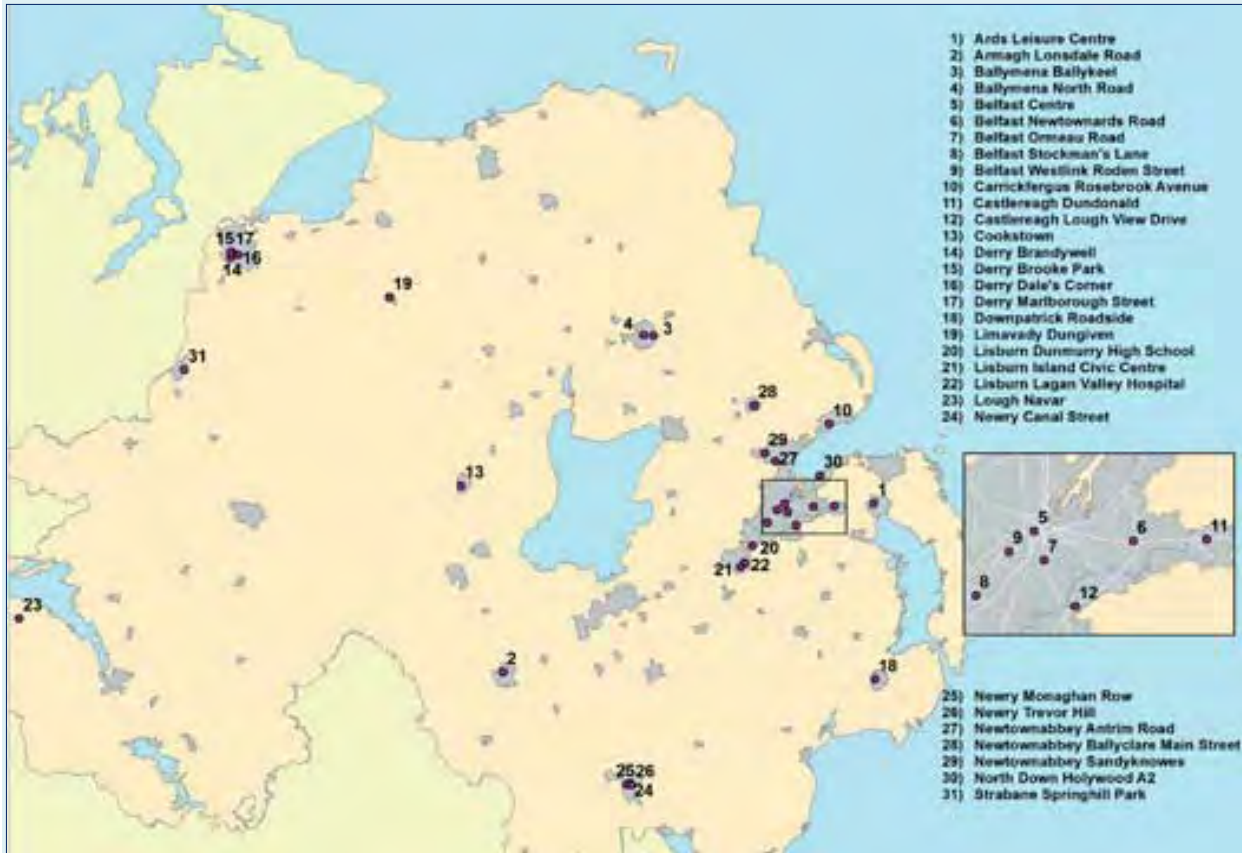
### Local Air Pollutants

A wide range of air quality monitoring is carried out in Northern Ireland. Some monitoring sites are run as part of UK-wide monitoring networks; others are operated by district councils in order to meet local objectives. There are 32 air quality monitoring stations, with some of these being background sites only.

Further information on air quality monitoring in Northern Ireland, including air quality monitoring reports from 2001 to 2011, can be found on the dedicated air quality web site [www.airqualityni.co.uk](http://www.airqualityni.co.uk).



Figure A1: Location of Air Quality Monitoring Sites in Northern Ireland, 2011



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Source: [Air Quality Report in Northern Ireland 2011](#)

## Air quality alerts

Each of the 32 automatic air quality monitoring stations in Northern Ireland gives real-time information on a range of air pollutants. These can be found on the Department's website: [www.airqualityni.co.uk](http://www.airqualityni.co.uk)

There are a number of different air pollutants, and each of them has different safe threshold levels. To make things simpler, an Air Quality Index has been developed. It reports air pollution on a 1-10 scale, so that you can easily see what the air quality is like in your area. '1' indicates that there is no significant air pollution, while '10' is the worst value.

When levels for a particular pollutant reach 'High' or 'Very High' (8 or more on the index), or they are forecast to do so, then the Department issues a High Air Pollution alert to the media.

The alert contains advice for susceptible people – those with lung or heart conditions – on the steps they may wish to take to protect themselves during high air pollution episodes.

High air pollution episodes largely occur as a result of weather conditions, when the air pollution from activities such as fuel burning and transport becomes trapped at ground level. Episodes can be seen in the winter, when cold, still, settled weather means that people burn more fuel to keep their homes warm, when there is little wind to disperse pollutants – this can result in high levels of particulate matter. Other episodes may occur during the summer when high levels of ground level ozone result from the reaction of nitrogen oxides with organic compounds in the presence of strong sunlight.

You can find more information on air pollution and health, including advice on what to do when there is high air pollution, on the NI Direct website: <http://www.nidirect.gov.uk/air-pollution-and-health>.

### Drivers and Pressures

The main driving forces and pressures in Northern Ireland with respect to both local air pollution and contribution to greenhouse gas emissions are transport, energy production, agriculture, industrial processes and residential development.

The **agriculture** sector accounted for the majority (95%) of ammonia emissions in Northern Ireland in 2011. 80% of the emissions came from manure management, with 59% coming from cattle management alone.

Emissions from manure spreading, storage, animal housing, and grazing are the most significant sources, with a smaller amount coming from fertiliser application. Controls are provided for larger intensive livestock farms in the pig and poultry industries through licences issued by NIEA under the [Pollution Prevention and Control Regulations \(Northern Ireland\) 2003](#). In future these will be regulated under the [Pollution Prevention and Control \(Industrial Emissions\) Regulations \(Northern Ireland\) 2013](#).



At a local level, ammonia is released close to manure storage tanks, animal housing facilities or fields on which slurry has been spread. Ammonia can have direct effects near the emission source. It can also be transported long distances and be deposited in rainfall. There are particular pressures on sensitive habitats in areas of intensive livestock production due to elevated ammonia concentrations.

**Agricultural practices** also release large quantities of greenhouse gases. See **Chapter 4 Climate**.

**Road transport** is a key source of many air pollutants, such as nitrogen oxides and particulate matter, particularly in urban areas. Emissions from cars have reduced considerably in recent years as new vehicles have become cleaner in response to European emission standards legislation. However exceedences of the EU objective for nitrogen dioxide have been seen near major roads in some areas, particularly the Greater Belfast area.

Despite a sizable increase in the amount of energy produced from indigenous renewable sources Northern Ireland is still largely dependent on fossil fuel combustion for power generation.

**Industrial processes** can produce emissions of nitrogen oxides, sulphur dioxide and particulate matter which affect local air quality. Hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (F-gases) are potent greenhouse gases, although they account for only a small proportion of total greenhouse gas emissions in Northern Ireland.

Hydrofluorocarbons arise from losses from refrigeration and air conditioning equipment, sulphur hexafluoride emissions arise mainly from leakage from electrical switching gear and the soles of certain brands of training shoes. Emissions are controlled by the Fluorinated Greenhouse Gases Regulations (NI) 2009, which specify minimum requirements for F-gas containing equipment as well as minimum qualification requirements for those who work with F-gases. For further information on F-gases see **Chapter 4 Climate**.

Air emissions from industrial sources are controlled by a variety of measures. Prescribed industrial activities are subject to controls on air emissions set out in permits issued by NIEA or district councils under the Pollution Prevention and Control Regulations (NI) 2003 or the equivalent 2013 regulations.

Each member of the European Union has to provide emission information to Europe annually, in the form of European Pollution Release and Transfer Register (E-PRTR) returns. This includes reporting on emissions and transfers to air, water and land from landfills, hazardous waste facilities, industry, large waste water treatment works and agriculture. Data reported to the E-PRTR, via the Department for the Environment, Food and Rural Affairs (Defra), is published on the [UK PRTR](#) website and the [E-PRTR](#) website.

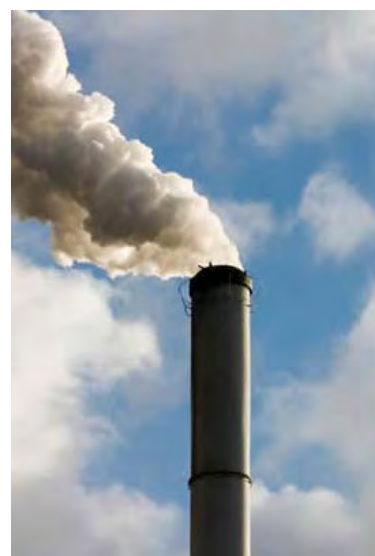


Photo: World Meteorological Organisation

### Solid fuel burning



Air quality in Northern Ireland has come a long way since the smogs of the 1950s and 1960s seen in Belfast, and this is largely due to Smoke Control legislation, which makes it an offence to burn smoky fuel in some urban areas. However we still have air quality problems in smaller urban areas, due to the burning of smoky fuel. In Northern Ireland here remains a significantly higher proportion of home heating which relies on solid fuel combustion, compared to other parts of the UK.

A particular pollutant of concern is polycyclic aromatic hydrocarbons (PAHs) – these are compounds which can cause cancer, and are released in small amounts when certain types of fuel are burnt. The highest levels come from burning smoky coal. The EU has set Target Values for PAHs, and these are based on possible health effects of exposure to PAHs in ambient air.

Monitoring equipment at some locations in Northern Ireland has shown that annual mean levels of PAHs in our air sometimes approach or exceed the EU Target Value. DOE has carried out research into these levels, which has shown that households burning smoky coal are the main culprit.

DOE is continuing to work with local councils across Northern Ireland to look at the issue of Smoke Control. It is also involved in undertaking further research into the effects of smoky coal burning, and what can be done to tackle PAH levels in our air.

**Waste management**, including landfill and wastewater treatment, contributes less than 15% to Northern Ireland's methane emissions. These are expected to decline further in the future with fewer landfill sites and tighter legislative controls following the introduction of the Landfill Regulations (Northern Ireland) 2003 and extension of waste management controls to agriculture.

## The Current Situation

### Summary

Air quality continues to improve, with a long-term decline in the number of days of moderate or worse air quality. Levels of particulate matter (PM<sub>10</sub>) are within EC limit values. However, localised high levels of PM are sometimes seen in cold, settled winter weather conditions, when residential burning of solid fuel is high, and wind dispersal of pollutants is low. Levels of nitrogen dioxide (due to transport) remain a problem, with monitored levels at particular locations exceeding objectives. Ammonia emissions, which are mostly associated with livestock, have decreased only slightly in the last 10 years.

### Air Indicators and Current Trends

Air			
A1: Nitrogen Oxides	Annual mean concentrations of nitrogen dioxide (2001-2011)	↔	Yellow
A2: Sulphur Dioxide	Annual mean concentrations of sulphur dioxide at long-running sites in Northern Ireland (1990-2011)	↓	Green
A3: Particulate Matter	Urban and rural annual mean concentrations of particulate matter less than 10 microns (PM <sub>10</sub> ) (2001-2011)	↔	Green
A4: Ground Level Ozone	Urban and rural annual exceedences of 8-hour mean objective for ozone (2001-2011)	No trend	Yellow
A5: Ammonia	Annual ammonia emissions (1990-2011)	↔	Red
A6: Polycyclic Aromatic Hydrocarbons	Annual mean concentration of benzo(a)pyrene (2001-2011)	No trend	Red

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

## Air Indicators

### Policy and Legislative Context

Guidelines on air quality standards which affect human health are published by the World Health Organisation and the limits and targets set for all substances shown in the box. These define national air quality objectives which are set by European Commission Directives.

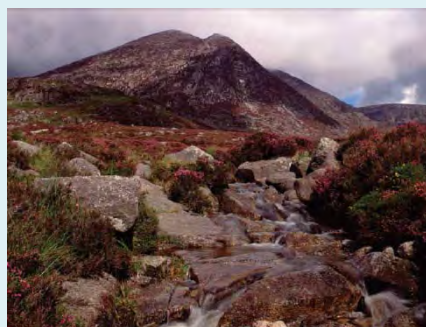
#### Air Pollutants covered by the Air Quality and 4<sup>th</sup> Daughter Directives

Nitrogen dioxide	Carbon monoxide
Sulphur dioxide	Polycyclic Aromatic Hydrocarbons
Particulate matter	Cadmium
Lead	Arsenic
Ozone	Nickel
Benzene	Mercury

The [Air Quality Strategy for England, Scotland, Wales and Northern Ireland](#) sets out health and habitat based standards and objectives for the main air pollutants in the UK. The [EC National Emission Ceilings Directive](#) sets ceilings for emissions of the four pollutants (nitrogen oxides, ammonia, sulphur dioxide and volatile organic compounds) that are primarily responsible for acid rain, eutrophication and ground level ozone.

#### Eutrophication of Sensitive Habitats

The species composition of some sensitive habitats has developed as a response to naturally occurring low levels of nutrients, for example on upland pastures or mountainsides where there are high levels of rainfall and nutrient-poor soil. Species such as heathers, mosses and some grasses thrive in these nutrient-poor habitats.



Airborne pollutants – particularly ammonia – can introduce nutrient nitrogen to these sensitive habitats. Changing the nutrient balance encourages the spread of other species which are more suited to higher nutrient levels, with the result that the species composition of the sensitive habitat is changed. European protected habitats in Northern Ireland are in danger of eutrophication from ammonia emissions and we have a legal duty to prevent damage to these sites.

#### Indicator A1: Nitrogen Oxides

##### Annual Mean Concentration of Nitrogen Dioxide (NO<sub>2</sub>): Urban Background and Urban Roadside, 2001 – 2011

This indicator measures status and trends in annual mean nitrogen dioxide concentrations reported against UK Air Quality Strategy objectives.

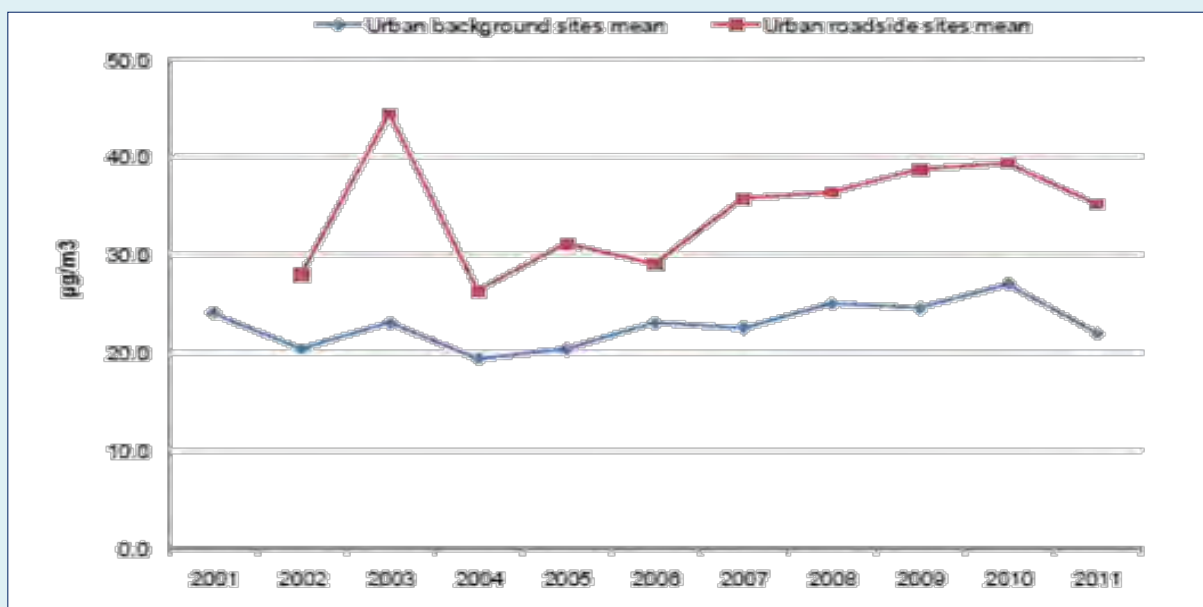
#### Policy

The UK Air Quality Strategy sets objectives for an hourly mean limit of 200µg/m<sup>3</sup> and an annual mean limit of 40µg/m<sup>3</sup> for nitrogen dioxide. No more than 18 exceedences of the hourly limit value are allowed per year.

#### Data

Nitrogen dioxide was monitored using automatic techniques at 21 urban sites across Northern Ireland in 2011. The average annual mean concentration of NO<sub>2</sub> at Northern Ireland's urban background monitoring sites has ranged from 19 to 27µg/m<sup>3</sup> and has remained relatively stable since 2001. The series for roadside levels, which have been monitored since 2002, shows more variation.

Figure A2: Nitrogen Dioxide Automatic Sites Annual Mean Trend (2001-2011)



Source: AEA Technology

## Indicator A2: Sulphur Dioxide

### Annual Mean Concentrations of Sulphur Dioxide at Long Running Sites (1990 - 2011)

This indicator measures status and trends in annual mean sulphur dioxide concentrations reported against UK Air Quality Strategy objectives.

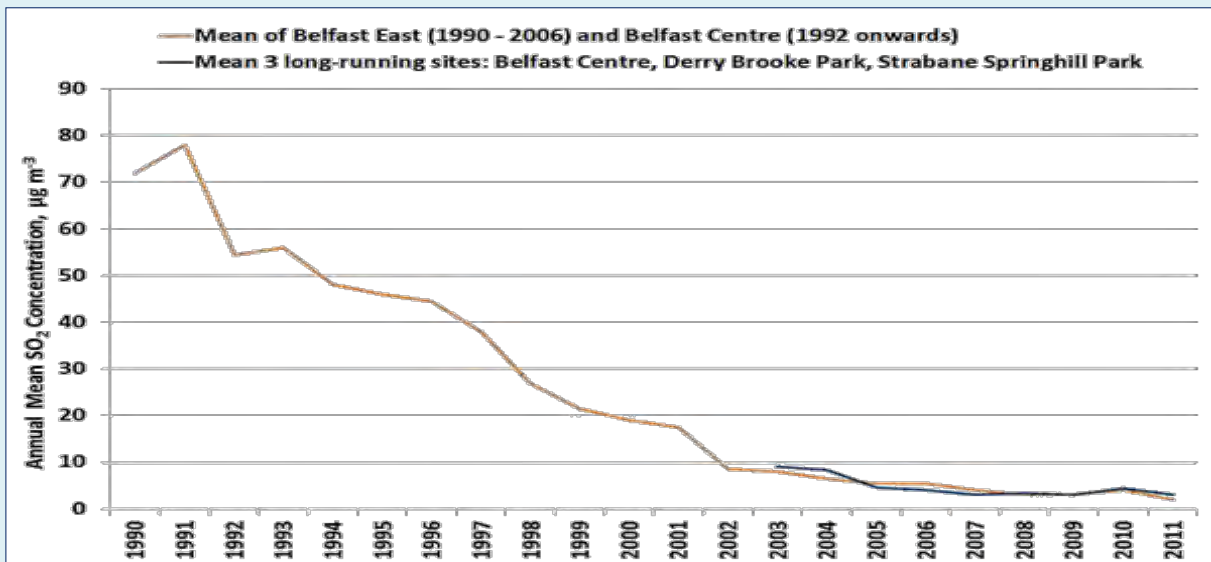
#### Policy

The UK Air Quality Strategy sets objectives for an annual mean limit of  $20\mu\text{g}/\text{m}^3$  for sulphur dioxide. It also sets objectives for a 1-hour mean limit of  $350\mu\text{g}/\text{m}^3$  which is not to be exceeded more than 24 times a year and a 24-hour mean limit of  $125\mu\text{g}/\text{m}^3$  which is not to be exceeded more than 3 times a year. These standards were to be achieved by December 2004 and maintained thereafter. A further objective for a 15-minute mean of  $266\mu\text{g}/\text{m}^3$  which is not to be exceeded more than 35 times a year was to be achieved by December 2005.

#### Data

All sites in Northern Ireland meet the requirements of the Air Quality Strategy for 1-hour and 24-hour mean levels for sulphur dioxide. All have also met the 15-minute mean objective by the due date. A significant downward trend in annual mean sulphur dioxide concentrations has been identified at monitoring locations.

Figure A4: Annual Mean Sulphur Dioxide (SO<sub>2</sub>) Concentrations at Long Running Sites (1990-2011)



Source: AEA Technology

UK wide SO<sub>2</sub> information is at <http://www.naei.org.uk/pollutantdetail.php> and [www.apis.ac.uk/](http://www.apis.ac.uk/)



**Indicator A3: Particulate Matter****Annual Mean Concentrations of Particulate Matter (PM<sub>10</sub>): Urban and Rural (2001 – 2011)**

Most monitoring is currently focussed on PM<sub>10</sub>, but the finer fractions such as PM<sub>2.5</sub> and PM<sub>1</sub> are becoming of increasing interest in terms of health effects. This indicator measures mass concentration levels reported against UK Air Quality Strategy objectives for PM<sub>10</sub>.

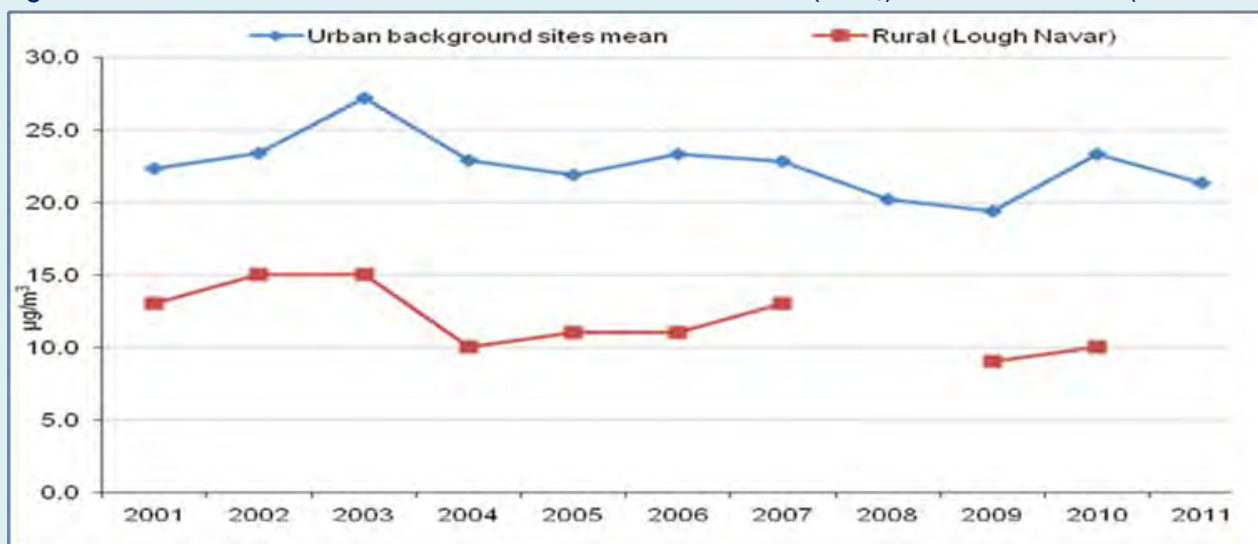
**Policy**

The UK Air Quality Strategy sets objectives for an annual mean limit of 40µg/m<sup>3</sup> for PM<sub>10</sub>. It also sets a daily mean limit (24-hour mean) of 50µg/m<sup>3</sup> which is not to be exceeded more than 35 times a year. These standards should have been achieved by December 2004 and maintained thereafter. An exposure reduction approach for the finer PM<sub>2.5</sub> fraction has been adopted.

**Data**

(PM<sub>10</sub>) data have been monitored for several years at a number of sites across Northern Ireland and provide consistent and accurate monitoring information. PM<sub>10</sub> was monitored automatically at 20 locations in 2011. All sites met the limit value and objective of 40µg/m<sup>3</sup> for annual mean PM<sub>10</sub>. Just one site (Newry Canal Street) exceeded the 24-hour mean limit value and objective of 50µg/m<sup>3</sup>, on more than the permitted 35 occasions during the year. However, there is concern about the location of the Newry Canal Street monitor. It is situated in a corner formed by two adjoining buildings, and it is suspected that wind vortices at the corner lead to artificially high PM<sub>10</sub> measurements. This site is not used for monitoring compliance with the EC Air Quality Directive.

Figure A5: Annual Mean Concentrations of Particulate Matter (PM<sub>10</sub>) Urban and Rural (2001–2011)



Source: AEA Technology. Also UK data at <http://www.naei.org.uk/pollutantdetail.php> and [www.apis.ac.uk/](http://www.apis.ac.uk/)

### Indicator A4: Ground Level Ozone

#### Annual Exceedences of 8-hour mean objective for Ozone: Urban and Rural (2001 – 2011)

Ground level ozone is a transboundary pollutant and a proportion of what is monitored here may have been produced elsewhere. It is not emitted directly from sources like combustion or transport; instead it is formed by the reaction between other pollutants (nitrogen oxides and organic compounds) in the presence of sunlight. This indicator measures status and trends in ground level ozone concentrations at three sites across Northern Ireland reported against Air Quality Strategy objectives.

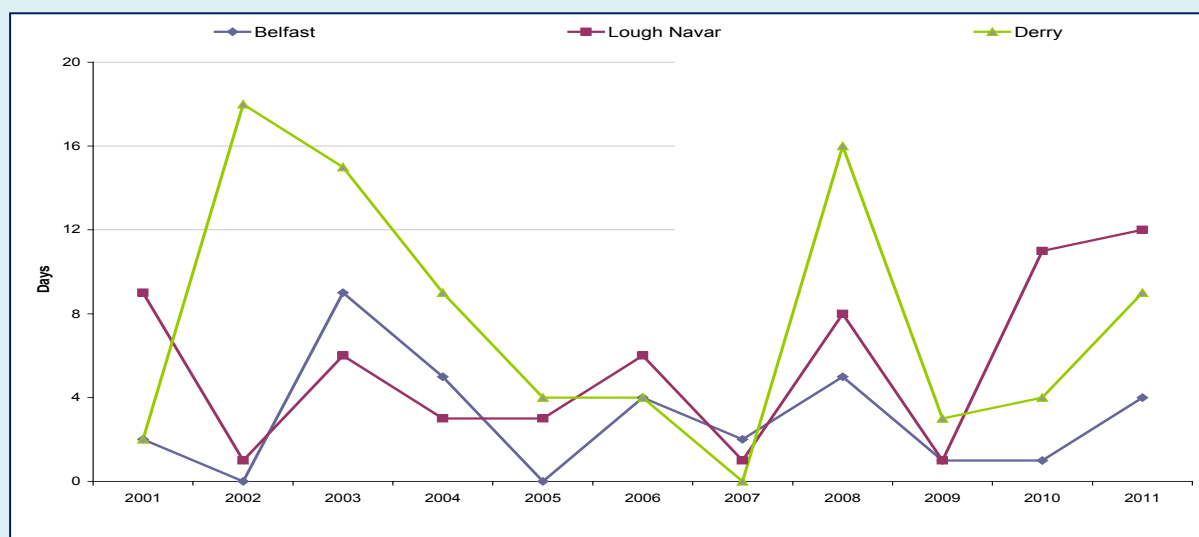
#### Policy

The UK Air Quality Strategy (AQS) sets an objective for the maximum daily eight hour mean concentration of ozone not to exceed  $100\mu\text{g}/\text{m}^3$  on more than ten occasions per year at each particular site. These standards were to be achieved by December 2005 and maintained thereafter. Ozone precursors including oxides of nitrogen and volatile organic compounds (VOCs) are also limited under the National Emissions Ceiling Directive.

#### Data

Ozone is monitored using automatic sites at Belfast, Londonderry and Lough Navar. No sites exceeded the EU Target Value for human health of  $120\mu\text{g}/\text{m}^3$  (for the maximum daily 8-hour mean) on more than the permitted 25 days, but Lough Navar did exceed the more stringent AQS objective of  $100\mu\text{g}/\text{m}^3$  on more than the permitted 10 days in 2011, as it also did in 2010.

Figure A6: Annual Exceedences of 8-hour mean objective for Ozone Urban & Rural (2001 - 2011)



Source: AEA Technology.

See also UK wide ozone information at <http://www.naei.org.uk/pollutantdetail.php> and [www.apis.ac.uk/](http://www.apis.ac.uk/)

## Indicator A5: Ammonia

### Annual Ammonia Emissions (2001 – 2011)

This indicator measures the total ammonia emissions from agricultural and non-agricultural sources and relates Northern Ireland figures to the UK target for 2010 set under the UNECE Gothenburg Protocol and the EC National Emissions Ceiling Directive.

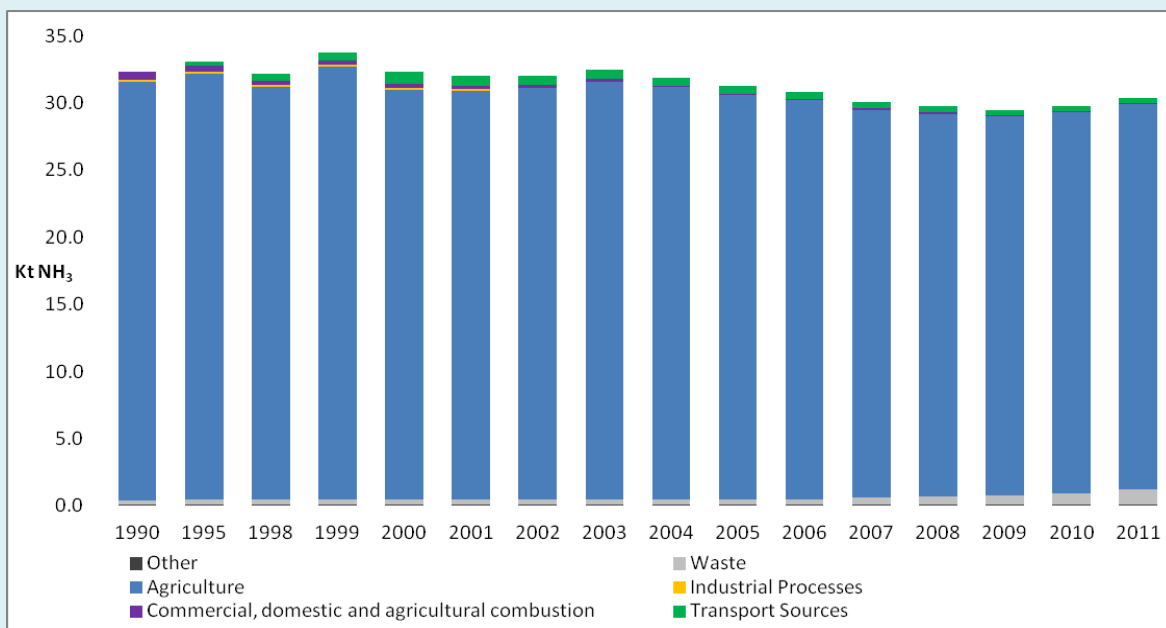
#### Policy

The UK target under the National Emissions Ceiling Directive is 297 thousand tonnes (kt) ammonia (NH<sub>3</sub>) emissions by 2010. Northern Ireland emissions are estimated as part of the UK total and there is no separate target.

#### Data

Estimated emissions from Northern Ireland in 2011 comprised 10% of the UK total – a much higher proportion than is suggested by the relative population figures and something which reflects the relative intensity of agriculture (livestock) activities in Northern Ireland compared with the rest of the UK. The UK totals are reported by Defra under its Air Quality Statistics.

Figure A7: Northern Ireland Ammonia Emissions by Sector (1990 – 2011)



Source: Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2011, Aether & Ricardo-AEA

### Indicator A6: Polycyclic Aromatic Hydrocarbons Annual Mean Concentration of Benzo (a) pyrene (2002-2011)

Polycyclic aromatic hydrocarbons (PAHs) are a group of compounds which are harmful and of particular concern to human health, having been closely linked to some forms of cancer. Benzo[a]pyrene (B[a]P) is one of seventeen PAHs, and its levels are monitored in ambient air. B[a]P is chosen as a marker compound which is indicative of levels of PAHs in general. The main source in Northern Ireland is from domestic bituminous (smoky) coal burning.

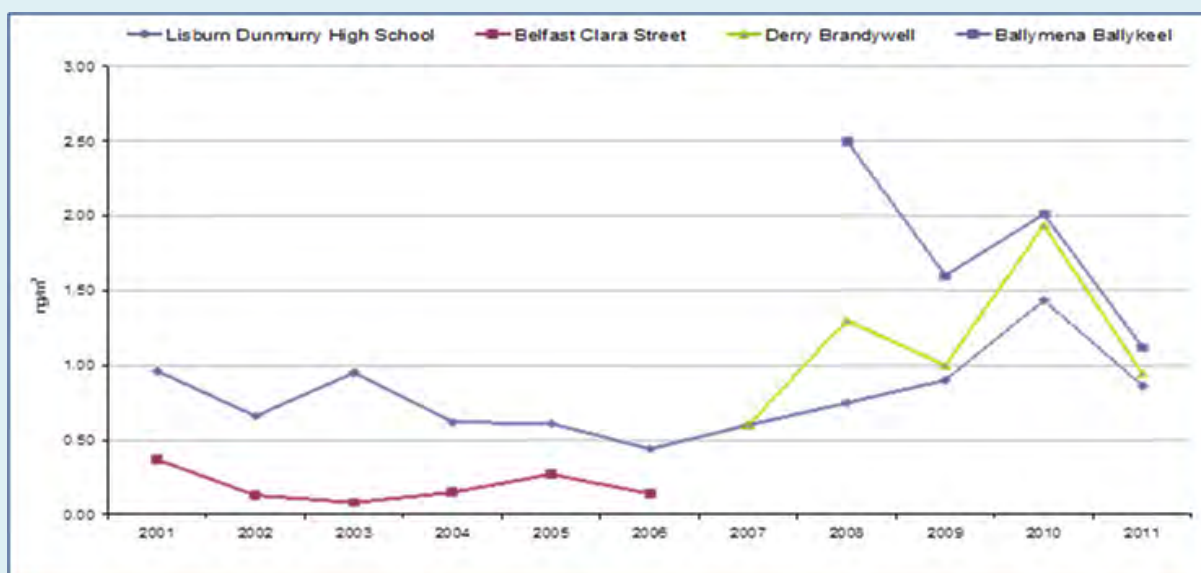
#### Policy

The EU has set a Target Value of  $1.0\text{ng}/\text{m}^3$  of B[a]P in ambient air to have been met by December 2012. In addition, the UK Air Quality Strategy sets a more stringent target of  $0.25\text{ng}/\text{m}^3$ .

#### Data

B[a]P has been measured at four different sites in Northern Ireland since 2001. The longest monitoring sequence (at Lisburn Dunmurry High School) has shown annual concentrations fluctuating between  $0.44$  and  $1.44\text{ng}/\text{m}^3$  since 2001. In 2010 all three sites breached the UK Air Quality Strategy objective; this is believed to have been because of harsh winter weather conditions, which may have led to increasing burning of smoky coal by households. However, in 2011, only the Ballymena Ballykeel site failed to meet the EC Target Value ( $1\text{ng}/\text{m}^3$  for B[a]P).

Figure A8: Annual mean concentrations of Benzo(a)pyrene, 2001 – 2011



Source: PAH Network operated by NPL, data provided from UK-AIR by AEA

## Commentary

**Indicator A1: Nitrogen Oxides** The data show that the annual average concentrations of nitrogen dioxide in urban areas have generally been declining over the long term. This is due primarily to the increased use of catalytic converters in cars, and a move from domestic coal burning to gas heating. While 2010 appears to have been a relatively high year for NO<sub>2</sub> in Northern Ireland, possibly due to the cold winter weather experienced at the beginning and end of the year, by contrast 2011 appears to have been year which saw lower levels of this pollutant. In 2011, three individual monitoring sites at urban roadsides showed exceedences of the annual mean limit value for NO<sub>2</sub> – these were Belfast Stockman’s Lane, Derry Marlborough Street, and Newtownabbey Antrim Road.

**Indicator A2: Sulphur Dioxide** The data show that the annual average concentrations of sulphur dioxide in urban areas have declined from when monitoring began, and more significantly since 1992 to current low levels, with notable decreases at some sites since 2001. This is due to the impact of the implementation of European Directives on low sulphur fuel (smokeless coal, low sulphur or sulphur free fuel oil, etc) and switching from coal to gas in the domestic sector. The introduction of requirements of the Large Combustion Plant Directive has also reduced sulphur dioxide emissions. See pp79-80 of the [National Atmospheric Emissions Inventory Report 2012](#).

**Indicator A3: Particulate Matter** In general, there has been a long-term decline in Particulate Matter less than 10 microns (PM<sub>10</sub>) in urban areas since the 1990s. Factors influencing the overall decline include: more stringent vehicle emissions standards, smoke control in urban areas, and the expansion of the natural gas network.

In 2011, the annual mean concentration of PM<sub>10</sub> in urban areas was 21.3µg/m<sup>3</sup>; however, the annual mean for the Lough Navar rural background monitoring site is not shown for 2011 because data capture was too low for a reliable annual mean to be calculated (this was also the case for 2008). In the period since 2001, the annual mean concentration of PM<sub>10</sub> at the rural Lough Navar site has been no higher than 15 µg/m<sup>3</sup> and the annual mean concentration averaged over Northern Ireland’s urban monitoring sites has been less than 28µg/m<sup>3</sup>.

**Indicator A4: Ground Level Ozone** Whilst ozone levels are generally found to be within Air Quality Strategy objectives, levels of ozone in Northern Ireland do not appear to be decreasing, unlike some other pollutants. Because of its transboundary nature, there is less control over levels of ozone, which remain variable from year to year, depending on weather conditions. Therefore, ozone exceedences remain a possibility. From 2001 to 2011, the AQS objective was exceeded three times at Derry, while at Lough Navar the objective was exceeded both in 2010 and 2011.

**Indicator A5: Ammonia** Data are based on estimates compiled for the National Atmospheric Emissions Inventory by various research organisations on an annual basis. In recent years, efforts have been made to unify estimates from the different sources to provide a more definitive guide for the UK, although uncertainties in the data remain. Specific Northern

Ireland estimates for the agricultural sector are also compiled annually and will assist reporting of trends in the future.

There has not been a significant reduction in NI ammonia emissions over the years, and in fact, emissions have increased slightly since 2009. Emissions remain relatively high in comparison with other parts of the UK, and Northern Ireland's ammonia emissions accounted for 10% of the UK total in 2011. It is estimated that 95% came from agriculture, with 80% coming from manure management, including spreading, storage, and animal housing.

**Indicator A6: Polycyclic Aromatic Hydrocarbons** The three Northern Ireland sites, although situated in predominantly residential areas, show annual mean B[a]P concentrations similar to those seen in industrial areas in GB such as Scunthorpe, Middlesbrough and Port Talbot.

Based on research commissioned by DOE in 2012, it is suggested that the high PAH concentrations recorded at these locations are due to widespread combustion of smoky (bituminous) coal. This is demonstrated by the lower PAH levels recorded at Belfast Clara Street (part of a Smoke Control Area) from 2001 to 2006, which are comparable to levels recorded in other large UK cities.

### Conclusion and Key Challenges

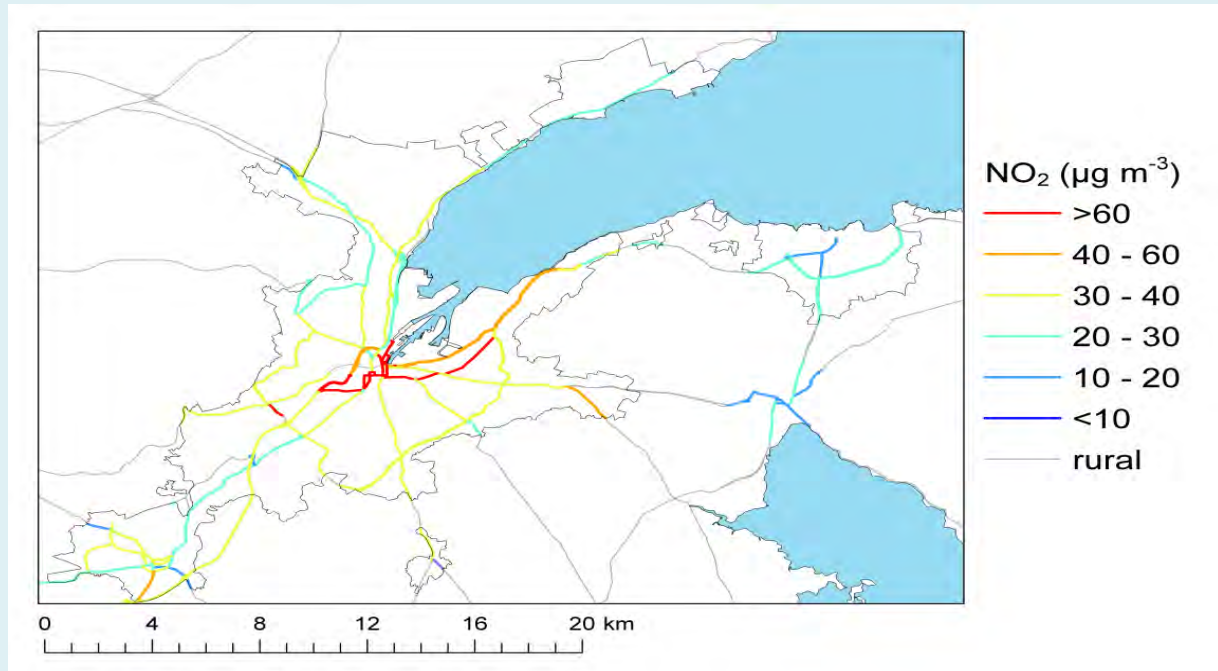
Air quality in Northern Ireland has improved substantially in recent decades. In particular, concentrations of sulphur dioxide, a pollutant associated with coal and oil combustion, have declined significantly over the past twenty years. However, some pollutants continue to exceed air quality objectives in some areas.

At a local level, ongoing activity to tackle problems with air quality is progressed in 28 Air Quality Management Areas, which have been declared by 12 district councils in Northern Ireland. Action Plans to improve air quality are prepared by district councils in conjunction with other relevant statutory bodies, such as Roads Service, Planning Service and the Northern Ireland Housing Executive.

Nevertheless, air pollution from domestic combustion of smoky coal, and from road transport remain as key challenges in our efforts to improve air quality for the protection of public health. In addition, ammonia emissions from agriculture remain high and pose a threat to our fragile ecosystems and habitats. A continued effort to reduce air pollution from these sources is therefore important, together with monitoring to assess progress and to provide sound, science-based input to policy development.

#### NO<sub>2</sub> Problems in Belfast

Estimated Annual Mean Roadside NO<sub>2</sub> in the Belfast Area



Source: Produced by Ricardo-AEA and included in the [Air Pollution in Northern Ireland 2011](#) Report

Nitrogen dioxide is a by-product of combustion processes, and the main source is from fuel (especially diesel) combustion by vehicles on our roads. At some roadside locations in Northern Ireland, high levels of NO<sub>2</sub> have been measured.

European Directive 2008/50/EC on ambient air quality sets out health-based limits for a number of air pollutants, including NO<sub>2</sub>. The limits for NO<sub>2</sub> were to have been met by Member States by 2010. When it became clear that many Member States were in danger of not meeting their NO<sub>2</sub> limit values, the Commission decided to allow these countries to apply for an extension to the 2010 deadline – to 2015. Applications for extension had to be accompanied by Action Plans, which set out how compliance would be achieved by the later deadline of 2015.

The UK was one of 18 Member States which applied for an extension for compliance with NO<sub>2</sub>. In the UK, Action Plans were developed for 40 zones in which compliance with NO<sub>2</sub> limits would not be met by 2010. One of these Action Plans was for Northern Ireland, and another was for the Greater Belfast metropolitan area, as modelling of NO<sub>2</sub> levels in these zones had shown exceedences of the NO<sub>2</sub> limit value along some major road transport routes. The Action Plan for Northern Ireland was accepted by the Commission in 2012. The Action Plan for the Greater Belfast area is among 14 UK Action Plans which have been rejected by the Commission. The problem is EU-wide: many other Member States have had Action Plans for problem zones rejected too.

DOE is working with Belfast City Council and with DRD Roads Service to look at ways to tackle the NO<sub>2</sub> levels in the Greater Belfast area. In the end, it is the number of vehicles on our roads which is causing the problem, and so the way we all think about transport is important in finding a solution.

## Responses

DOE is working with DRD Roads Service and Belfast City Council to explore ways of tackling the exceedences of the EU's nitrogen dioxide limit value. The Department is intending to build on previous research into PAHs from household emissions, and intends to embark on joint research with the Department for Environment, Communities and Local Government (DECLG) in ROI which will look at the issue in more detail.

### Northern Ireland e-car Project



This project has introduced an electric vehicle charging infrastructure to Northern Ireland. The introduction of this infrastructure means that 160 electric vehicle charging points are now installed in many towns and cities across Northern Ireland.

Electric vehicles are revolutionising the way people think about cars. With no tail-

pipe CO<sub>2</sub> (carbon dioxide) emissions, the electric car is a step towards a more sustainable future.

e-car is part of the UK-wide scheme called [Plugged in Places \(PIP\)](#) which provides government funding to regions that want to bring charging points to their area. There are also other 'Plugged in Places' schemes operating in London, the North East of England, East of England, Manchester, Scotland, and the Midlands.

Plans to increase agricultural production must take into account the potential impact of increased nitrates to land, water and air both locally and regionally. This will be discussed further in the **Land** and **Water** chapters.



## ANNEX Air Quality Legislation and Policy Drivers

EC Directives	Description
The <a href="#">Fourth Daughter Directive</a> 2004/107/EC of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.	This is the Fourth Daughter Directive and completes the list of pollutants initially described in the EC Framework Directive ( <a href="#">96/62/EC</a> ). This sets Target Values for heavy metal pollutants and polycyclic aromatic hydrocarbons (PAHs).
Air Quality Directive <a href="#">Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe</a>	Relates to sulphur dioxide, oxides of nitrogen, particulate matter, lead, carbon monoxide, benzene and ozone in ambient air.
Industrial Emissions Directive (integrated pollution prevention and control) <a href="#">Directive 2010/75/EU</a>	Relates to Industrial activities, large combustion and incineration activities and activities using solvents. The Industrial Emissions Directive (IED) is a recast of seven previous directives which relate to industrial pollution control.
Paints Directive <a href="#">Directive 2004/42/EC</a>	Establishes limit values for the maximum VOC contents of decorative paints and other products covered by the Directive.
International Agreements	Description
<a href="#">Gothenburg Protocol</a>	The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone sets emission ceilings for four pollutants: sulphur dioxide, nitrogen oxides, VOCs and ammonia.
UK Policy & Strategy	Description
<a href="#">The Air Quality Strategy for England, Scotland, Wales and Northern Ireland</a>	Establishes the framework for air quality improvements across the UK. Measures agreed at the national and international level are the foundations on which the strategy is based. The strategy sets out the Air Quality Standards and Objectives which have been set in order to measure the improvement of air quality.
Local Legislation	Description
<a href="#">Air Quality Standards Regulations (Northern Ireland) 2010</a>	Replaces the Air Quality Standards Regulations (Northern Ireland) 2007, and also incorporate provisions of the fourth daughter directive relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. Places a duty on NI departments to ensure that objectives are met in zones and agglomerations.
<a href="#">Environment Order (NI) 2002</a>	Local Air Quality Management (LAQM). Places a duty on district councils to review and assess air quality within their areas, and where objectives are exceeded, or in danger of becoming so, to declare Air Quality Management Areas and Action Plans.
<a href="#">The Volatile Organic Compounds in Paints, Varnishes and Vehicle Refinishing Products Regulations 2012</a>	Contributes to the control of VOC emissions. Replaces the 2005 Regulations and sets maximum levels of organic solvents that can be contained in paints, varnishes and vehicle refinishing products (such as cleaners, primers and fillers).
<a href="#">The Pollution Prevention and Control (Northern Ireland) Regulations 2003</a> <a href="#">The Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013</a>	Requires certain industrial activities to be regulated by the NIEA or district councils. Updates the above regulation to reflect the requirements of the recast Industrial Emissions Directive.

### 3 Air

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[Clean Neighbourhood and Environment Act \(Northern Ireland\) 2011](#)

Makes provision for: the gating of certain minor roads; vehicles parked on roads that are exposed for sale or being repaired; the abandonment of vehicles and the removal and disposal of vehicles; litter and graffiti, fly-posting and the display of advertisements; the control of dogs; noise; the restatement of the law on statutory nuisances and to improve the summary procedures for dealing with them; an increase in the maximum penalty in relation to certain pollution offences; and for connected purposes.



Since the start of the 20<sup>th</sup> century records show that the climate in Northern Ireland is changing. If this continues the long term impact on the environment around us and how we live in it will be significant.

This chapter sets out what are thought to be the main causes of changes to our climate, the steps we need to take to reduce our impact and how we can adapt in the future.

### Key Messages

- **Greenhouse gas emissions have decreased since 1990**, with a reduction of 17.5% achieved by 2011.
- In Northern Ireland the main sources of greenhouse gas emissions are agriculture, transport, energy supply and residential combustion. **In recent years most sectors have decreased except for transport and land use change.**
- Meeting the Northern Ireland Executive's Programme for Government target to continue to work towards **a reduction in greenhouse gas emissions of at least 35% by 2025** based on 1990 levels will be challenging.
- In preparing for the impacts of climate change one of our key priorities for the next few years will be ensuring the implementation of the **Northern Ireland Adaptation Programme.**

## 4 Climate

### Introduction

The world's climate varies naturally as a result of:

- Interactions between the ocean and the atmosphere;
- Changes in the earth's orbit; and
- Fluctuations in energy received from the sun.

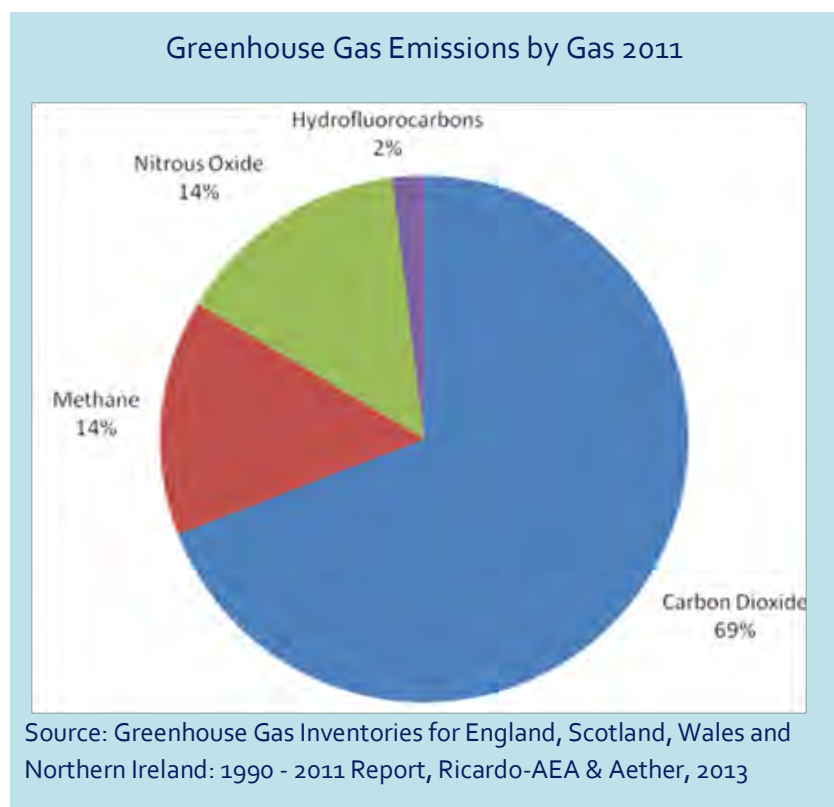
There is now strong evidence that emissions of greenhouse gases such as carbon dioxide and methane are contributing to the rate at which our climate is changing.

### The greenhouse effect

The earth is surrounded by a layer of gases which act like the glass walls of a greenhouse: they let the sun's rays enter, but stop much of the heat from leaving. This is a natural process, and it is this layer of 'greenhouse gases' that keeps the planet warm enough to sustain life for people and animals. Human activities emit pollution (such as carbon dioxide and methane) into the atmosphere, which increases the greenhouse effect. In the UK, approximately 40 per cent of emissions are caused by individuals, mostly from energy used in the home, driving and air travel.

The six greenhouse gases listed under the [Kyoto Protocol](#) are carbon dioxide, methane, nitrous oxide, hydro fluorocarbons, per fluorocarbons and sulphur hexafluoride.

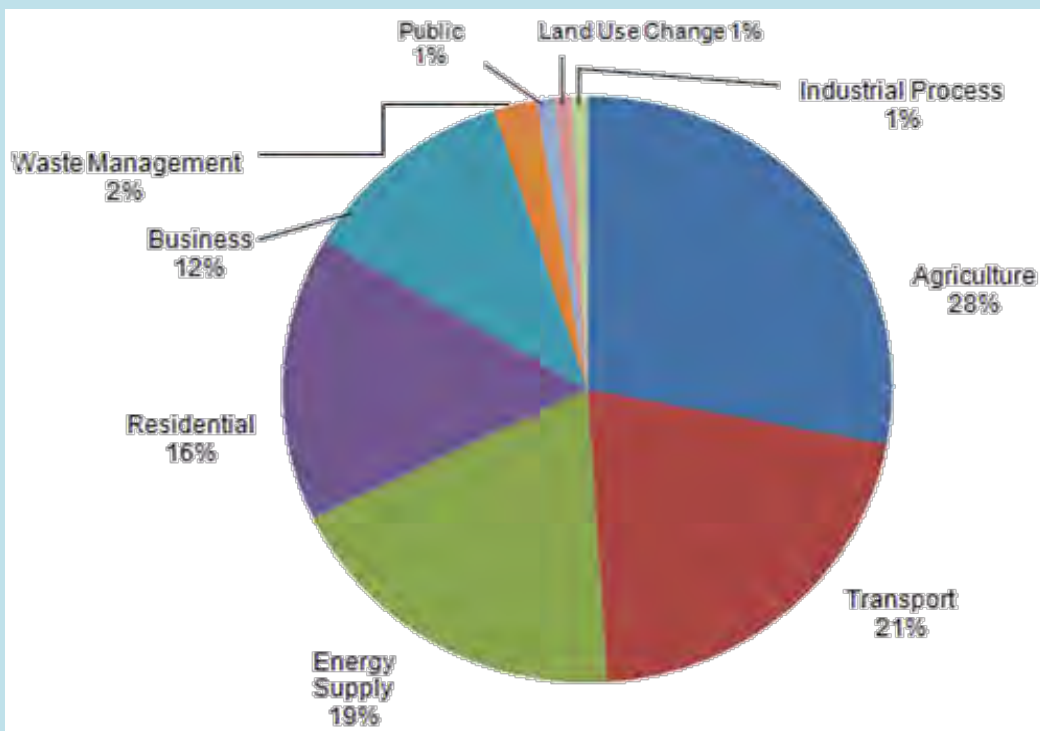
Fluorinated greenhouse gases (F-gases) are a small (2.0%) but significant component of total greenhouse gas emissions. F-gases were largely introduced to replace CFCs, which damage the ozone layer, and are mostly used in refrigeration, air conditioning and fire protection systems.



### Drivers and Pressures

In 2011, Northern Ireland's total greenhouse gas emissions accounted for 3.6% of the UK total. The main sources were agriculture, transport, energy supply and the residential sector, which contributed almost 84% of Northern Ireland's total. In 1990, the same four sectors contributed just under 79%.

Total Greenhouse Gas Emissions by Sector in Northern Ireland (2011)



Source: [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2011 Report, Ricardo-AEA & Aether, 2013](#)

**Agriculture** forms the biggest contributor to total emissions of greenhouse gases in Northern Ireland because of the quantity of methane released from livestock and its greater potency compared with carbon dioxide (in 2011, 28% of total emissions). Around 84% arises from agriculture of which 88% is from cattle and mostly gases produced during digestion.



## 4 Climate

Intensive poultry and pig production also contribute some emissions, together with application of nitrogen fertilisers. Controls are provided for larger intensive livestock farms in the pig and poultry industries through licences issued under the Pollution Prevention and Control Regulations (Northern Ireland) 2003. In addition, agricultural soils provide the major source of nitrous oxide in Northern Ireland, from denitrification of nitrogen fertilizer and animal manures applied to land.



**Road transport** Emissions from cars have reduced considerably in recent years as new vehicles have become cleaner in response to European emission standards legislation. However, while total vehicle kilometres have increased over the past two decades they have remained steady for the past few years. This contributes to transport being the second largest source sector of greenhouse gas emissions in Northern Ireland.

Greenhouse gas emissions from road transport in Northern Ireland accounted for nearly one fifth of emissions in 2011. The 25% increase in transport emissions between the base year and 2011 was due to growth in transport demand and increased affordability of cars and fuel although, since peaking in 2007, there has been a reduction of almost 9% over the last four reported years.

**Energy production** is the third largest source of emissions as Northern Ireland is largely dependent on fossil fuel combustion for power generation. Between 2011 and 2012 emissions from the energy sector rose by 120 Kt (circa 2.6%) as a result of higher coal fired generation due to increases in Natural gas prices. This trend has continued in 2013. In 2011/12, 14.3% of total electricity consumed in Northern Ireland was produced from indigenous renewable sources.



Demand for **residential development**, roads and other infrastructure as a result of the improvement in the Northern Ireland economy has led to a consequent rise in emissions from the construction sector. Whilst cleaner fuels and a reduction in coal usage have reduced sulphur dioxide and nitrogen dioxide emissions from domestic sources, carbon dioxide emissions from housing and development make a significant contribution to greenhouse gases and will increase with growing pressures for new housing.

## 4 Climate

### The Current Situation

#### Summary

Greenhouse gas emissions in Northern Ireland have decreased since the 1990 baseline<sup>1</sup>, with a reduction of 17.5% achieved by 2011. There was a decrease of over 5% between 2010 and 2011, mainly due to a large reduction in burning oil use in the residential and business sectors after the exceptionally cold weather in 2010, and a reduction in emissions from coal consumption at power stations.

Towards the end of the 20<sup>th</sup> century, the ten year moving average for the mean annual minimum temperature had risen to its highest level since the temperature records began at Armagh in 1844. The mean annual minimum temperature for Northern Ireland varies but tends to fall between 4°C and 6°C, whilst the mean annual maximum temperature tends to vary between 12°C and 14°C. There appears to be a general increase in the ten year moving average over the last hundred years, however, the length of time for which records have been taken is still short in terms of monitoring climate.

The ten year moving average for the proportion of annual rainfall falling in winter has generally fluctuated between 25% and 30% since the beginning of the 20<sup>th</sup> century; however it has fallen in recent years. The ten year moving average for the proportion of annual rainfall falling in summer showed a general decrease during the 20<sup>th</sup> century; however records show an increase in recent years.

#### Climate Indicators

Climate			
C1: Greenhouse Gas Emissions	Total greenhouse gas emissions (1990-2011)	↓	
C2: Temperature	Annual minimum and maximum temperature (1844-2011)	No trend	
C3: Rainfall	Percentage of annual rainfall falling in summer and winter (1854-2011)	No trend	

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

<sup>1</sup> The base year for UK greenhouse gas emissions are 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for fluorinated gases.

### Climate Indicators

#### Policy and Legislative Context

There are international, EU, UK and Northern Ireland commitments on greenhouse gas emissions. The [Kyoto Protocol](#) is the main international agreement which drives the following targets at EU and Northern Ireland levels:

- The EU has committed to reduce emissions by 20% by 2020 compared with 1990 levels and to increase this to 30% reductions if there is a wider global deal;
- The UK government is committed to 34% reductions by 2020 on 1990 baselines through the Climate Change Act 2008; and
- The Northern Ireland target in its Programme for Government is to reduce Northern Ireland's total greenhouse gas emissions by at least 35%, on 1990 levels, by 2025.

The [UK Climate Change Act 2008](#) is main legislation applying in Northern Ireland. This provides a legally binding framework with targets set at UK level to tackle the dangers of climate change. The Act requires government to publish 5-yearly assessments of the risks to the UK from current and projected future impacts of climate change. The [UK Climate Change Risk Assessment \(CCRA\)](#) and a [CCRA for Northern Ireland](#) were published in 2012. These documents identify key risks and opportunities which we may face as a result of our changing climate. The first [Northern Ireland Climate Change Adaptation Programme](#) will respond to the findings of the CCRA for Northern Ireland.

Key policies include the [EU Emissions Trading Scheme](#) (EUETS) and the [CRC \(Carbon Reduction Commitment\) Energy Efficiency Scheme](#). In the EUETS, large emitters of carbon dioxide, including the power sector, must monitor and report annually their carbon dioxide emissions. They are then required to surrender allowances equivalent to their carbon dioxide emissions in that year. The aviation sector was brought into the Scheme in 2012 and from January 2013 energy producers no longer receive free allowances under the scheme. In addition plants which are not operating, or who reduce their capacity, are no longer allowed to keep their allowances. The aim of these measures is to increase the cost of CO<sub>2</sub> allowances in order to make it more beneficial for installations to reduce their emissions.

The [CRC Energy Efficiency Scheme](#) was introduced in 2010. The scheme applies to large commercial and public sector organisations including supermarkets, hotel chains, government departments and large local authority buildings. It was designed to create a shift in awareness, behaviour and infrastructures within these organisations in assisting them to achieve greater energy efficiency.

EC regulations on F-gases are implemented by Northern Ireland Regulations, which aim to limit emissions by specifying controls on supply and use of F-gases and setting out minimum qualification requirements for people who work with equipment which contains F-gases.



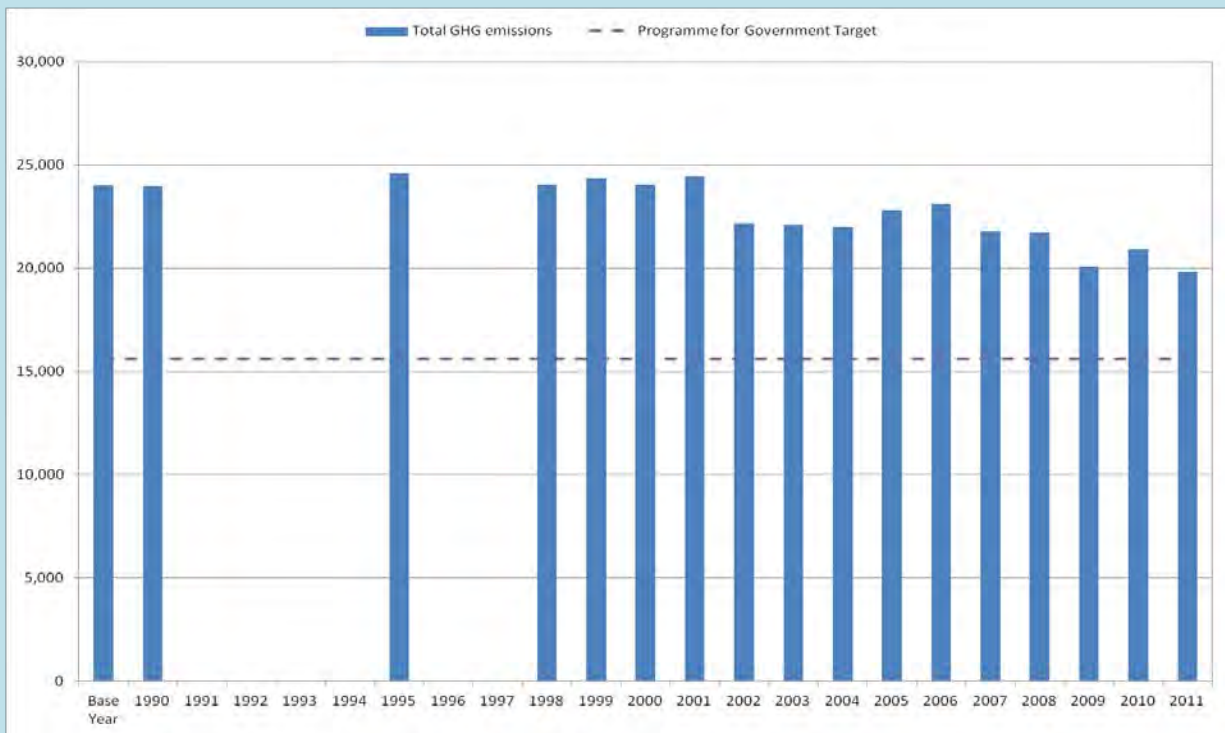
## Indicator C1: Greenhouse Gas Emissions Total Greenhouse Gas Emissions 1990-2011

The six greenhouse gases listed under the Kyoto Protocol are carbon dioxide, methane, nitrous oxide, hydro fluorocarbons, per fluorocarbons and sulphur hexafluoride. Carbon dioxide is the main gas of concern, because it makes the second largest contribution after water vapour. This indicator measures the total greenhouse gas emissions for Northern Ireland against the 1990 baseline year.

### Data

Data on greenhouse gas emissions are compiled by Ricardo-AEA and Aether for the UK and reported annually, two years in arrears, in the [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland](#). Emissions of different greenhouse gases can be compared using a measure of their carbon equivalent based on their Global Warming Potential (GWP).

Figure C1: Total Greenhouse Gas Emissions (1990 base year and 2011)



Source: Ricardo-AEA & Aether

### Indicator C2: Temperature

#### a. Annual Minimum Temperature (1844-2011)

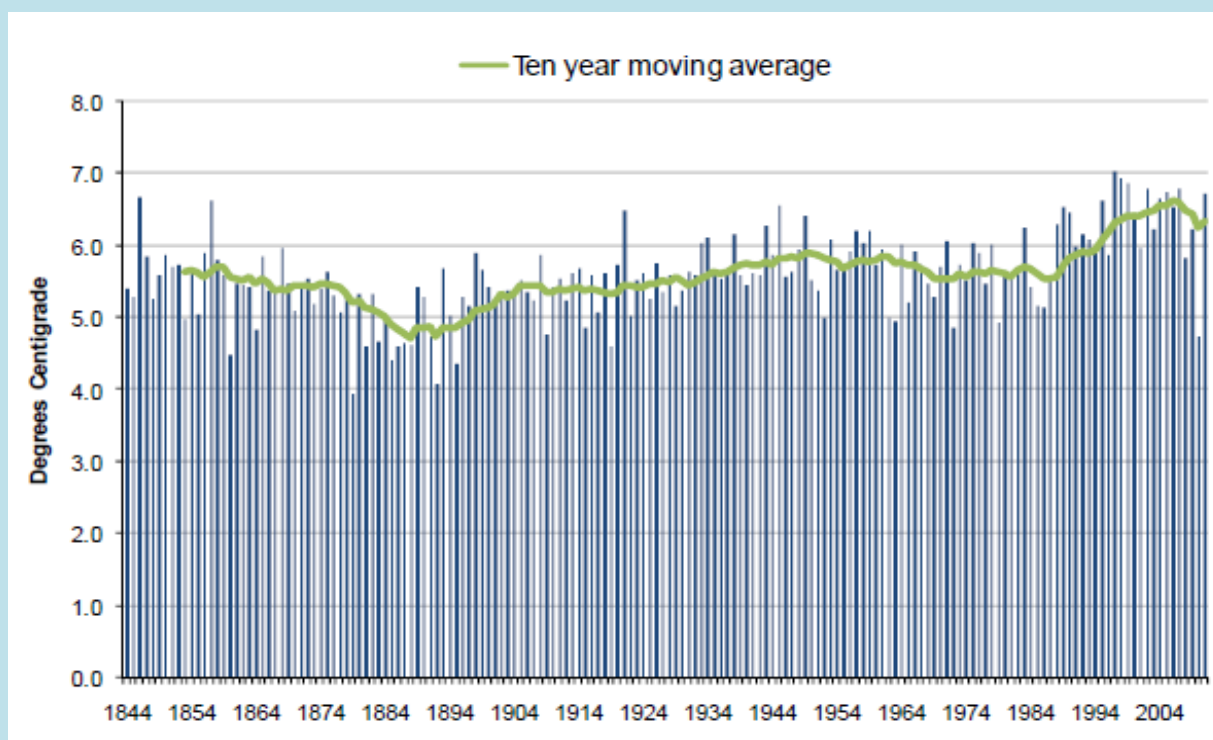
A continuous temperature record has been maintained at Armagh Observatory since 1844. The mean annual minimum temperature has been calculated from Armagh temperature records for all years since these records began.

#### Data

The ten year moving average trend line shows that the annual minimum temperature reached a low in the late 19<sup>th</sup> century, and rose to its highest level since the temperature records began towards the end of the 20<sup>th</sup> century. There appears to be a general increase in the ten year moving average over the last hundred years.

The lowest mean annual minimum temperature (3.95°C) was recorded in 1879. The highest mean annual minimum temperature (7.02°C) was recorded in 1997. The 2011 mean annual temperature (6.73°C) returned to a level more comparable with recent years after a large fall to 4.74°C in 2010.

Figure C2: Mean Annual Minimum Temperature (1844-2011)



Source: Armagh Observatory

### Indicator C2: Temperature

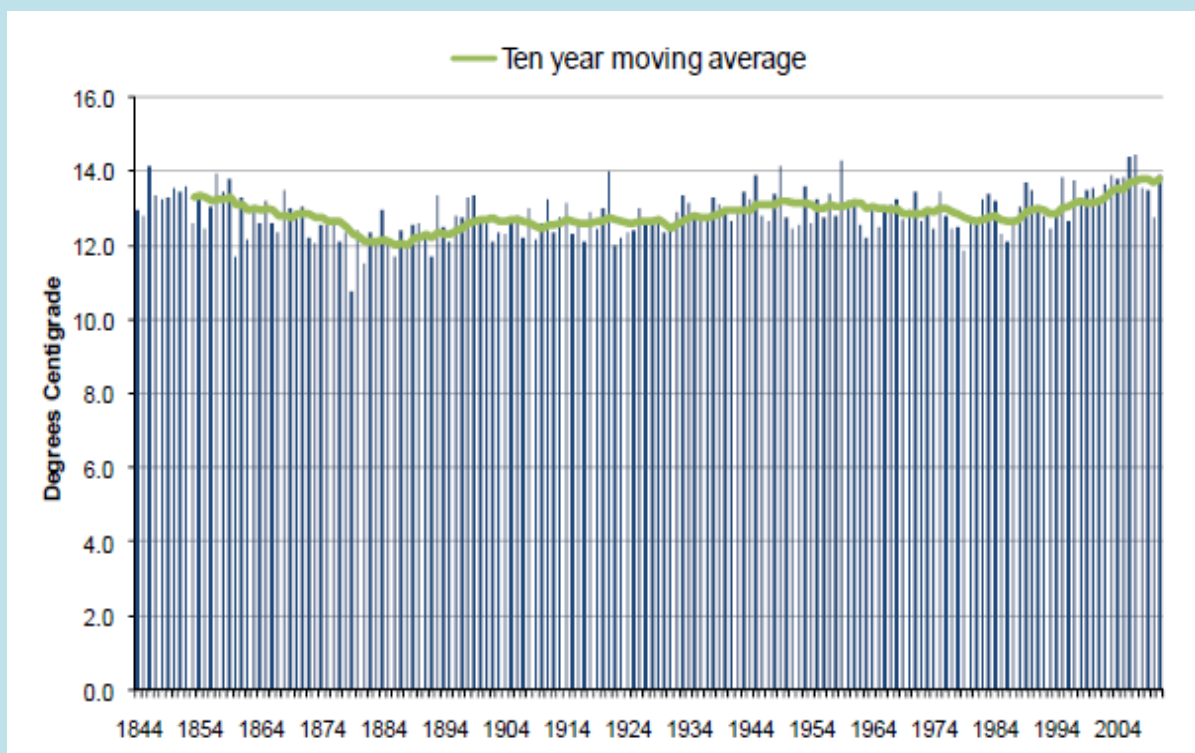
#### b. Annual Maximum Temperature (1844-2011)

The mean annual maximum temperature for Northern Ireland has been calculated from the Armagh Observatory temperature records.

#### Data

The ten year moving average of mean annual maximum temperature tends to vary between 12°C and 14°C. The mean annual maximum temperature reached a low of 10.74°C in the late 19th century which was recorded in 1879, and a high of 14.44°C which was recorded in 2007. There appears to be a general increase in the ten year moving average over the last hundred years but this is not as marked as the increase for the minimum moving average. However, in both cases the length of time records have been taken is still short in terms of monitoring climate.

Figure C3: Mean Annual Maximum Temperature (1844-2011)



Source: Armagh Observatory

### Indicator C3: Rainfall

#### a. Percentage of annual rainfall falling in winter (Dec – Feb), 1854 – 2011

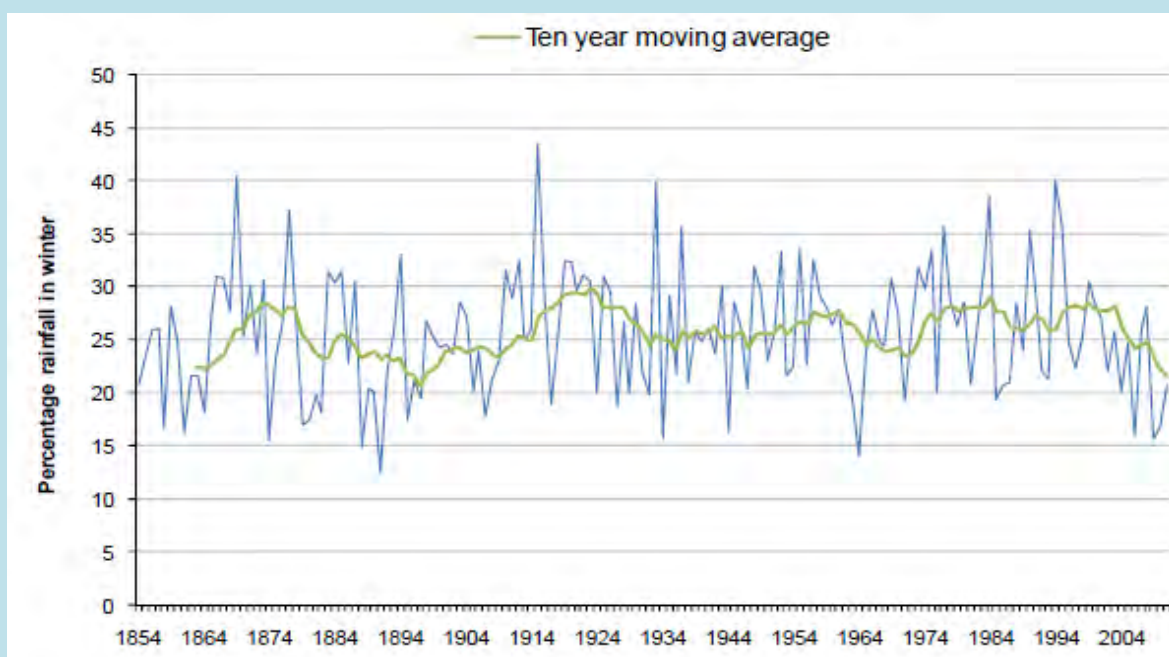
Rainfall records are kept at Armagh Observatory. The amount of rainfall observed in winter (December to February) is calculated as a percentage of annual rainfall (December to November).

#### Data

The ten year moving average for winter rainfall has generally fluctuated between 25% and 30%.

The greatest percentage of annual rainfall falling in winter occurred in 1915, when 43% of the year's rainfall fell in the three winter months. In 1891 just 12% of the annual rainfall fell in winter. This is the smallest percentage of annual rainfall in winter recorded in Northern Ireland.

Figure C4: Percentage of annual rainfall falling in winter (Dec – Feb), 1854 – 2011



Source: Armagh Observatory

### Indicator C3: Rainfall

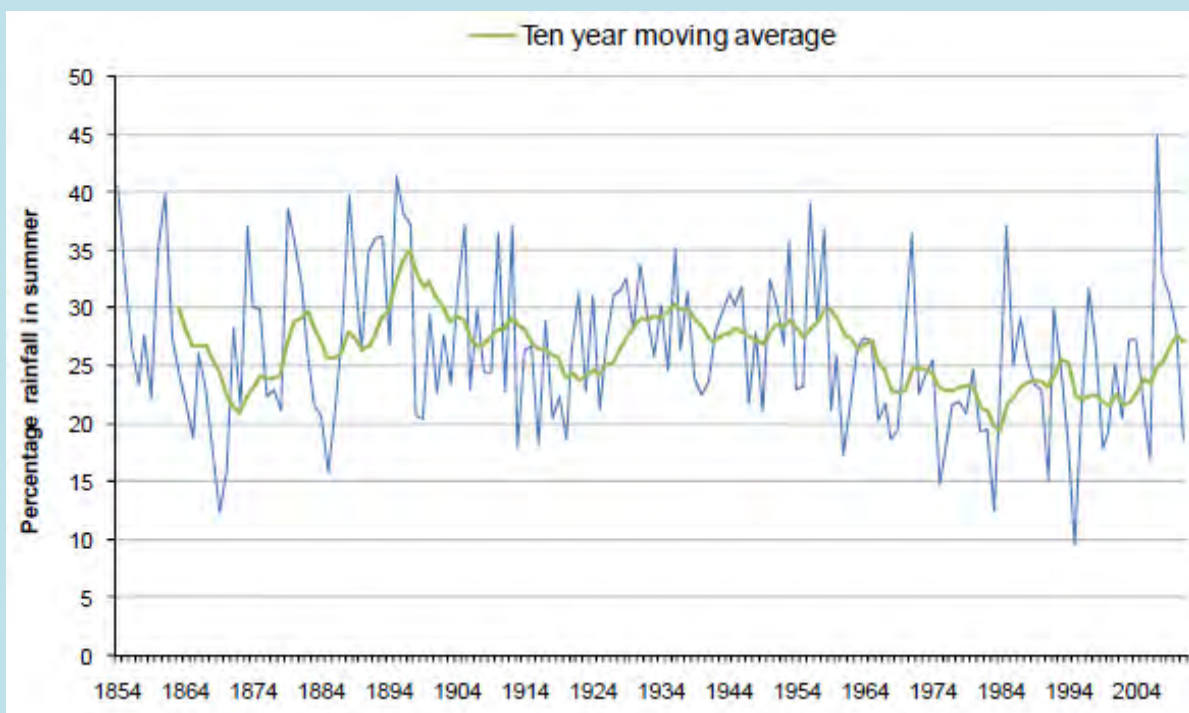
#### b. Percentage of annual rainfall falling in summer (Jun – Aug), 1854 – 2011

Rainfall records are kept at Armagh Observatory. The amount of rainfall observed in summer (June to August) is calculated as a percentage of annual rainfall (December to November).

#### Data

The ten year moving average for the proportion of annual rainfall falling in summer fluctuates but showed a general decrease during the 20<sup>th</sup> century. There has been an increase in the ten year moving average in recent years. The highest level recorded was in 2007, when 45% of the year's rainfall fell in the three summer months. In 1995, less than 10% of the annual rainfall fell between June and August, the lowest percentage recorded in Northern Ireland.

Figure C5: Percentage of annual rainfall falling in summer (Jun – Aug), 1854 – 2011

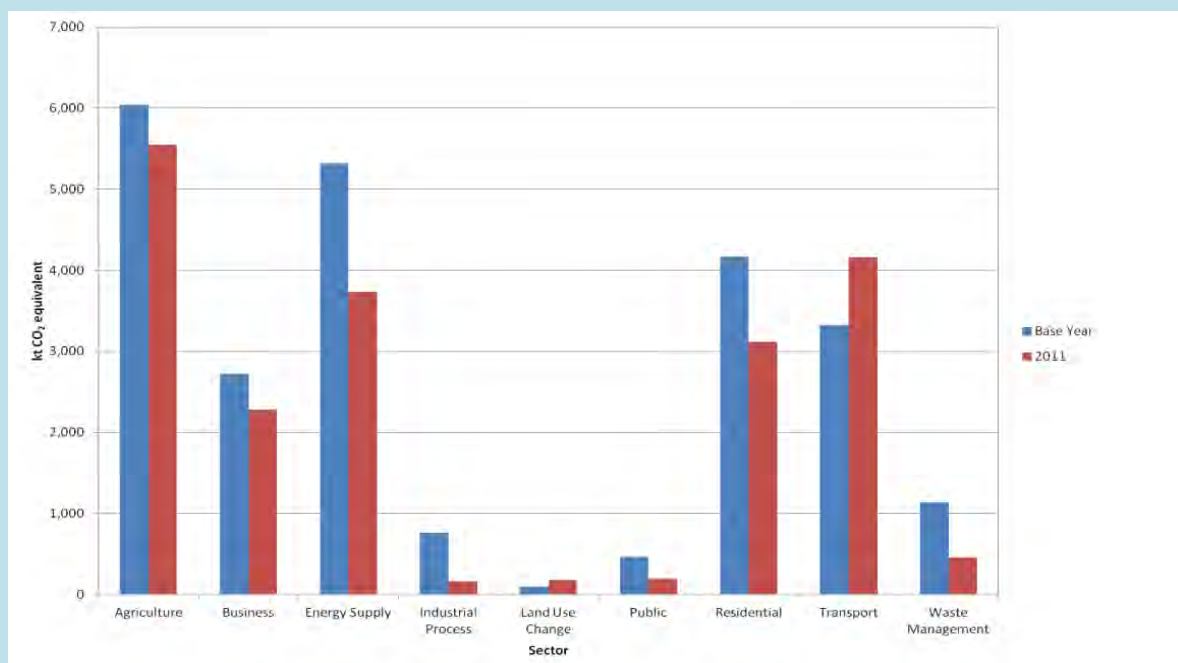


Source: Armagh Observatory

### Commentary

**Indicator C1: Total Greenhouse Gas Emissions** Since the 1990 baseline year, Northern Ireland's total greenhouse gas emissions have decreased by 17.5%. This is less than the reduction seen for the UK as a whole, which has seen a decrease of just over 29% on 1990 levels. Most sectors have shown a decrease on 1990 baseline levels, with the exception of transport and land use change. In 1990, transport accounted for 3,325 kt CO<sub>2</sub> equivalent while land use change accounted for 98 kt CO<sub>2</sub> equivalent. By 2011, these figures were 4,158 kt CO<sub>2</sub> equivalent and 180 kt CO<sub>2</sub> equivalent respectively.

Greenhouse Gas Emissions by Sector (1990 base year and 2011)



Source: Ricardo-AEA & Aether

**Indicator C2: Temperature** Ten year moving averages for mean annual minimum and maximum temperatures are variable; however there appears to be a general increase in the ten year moving average over the last hundred years. Although records have now been kept continuously since 1844, the length of time records have been taken is still short in terms of monitoring climate and detecting statistically valid trends.

**Indicator C2: Rainfall** The ten year moving average has fluctuated considerably since records began in 1854. The biggest variation was recorded for summer rainfall in 2007, when 45% of the year's rainfall fell in the three summer months.

## 4 Climate

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### Key Challenges

Northern Ireland faces changes to its climate over the next century. Projections suggest that we may face hotter, drier summers and warmer, wetter winters as a result of climate change. This means that we may need to make changes to our lifestyles to adjust to our changing climate. In June 2009 the Department for Environment, Food and Rural Affairs launched the 2009 UK Climate Projections. Some of the projections estimate that by 2050 Northern Ireland will have:

- An increase in winter mean temperature of approximately 1.7 °C
- An increase in summer mean temperature of approximately 2.2°C
- Changes in winter mean precipitation of approximately +9 per cent
- Changes in summer mean precipitation of approximately -13 per cent
- Sea level rise for Belfast of 14.5cm above the 1990 sea level.

Disruption to business, services and our daily lives may increase if adverse changes occur. An increased risk of flooding and coastal erosion would put pressure on drainage, sewage, roads, water and habitat. Increased temperature may bring discomfort to vulnerable people, particularly the elderly, and threaten species of animals and crops.

### Responses

There are two parallel approaches to address the impacts of climate change:

- Limiting further impacts of climate change by reducing man's contribution to greenhouse gases (Mitigation)
- Preparing for the changes and improving resilience to climate change (Adaptation).



In February 2011, the Executive approved the first [Northern Ireland Greenhouse Gas Emissions Reduction Action Plan](#). This was delivered by a Cross-Departmental Working Group Chaired by the Environment Minister. It examined relevant policies, projecting how NI emissions might look in 2025. Progress on greenhouse gas emission reductions and preparing for the impacts of climate change are [reported annually](#).

In terms of adaptation the key priorities for next few years will be:

- Ensuring the implementation of the [Northern Ireland Adaptation Programme](#); and
- Supporting the preparation of the second assessment of the risks to the UK and Northern Ireland of the current and predicted impact of climate change.

## 4 Climate

Everyone can help reduce their potential contribution to climate change by saving water and energy, and reducing their carbon footprint. Reusing and recycling instead of throwing items away will mean less waste and less energy needed to make new items. Reducing emissions of greenhouse gases and preparing for the impacts of climate change are considerable challenges facing all humanity. Northern Ireland is moving in the right direction by acting to respond to both the risks and opportunities that a changing climate might present.

### Titanic Quarter – Incorporating flood risk

The £7bn Belfast Titanic Quarter project is transforming a 185-acre site on the banks of Belfast's river Lagan into a new mixed use maritime quarter. Environmental sustainability and resilience to a changing climate is at the core of the development.

Measures are incorporated into the design to:

- minimise carbon dioxide emissions
- support renewable forms of energy particularly in community heating systems; and
- ensure buildings are not at risk from flooding from predicted sea level rises



Source: NIEA



### ANNEX Climate Legislation and Policy Drivers

EC Directives	Description
<a href="#">EU Emissions Trading System (EU ETS)</a>	Large emitters of carbon dioxide, including the power sector, must monitor and report annually their carbon dioxide emissions.
<a href="#">The Greenhouse Gas Emissions Trading Scheme Regulations 2012</a>	These regulations came into effect on 1 January 2013. The Regulations consolidate 13 sets of regulations into one single statutory instrument. They also integrate the legislative requirements for aircraft and stationary operators to reduce duplication and repeal a number of provisions that are no longer relevant
International Agreements	Description
<a href="#">Kyoto Protocol</a>	International agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets.
<a href="#">UN Framework Convention on Climate Change (UNFCCC)</a>	The ultimate objective of the Convention is "...stabilisation of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system..."
<a href="#">UNFCCC LUCF</a>	GHG net emissions/removals by LUCF refers to changes in atmospheric levels of all greenhouse gases attributable to forest and land-use change activities, including but not limited to (1) emissions and removals of CO <sub>2</sub> from decreases or increases in biomass stocks due to forest management, logging, fuelwood collection, etc. (2) conversion of existing forests and natural grasslands to other land use; (3) removal of CO <sub>2</sub> from the abandonment of formerly managed lands (e.g. croplands and pastures) and (4) emissions and removals of CO <sub>2</sub> in soil associated with land-use change and management.
UK Policy & Strategy	Description
<a href="#">Climate Change Act 2008 (UK &amp; NI)</a>	This outlines the GHG emissions reduction targets to be achieved by 2050; requires publication of 5-yearly assessments of the risks to the UK from current and projected future impacts of climate change; and requires a programme to be laid in the NI Assembly based on these assessments.
<a href="#">UK Climate Change Risk Assessment – January 2012</a>	The Northern Ireland <a href="#">report</a> identifies key risks and opportunities which we may face as a result of our changing climate in terms of their relative magnitude throughout the twenty first century and the confidence that can be attributed to the risk.
<a href="#">National Adaptation Programme Report</a>	This sets out the objectives, policies, proposals and timescales to address the priority risks and opportunities identified in the CCRA for Northern Ireland. It identifies four primary areas for action within which progress on the application of the objectives and adaptation principles will be pursued.

## 4 Climate

Local Legislation	Description
<a href="#">NI Greenhouse Gas Emissions Action Plan 2011 &amp; Annual Report 2012 and 2013</a>	Outlines actions to reduce GHG emissions.
<a href="#">NI Programme for Government (PfG)</a>	To work towards a reduction in GHG emissions by at least 35% by 2015 on 1990 levels.
<a href="#">Fluorinated Greenhouse Gases Regulations (NI) 2009 (as amended)</a>  <a href="#">Fluorinated Greenhouse Gases (Amendment) Regulations (Northern Ireland) 2012</a>	Although fluorinated greenhouse gases ('F-gases') do not damage the ozone layer like the CFCs that they have widely replaced, they are believed to have a very high Greenhouse Warming Potential, are generally long-lived, and are included in the "basket of gases" under the Kyoto Protocol. Put in place controls on servicing, leakage checking and record keeping for equipment containing F-gases, which are used mostly in refrigeration, air conditioning and fire protection systems. Specify minimum qualification requirements for personnel who work with such equipment.
<a href="#">Controls on Ozone-Depleting Substances Regulations (Northern Ireland) 2011</a>  <a href="#">The Ozone Depleting Substances (Qualifications) Regulations (Northern Ireland) 2011</a>	Implements EC Regulation 1005/2009 on substances that deplete the ozone and places controls on the production, marketing and use of ozone depleting substances (ODS). Corresponding qualifications regulations set the minimum prescribed qualifications requirements for personnel who work with ODS or equipment which contains ODS.



Water is essential for maintaining human life and biodiversity and supporting economic development. Our rivers, lakes, estuaries, seas and groundwater sustain many of our core activities and provide drinking water for our population. This chapter reports on the condition of Northern Ireland's freshwaters (rivers, lakes and groundwater) and on the levels of compliance with drinking water and waste water standards. The marine water environment is described in Chapter 6 and biodiversity associated with water in Chapter 8.

### Key Messages

- The overall **status of water bodies** in Northern Ireland **has not changed significantly** from 2009, however, at an individual quality element level more marked improvements are observed.
- There have been **notable improvements in water utility discharge quality and drinking water quality**, in addition to a **reduction in water pollution incidents**.
- Across Northern Ireland, **we are broadly on track** to implement the measures we identified as necessary by 2015 within the North Western, Neagh Bann and North Eastern river basin districts.
- Structures set up at a local level are facilitating implementation of the programme of measures and helping to develop partnership working.
- Work to meet the 2015 objectives is ongoing. Particular challenges include assessment of priority substances and chemical status of the water environment, options for controlling diffuse pollution and measures to address physical modifications of the beds, banks and shores of surface waters.

### Introduction

Our rivers, lakes, estuaries, seas and groundwater provide water to sustain many of our core social and economic activities. These include industry and fisheries, agriculture, tourism and recreation and drinking water for Northern Ireland's 1.8 million inhabitants. The development of our society has been fundamentally influenced by rivers and the sea.



**Rivers, lakes and reservoirs** in Northern Ireland are used to abstract around 99.95% of our public drinking water supply, with the remaining 0.05% abstracted from groundwater. Our 15,445 km of rivers support habitats and species of national and international importance, including Otter, Salmon, and freshwater Pearl Mussel. They also provide an important recreational and tourism resource, such as the Fermanagh Lakelands, for boating and angling. In the centre of Northern Ireland Lough Neagh is the UK's largest lake and a multi-purpose resource.

**Groundwater** can be found across much of Northern Ireland, and it is an important component of our industrial, agricultural and domestic water supply. The public water supplier (Northern Ireland Water) has in recent years moved away from groundwater abstractions and there is now only one small public water supply on Rathlin Island (population 80) which abstracts from a groundwater source. However, the volume of groundwater abstracted for private water supplies has been growing over the last few years. In addition, groundwater storage feeds into surface waters such as streams and rivers, which in turn provide water for public supply.



Many surface water bodies, such as wetlands, rivers and lakes are directly dependent on groundwater to maintain water levels and ecological diversity. The interaction between groundwater and surface waters is complex and our current understanding is limited but is receiving increasing attention through research.

A common theme within Global, European and UK Environmental policy is the concept of **Ecosystem Services**. The [Millennium Ecosystem Assessment of 2005](#) defines Ecosystem Services as "the benefits provided by ecosystems that contribute to making human life both possible and worth living". Ecosystem Services incorporate water and include resources for the supply of clean water and protection from hazards through the regulation of water cycles.

### Ecosystem Services and Water



**Provisioning Services** refers to the products obtained from ecosystems such as: food; fibre; **fresh water**; genetic resources.

**Regulating Services** are the benefits obtained from the regulation of ecosystem processes. For example: climate regulation; hazard regulation; noise regulation; disease and pest regulation; **regulation of water**, air and soil quality; pollination.

**Supporting Services** are responsible for the production of all other ecosystem services. These include: **water cycling**; nutrient cycling; soil formation; primary production.

**Cultural Services** are the non-material benefits individuals receive from ecosystems such as: **recreation** and tourism; **aesthetic experience**; spiritual or religious enrichment; cultural heritage.

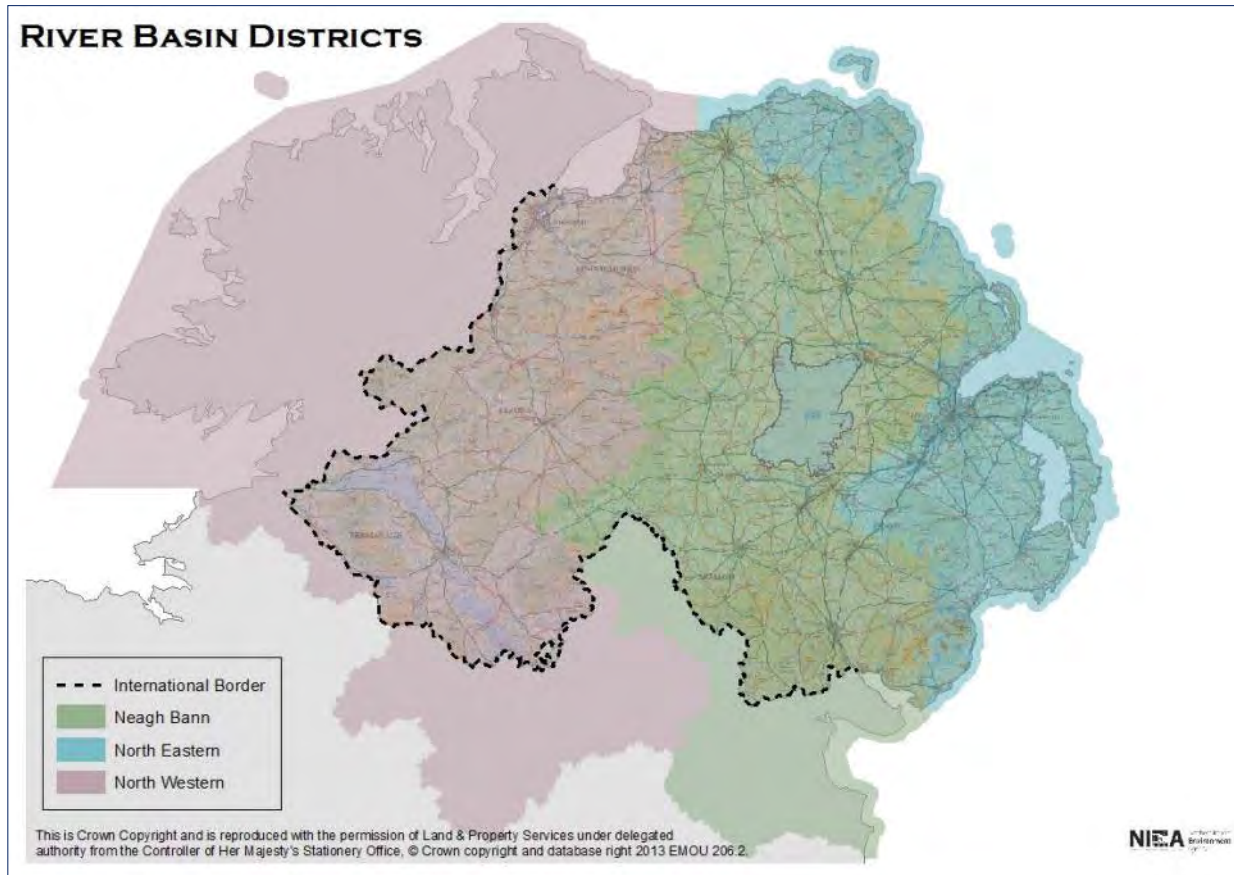
Source: [UK National Ecosystem Assessment](#)

### Our approach to managing our waters

The management and monitoring of the water environment has altered notably since the last SOE report, with the implementation of the [Water Framework Directive](#) (WFD). WFD requires an assessment of the water environment to be carried out in a more holistic manner. Impacts that go beyond water pollution are considered, including impacts resulting from water abstraction and impoundment, physical modifications by engineering activities and invasive alien species. New monitoring programmes and classification systems have been developed and applied to assess the impacts on the whole water environment, including rivers, lakes, and groundwaters.

WFD is implemented through river basin planning which introduces a six-yearly cycle of planning, action and review. In 2009, a [River Basin Management Plan](#) was produced for each river basin district. This will be repeated at six-yearly intervals.

River basins (catchments) within Northern Ireland have been assigned to four **River Basin Districts** (RBD). One of these RBDs lies wholly in Northern Ireland (North Eastern), while the remaining three (North Western, Neagh Bann, Shannon) are shared with the Republic of Ireland and are therefore, International RBDs (see map). The Shannon International RBD includes only a small portion of County Fermanagh and is not shown on the map. The responsible bodies, Northern Ireland and the Republic of Ireland, are coordinating their water management actions through a North-South Working Group on Water Quality.



The production of the River Basin Management Plans was co-ordinated by NIEA but involved a wide range of organisations that have an interest in the water environment.

There is a layered approach to consultation and public involvement, based on the Northern Ireland WFD Stakeholder Forum, which is linked to a network of nine Catchment Stakeholder Groups. These groups facilitate effective stakeholder engagement and encourage the development of partnership working to address local pressures affecting the water environment.

Further information on the implementation of WFD in Northern Ireland is available at <http://www.doeni.gov.uk/niea//water/wfd.htm>.





### Partnership Working

There are nine Catchment Stakeholder Groups, each with a dedicated Catchment Management Officer. This network of groups provides a structure to deliver effective stakeholder engagement and encourage partnership working. Twenty six Local Management Area Action Plans have been developed and are currently being implemented across Northern Ireland.

NIEA also supports Riverfly Partnership Schemes for the Ballinderry, Six Mile Water, Roe, Lagan and Enler Rivers. Volunteers protect water quality in these rivers through monitoring riverfly populations and identifying pollution issues.

Information about protecting and improving the water environment is presented at many local events and through, for example, Water Environment Community Awards. Past projects include Salmon in the Classroom, Water Detectives and Saints Save the River.

### Drivers and Pressures

Industry, power generation, agriculture and forestry, development, transport and infrastructure pressures all potentially impact on the water environment. Under the WFD pressures are assessed according to the categories highlighted below.

**Point source pollution pressures** on water quality include effluent discharges from industry and waste water treatment works in urban areas, towns and settlements; and overflows from sewers during heavy rain to surface waters.

**Diffuse pollution pressures** on water quality include contaminated run-off from roads, construction sites, fuel storage areas and other hard surfaces; small discharges from poorly sited or constructed septic tanks in rural areas; the deposition of acid pollutants and nutrients from the air, pesticide run-off, soils and nutrients used by agriculture and forestry, and migration of nutrients and pesticides to groundwater and surface waters.

**Eutrophication**, or the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, can arise from both point source (e.g. sewage discharges) and diffuse pollutions (e.g. run-off from agricultural land). It is considered to be a widespread major threat to water quality in the freshwater environment. Excessive nutrient inputs can lead to accelerated growth of plants and algae, disrupting the delicate ecological balance of water quality and the organisms present, and having potentially negative impacts on important uses of water including recreation and drinking water supply. For further information see:

[http://www.doeni.gov.uk/index/protect\\_the\\_environment/water/nitrates\\_.htm](http://www.doeni.gov.uk/index/protect_the_environment/water/nitrates_.htm)

**Pressures on water quantity and flow** can result from abstractions and impoundments used for drinking water supply, industrial use, use in the food and drink industry, hydropower generation, agricultural use and recreational use.



Abstraction is the removal of water, permanently or temporarily, from the water environment and the impact on the water environment depends on the amount and timing of the abstraction and the location and amount of water that may be returned after it has been used. Over abstraction can result in reduced water flow, a reduction in water resources, stress or mortality of fish and other invertebrates, increased pollution risk due to decreased dilution, and damage to groundwater dependent ecosystems.

Poorly designed or managed impoundments can impede migratory fish movement, cause build up of sediment leading to changes in river bed habitat and other changes in river morphology.

There is a growing demand for water resources. The water utility provider for Northern Ireland ([NI Water](#)) supplies 562 million litres of water every day and treats 134 million m<sup>3</sup> of wastewater each year. Lower average house occupancy, the increasing use of appliances, such as dishwashers and washing machines, changing land uses and economic development all place increasing pressure on our water environment.

Rainfall provides and replenishes our water resources. The amount of rainfall, the topography of an area and differing land management practices influence the speed of water run-off, infiltration rates and water storage potential. In extreme conditions, flooding can result. This can be exacerbated in urban areas where there is a high occurrence of impermeable surfaces.

Flooding is a natural occurrence and can have devastating impacts on human health, cultural heritage, economic activity and the environment. The Department of Agriculture and Rural Development, through Rivers Agency and in co-operation with other government departments, agencies and stakeholders, aims to understand the likelihood of flooding in Northern Ireland, and to manage the harm that it causes.

A [Strategic Flood Map](#) has been developed by Rivers Agency in co-operation with the Department of the Environment. The Map provides an illustration of the areas that are considered to be at risk of flooding now and in the future.



## Stormwater Management: Implementation in Northern Ireland

Due to the expansion of urban development, many of our hard engineered systems for stormwater run-off have reached capacity and are currently failing. This is primarily due to the increased ratio of impermeable to permeable surfaces, in combination with higher levels of rainfall. When our infrastructure becomes overloaded flooding occurs and water quality may be adversely affected.

The solution is **sustainable stormwater management systems**, which replicate natural drainage processes. Such systems manage stormwater as near to source as possible, slow down run-off, treat stormwater naturally and release improved quality water back into the environment. Systems designed and installed professionally may also save money. A number of sustainable stormwater management systems have been installed at sites across Northern Ireland.



Granshaw Hospital, Londonderry (permeable pathing)

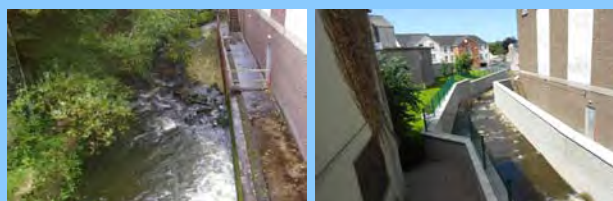


Newtown Stewart By-pass (swales)

**Physical or morphological alterations** can cause changes in ecology, result in habitat loss and change how much and how fast water drains off the land. Examples of activities causing morphological alterations include construction of impounding structures such as dams and weirs for drinking water supply and hydropower generation, construction of flood walls or embankments for flood defence and land use pressures from agriculture and urbanisation such as straightening, channelization and culverting of rivers. Older structures may impede fish movements while straightening and deepening of rivers can lead to increased flooding risk.

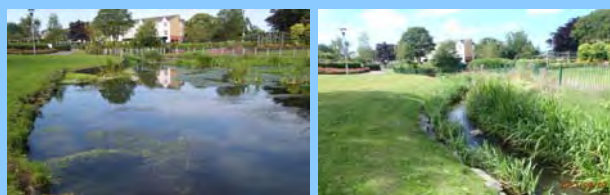
## Lodge Burn in Coleraine: addressing barriers to fish

The Lodge Burn was prone to flooding on the lower reaches in Coleraine. The water depth was low and there was a steep climb for fish up a concrete apron before they could approach the culvert.



The solution was to construct a series of small pools leading up to the culvert which was enhanced to improve the conditions for fish passage. Flood walls were built along the banks to reduce the level of flood risk to adjacent properties. The overall cost for the flood alleviation scheme including enhancements and fish passage work was just over £2 million. The fish passage work was approximately £80,000.

An artificial lake downstream was subject to siltation problems and required regular maintenance. The river was re-profiled and the lake removed which should help reduce siltation issues and improve fish movement.



**Invasive alien (non-native) species**, are animals and plants that have been introduced, either intentionally or unintentionally, outside their natural range and out-compete native plants and animals. They represent a threat to native biodiversity and can also adversely impact on recreational activities such as boating, fishing and swimming. Species already established in Northern Ireland include aquatic plants such as Floating Pennywort and Curly Waterweed and riparian species such as Giant Hogweed and Japanese Knotweed.

### Control of Floating Pennywort (*Hydrocotyle ranunculoides*) at Balloo Woodland Nature Reserve

The ponds at Balloo Woodland Nature Reserve were overgrown with Floating Pennywort. This plant resembles a very large, robust version of the native Irish Marsh Oenneywort and is a creeping, perennial aquatic plant, with floating or emergent leaves arising from nodes on its stem. Floating pennywort negatively impacts on water quality and biodiversity by decreasing oxygen levels in affected water bodies which may lead to fish kills. It can block water bodies, leading to increased flooding risks.



To combat the poor water quality and ecology in the ponds at the Balloo Reserve, Ulster Wildlife carried out restoration works to improve habitat and control Floating Pennywort. The project was funded through the Department of the Environment's Water Quality Improvement Grant scheme. NIEA and DARD Rivers Agency also provided advice on the best practice available to control Floating Pennywort. Ulster Wildlife worked with contractors and local volunteers to clear the floating pennywort which had been choking the ponds

**Pressures on drinking water quality** are an on-going concern and are of particular importance to the public. Considerable improvements have been made to the water infrastructure to ensure compliance with drinking water quality standards and it is important that these improvements are maintained. Future investment should be targeted through a risk management approach to ensure a continuing supply of safe, clean drinking water to all consumers.



## 5 Water

### The Current Situation

#### Summary

The overall classification status of water bodies in Northern Ireland has not changed significantly from 2009, however, at an individual quality element level more marked improvements are observed. There have been notable improvements in water utility discharge quality, drinking water quality, in addition to a reduction in water pollution incidents.

#### Water Indicators and Current Trends

Water			
W1: River Quality	Water Framework Directive overall classification (% river waterbodies) (2008-2011)	↔	
W2: Lake Quality	Water Framework Directive status (lake waterbodies) (2008-2011)	No trend	
W3: Salmon Fisheries Monitoring	Compliance with conservation targets (2007-2011)	No trend	
W4: Groundwater Quality	Annual mean nitrate concentrations in groundwater (2000-2011)	No trend	
W5: River Quality – Nitrates	Annual mean nitrate concentrations (2000-2011)	No trend	
W6: Industrial Discharge Quality	Trends in annual private and trade discharge consent compliance (2001-2011)	No trend	
W7: Water Utility Discharge Quality	Summary of compliance of water utility sector Waste Water Treatment Works (WwTW) (2007-2011)	↑	
W8: Drinking Water Quality	Mean zonal compliance percentage failure with the Drinking Water Standards at consumers' taps (2004-2011)	↓	
W9: Water Pollution Incidents	Severity of substantiated water pollution incidents (2001-2011)	↓	

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

### Water Indicators

#### Policy and Legislative Context

Monitoring is currently undertaken to determine the quality of water and to assess compliance with a range of European Directives, national standards and national and international agreements. Monitoring programmes also address particular issues, such as eutrophication. These programmes provide the data for the indicators presented in this chapter.

NIEA policy for water is to maintain or improve quality in surface waters and waters in underground strata as required by national policy, EC Directives and international agreements. The general objective of the [Water Framework Directive](#) (WFD) is to achieve 'Good Status' for all rivers, lakes and marine waters by 2015, with no downward movement between classes.

The WFD was established in law in Northern Ireland through the [Water Environment \(WFD\) Regulations \(Northern Ireland\) 2003](#) and will rationalise EC water legislation by replacing seven existing directives by the end of 2013. WFD combines biological and chemical indicators with impacts due to pressures affecting the water environment.

The implementation of the WFD provided new and more robust methods for the observation and management of water quality in Northern Ireland. These methods now focus more on demonstrating the achievement of Good Status in the context of River Basin Management Plans, than just chemical water quality alone. Methods and standards are regularly reviewed at a European level as more information becomes available, including the identification of new harmful chemicals that will be controlled under the Directive. The latest position on UK environmental standards and methods can be found at <http://www.wfduk.org/>.

As required by the [Environmental Quality Standards \(EQS\) Directive](#) (2008), an inventory of emissions, discharges and losses of all priority substances and pollutants listed in the Directive is being developed for each River Basin District. The first inventories are due to be completed in December 2013. Inventories will assess the relevance of each substance within River Basin Districts, in addition to point and diffuse source loads, and will contribute to an assessment of the effectiveness of measures implemented to achieve requirements for the reduction and phasing out of emissions.



The aim of the [EU Nitrates Directive \(91/676/EEC\)](#) is to reduce nitrates from agricultural sources entering the water environment. It is currently implemented in Northern Ireland through the [Nitrates Action Programme Regulations \(Northern Ireland\) 2010](#) (NAP Regulations) and an associated water quality monitoring programme and guidance and training for farm businesses. The Regulations include measures controlling storage of livestock manure and restrictions on the application of

## 5 Water

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manure and chemical nitrogen fertiliser to land. Implementation is the joint responsibility of Department of the Environment and Department of Agriculture and Rural Development.

The Nitrates Directive requires that action programmes are reviewed and, if necessary, revised, every four years. The review process for the NAP Regulations will commence in 2013, so that a new action programme can be in place by January 2015.

[The Water Framework Directive \(Priority Substances and Classifications\) Regulations \(Northern Ireland\)](#) (Amended 2012) transpose the EC Priority Substances Directive (2008) into Northern Ireland legislation and ensure protection of the water environment from dangerous chemicals (priority and priority hazardous substances).

The [European Directive on the Assessment and Management of Floods](#) was adopted in 2007. It creates new obligations on Member States to undertake a preliminary flood risk assessment for all of their river basins and coastal zones and to prepare and implement flood risk management plans by December 2015. The Floods Directive requires Rivers Agency to identify those areas within Northern Ireland which are at significant risk of flooding, and to carry out further studies in these areas.

Flood hazard and flood risk maps will be completed for Significant Flood Risk Areas by December 2013. Flood risk management plans containing objectives and measures to manage flood risks in these areas will be produced by December 2015.

Flood risk management plans are based on the River Basin Districts identified for WFD. A plan, focusing on prevention, protection and preparedness for flooding, will be produced for each District.



Rivers Agency is engaging with key stakeholders to ensure that the views of a wide range of interested parties are represented in the final flood risk management plans, and has set up a number of groups to develop policy and direct the process.

## Indicator W1: River Quality

### Water Framework Directive Overall Classification (2008-2011)

Our understanding of the state of Northern Ireland’s water environment has developed as we have adapted to the requirements of the WFD. Now when assessing water quality, both ecological and chemical quality are considered, as well as the pressures that can affect them. The WFD requires NIEA to protect the status of water bodies from deterioration and, where necessary and practicable, to restore water bodies to good status. Environmental objectives, established in the River Basin Management Plans, set the water status to be achieved for surface water bodies for each six year planning cycle starting from 2009.

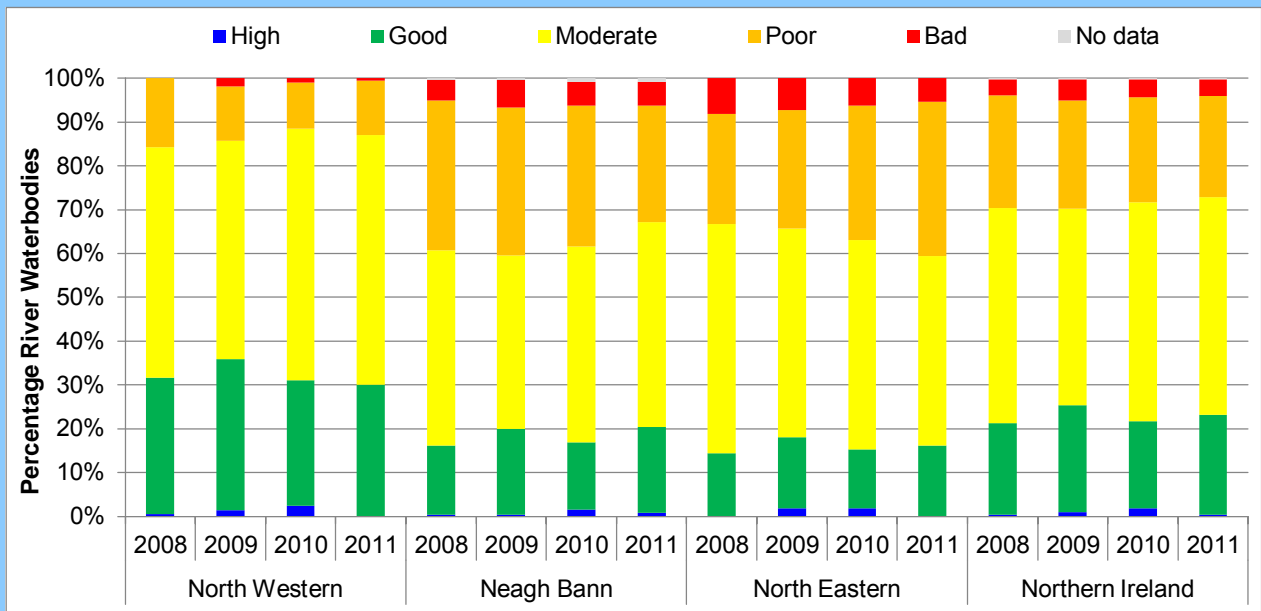
#### Data

The ecological quality of surface waters reflects:

- Biological quality elements (invertebrates, plants, fish, phyto-benthos);
- General chemical and physicochemical quality elements (phosphorus, dissolved oxygen & pH);
- Specific pollutants (ammonia and other potentially ecologically toxic substances);
- Hydromorphological quality elements (water flow and physical modifications).

The chemical status of surface waters is also assessed for thirty-three priority substances (such as pesticides, biocides and toxic metals) identified under the Directive. For each waterbody, the ecological quality elements are classified individually and the results combined with chemical status and hydromorphology to give an overall classification status in one of five classes; high, good, moderate, poor or bad. Figure W1 shows data for 575 river water bodies.

Figure W1: Water Framework Directive Overall Classification (2008 - 2011)



Source: NIEA

## Indicator W2: Lake Quality Lake Water Framework Directive Status (2008 – 2011)

Lakes are a significant source of drinking water supplies (39%) and also support habitats and species of national and international importance. The WFD introduced, for the first time, a formal classification for lakes. Environmental objectives, established in the River Basin Management Plans, set the water status to be achieved for surface water bodies for each six year planning cycle starting from 2009.

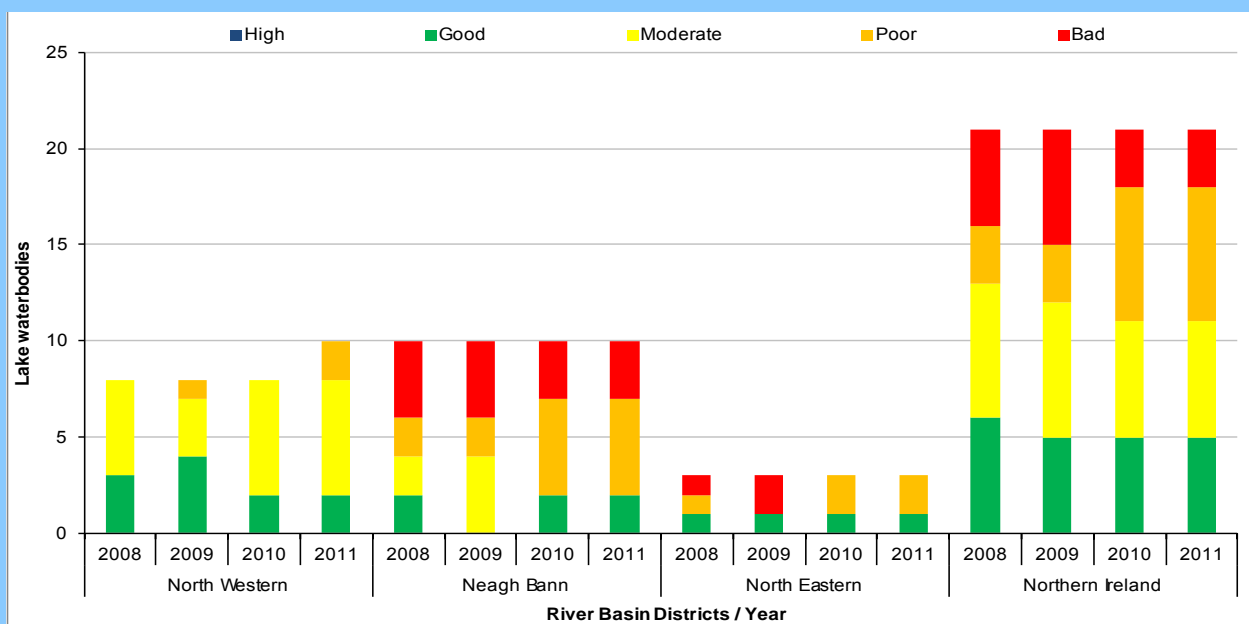
### Data

The ecological quality of lakes reflects:

- Biological quality elements (plants, fish, phytobenthos, phytoplankton);
- General chemical and physiochemical quality elements (total phosphorus, dissolved oxygen and salinity);
- Specific pollutants (ammonia and other potentially ecologically toxic substances);
- Hydromorphological quality elements (water levels and physical modifications).

The chemical status of lakes is also assessed for thirty-three priority substances (such as pesticides, biocides and toxic metals) identified under the Directive. For each waterbody, the ecological quality elements are classified individually and the results combined with chemical status and hydromorphology to give an overall classification status in one of five classes; high, good, moderate, poor or bad. In 2010 and 2011 five of the 21 lake water bodies are classified as 'good' status and 16 are classified as less than 'good' status.

Figure W2: Lake Water Framework Directive Status (2008 – 2011)



Source: NIEA

### Indicator W3: Salmon Fisheries Monitoring (2007-2011) Compliance with conservation targets

Based on North Atlantic Salmon Conservation Organisation (NASCO) resolutions, governments are required to manage salmon stocks. To help DCAL meet this requirement six index rivers are monitored for compliance with their respective salmon conservation targets. Where these are not being attained, the reasons are researched and a programme of measures designed to address them is adopted.



#### Data

The conservation limit is based on the minimum number of salmon eggs that must be laid to ensure adequate seeding of available nursery habitat. Compliance is measured as the actual number of eggs laid as a percentage of the target figure.

A compliance level below 100% indicates that the target was not met and therefore, of the six monitored rivers, only the Clady River achieved the conservation limit standard in 2011. Conservation limits on other systems within the DCAL area remain low and a variety of factors have brought this about (see commentary).

Figure W3: Salmon eggs laid as a percentage of conservation limit for six monitored rivers 2007-2011

River	2007	2008	2009	2010	2011
Blackwater*	-	-	-	-	64
Bush	170	103	62	56	46
Clady*	-	-	-	-	163
Glendun	77	96	33	64	76
Maine	96	170	68	61	77
Shimna*	-	-	-	99	53

\* The first year available for the compliance levels for Shimna river was 2010, and for both the Blackwater and Clady rivers was 2011.

Source: DCAL



## Indicator W4: Groundwater Quality

### Annual Mean Nitrate Concentrations in Groundwater (2000 - 2011)

Nitrates in groundwater derive from chemicals such as artificial fertilisers leaching from soil and migrating downwards to the water table. Regional monitoring of nitrate concentrations in groundwater across Northern Ireland began in 2000. The Groundwater Daughter Directive (2006/118/EC) sets the groundwater quality standard at 50 mg NO<sub>3</sub>/l.

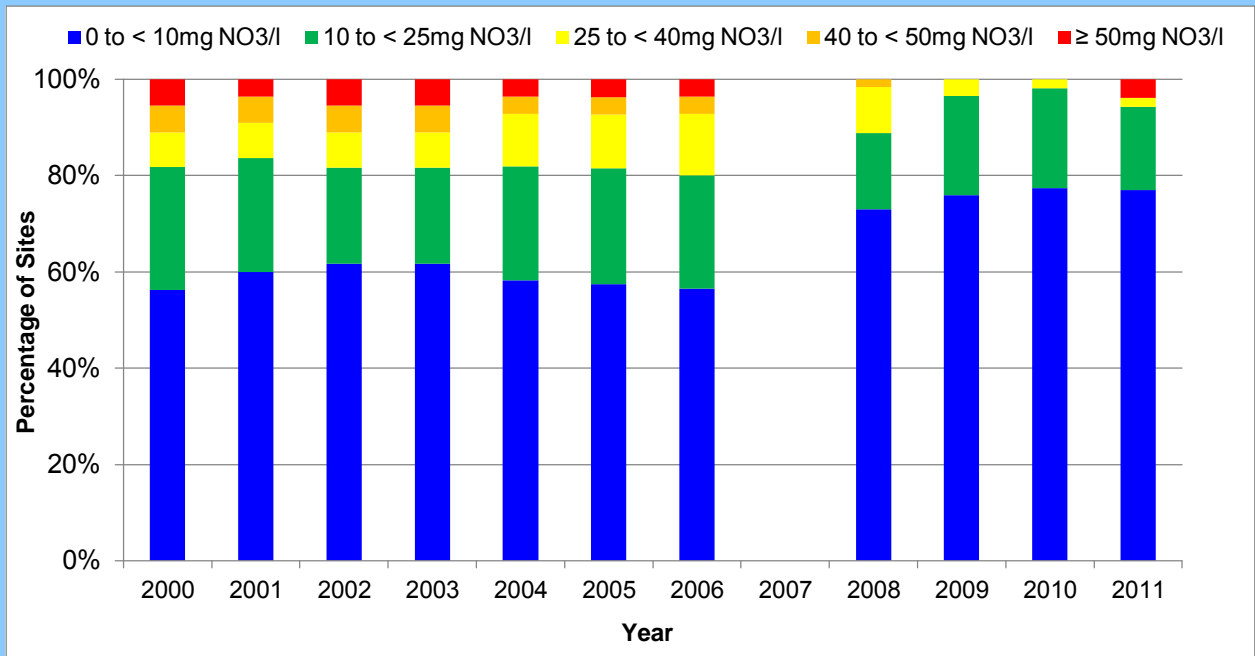
#### Data

In the period 2000 to 2006, approximately 91% of sites had an annual mean concentration of less than 40 mg NO<sub>3</sub>/l and approximately 82% were less than 25 mg NO<sub>3</sub>/l.

In 2007 regional monitoring underwent a major review and no results are shown for that year. The review ensured that the groundwater monitoring network was fit-for purpose for the requirements of the Water Framework Directive (2006/60/EC). Regional monitoring recommenced in 2008.

Fifty-two sites were monitored in 2011, 96% of which had an annual mean concentration of less than 40 mg NO<sub>3</sub>/l and 94% were less than 25 mg NO<sub>3</sub>/l.

Figure W4: Annual Mean Nitrate Concentrations in Groundwater (2000 - 2011)



Source: NIEA

## Indicator W5: River Quality – Nitrates

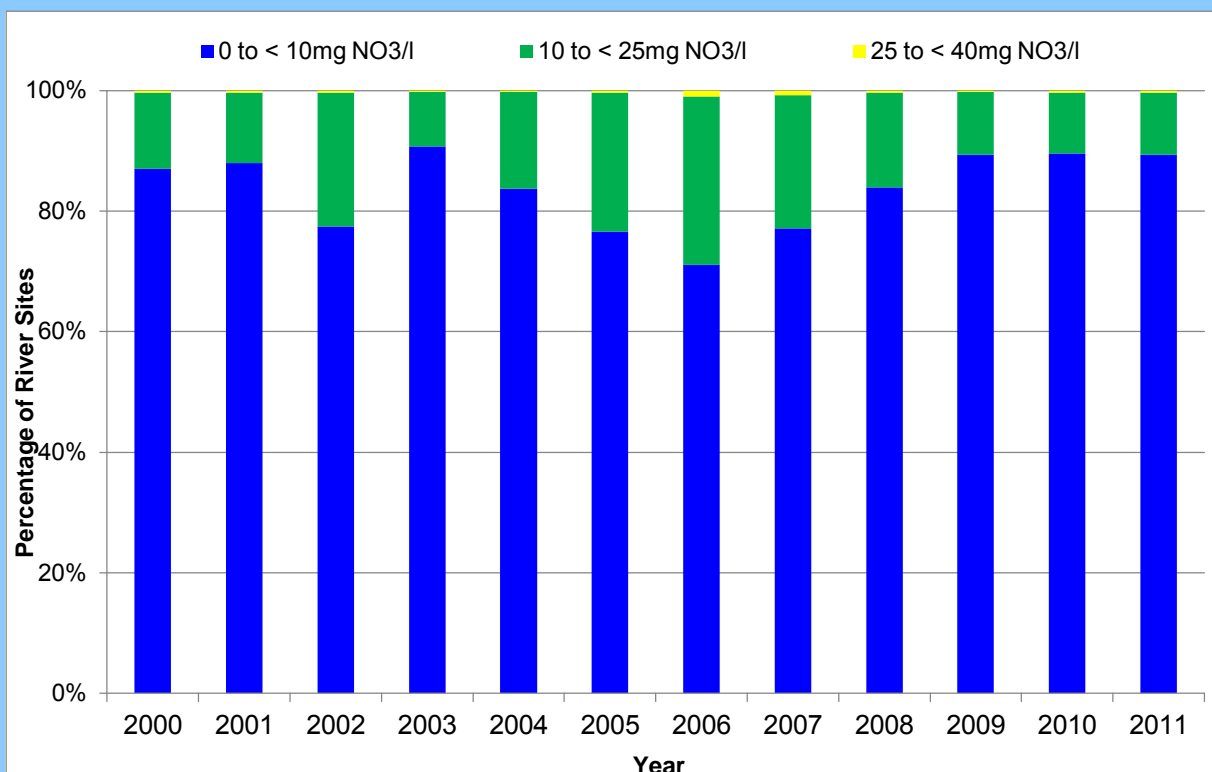
### Annual Mean Nitrate Concentrations in Rivers (2000 – 2011)

Nitrates in rivers derive from chemicals such as fertilisers used in farming practices which find their way into waterbodies, mostly at times of high rainfall. This process is known as eutrophication. Under the [Nitrates Directive](#) Northern Ireland must monitor surface waters for nitrate pollution against a mandatory standard of 50 mg NO<sub>3</sub>/l. In addition a guide standard for surface waters is operational where 90% of samples should be less than 25 mg NO<sub>3</sub>/l.

#### Data

In the period 2000 to 2010, 99.6% of sites had an annual mean concentration of less than 25 mg NO<sub>3</sub>/l. Nearly all rivers (99.7%) that were monitored for nitrate in 2011 had an annual mean concentration of less than 25 mg NO<sub>3</sub>/l.

Figure W5: Annual Mean Nitrate Concentrations in Rivers (2000 – 2011)



Source: NIEA

## Indicator W6: Industrial Discharge Quality

### Trends in Annual Private and Trade Discharge Consent Compliance (2001 – 2011)

The monitoring of effluent discharges gives an indication of levels of pollution to the water environment and improvements in controls.

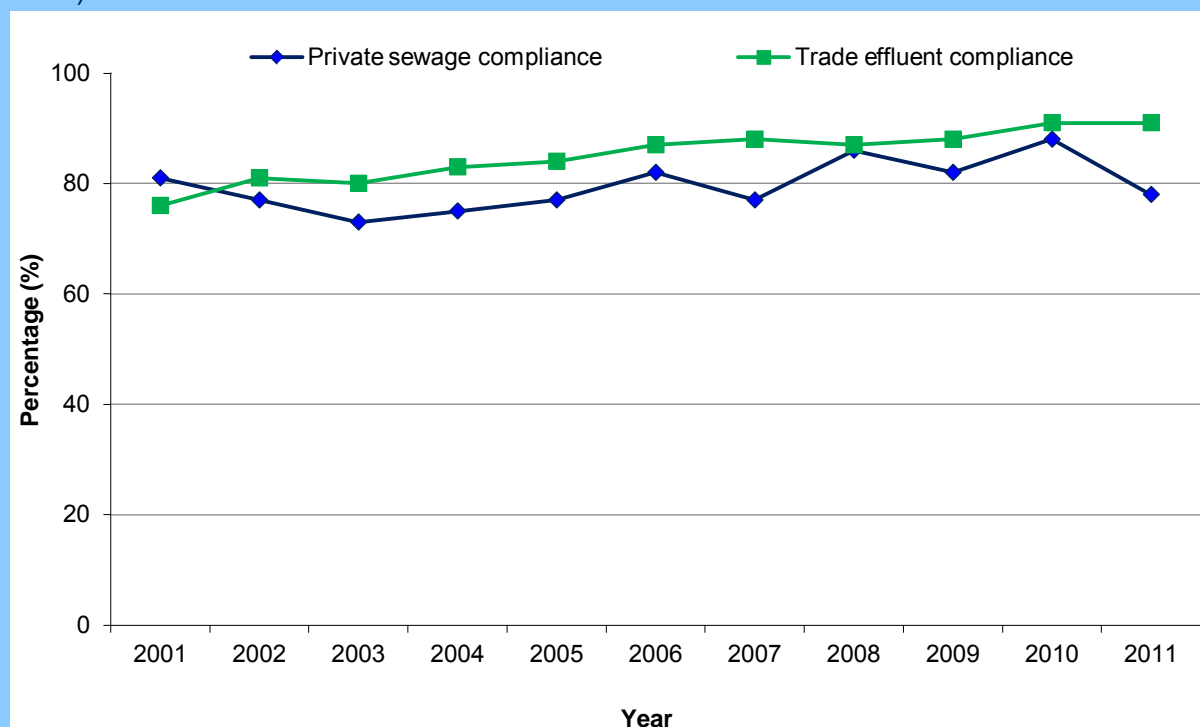
Numerical limits on Water Order consents for private sewage and trade discharges are set as absolute standards. However, compliance is assessed on a 95-percentile basis, i.e. a discharge must be within its consent conditions 95% of the time to comply.

#### Data

Compliance for private sewage was 78% in 2011 compared to 88% in 2010.

For trade effluent compliance there has been a steady increase from 76% in 2001 to 91% in 2011. These figures show a promising increase in trade discharge consent compliance over the long term.

Figure W6: Trends in Annual Private and Trade Discharge Consent Compliance (2001 – 2011)



Source: NIEA

### Indicator W7: Water Utility Discharge Quality

#### Summary of Compliance of Water Utility Sector Waste Water Treatment Works (WWTWs) (2007 – 2011)

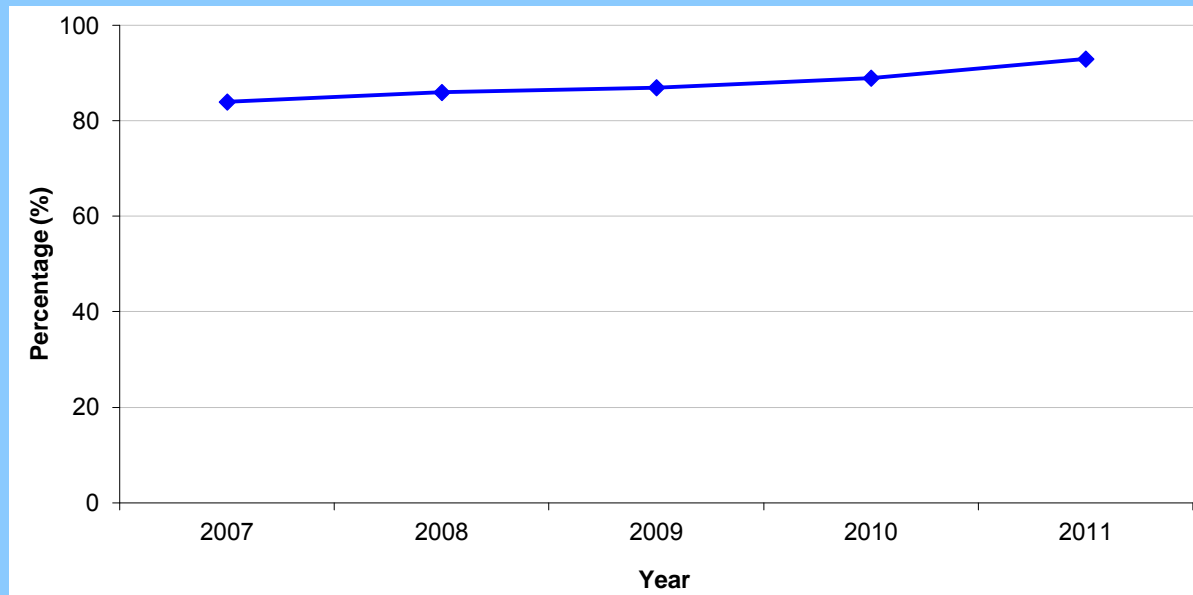
This indicator measures the compliance of Waste Water Treatment Works owned by [NI Water](#) the leading water utility provider for Northern Ireland. Compliance of waste water treatment works against the numeric conditions of their Water Order consent was introduced in 2007 and is a key performance indicator for the water utility sector.

#### Data

Compliance of waste water treatment works has continued to improve since 2007, having reached 93% in 2011. [NI Water](#) compliance was assessed against numeric standards set for discharges from 232 waste water treatment works, serving a population equivalent to or greater than 250. In addition numeric compliance was also assessed for six waste water treatment works operated under Public Private Partnership contracts.

The situation has improved in recent years and Figure W7 shows that in 2011 compliance of WWTWs reached an all-time high of 93%.

Figure W7: Summary of Compliance of Water Utility Sector Waste Water Treatment Works (WWTWs) (2007 – 2011)



Source: NIEA

## Indicator W8: Drinking Water Quality

### Mean zonal compliance percentage failure with the Drinking Water Standards at consumers' taps (2004-2011)

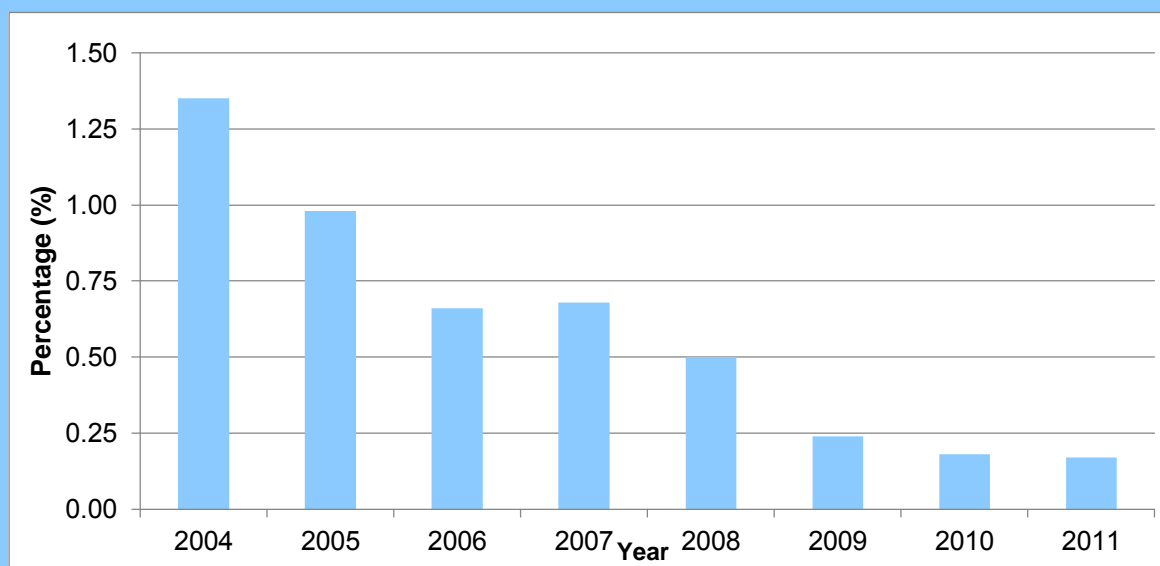
Access to safe drinking water is important for general health and wellbeing. [The Guidelines for Drinking-water Quality](#) (WHO, 2006) define safe drinking water as water that “.....does not represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages”.

Drinking water quality at consumer taps is assessed using ‘mean zonal compliance’, an index calculated using 39 parameters from NI Water’s public water supplies regulatory sampling programme. The results for mean zonal compliance are based on upwards of 40,000 samples taken at consumers’ taps across Northern Ireland throughout the year.

#### Data

During 2011 the number of private water supplies included in the regulatory sampling programme remained at 116. The overall compliance with the regulatory standards for private water supplies was 98.08% with the corresponding figure for 2010 being 98.33%. The mean zonal compliance for Northern Ireland was 99.83%, a significant improvement on the level in 2004 of 98.65%. This figure differs from that previously published as it is based on regulatory samples only, in line with the [new reporting format for 2011](#) which changed the regulations covering both public and private water supplies.

Figure W8: Mean zonal compliance percentage failure with the Drinking Water Standards at consumers' taps (2004-2011)



Source: NIEA

## Indicator W9: Water Pollution Incidents Severity of Substantiated Water Pollution Incidents (2001 – 2011)

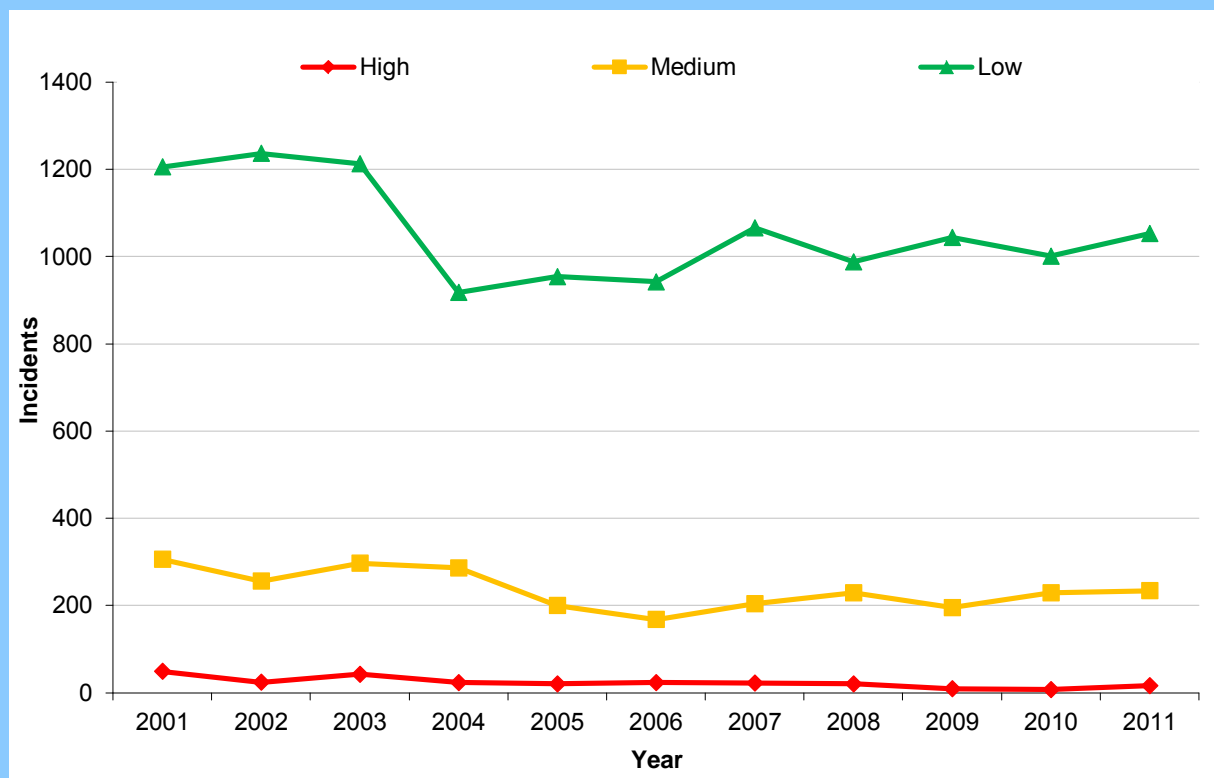
Water pollution refers to the contamination of waterbodies such as lakes, rivers, loughs, oceans, aquifers and groundwater by pollutants either directly or indirectly and without the necessary steps being taken to eradicate the source of contamination. Water pollution incidents are investigated by NIEA and are classified according to their environmental impact severity.

### Data

In 2011 there were 2,123 incidents reported to NIEA, of which 1,303 were substantiated as having an impact on the water quality of the receiving waterway.

The total number of substantiated incidents has fallen from the levels recorded in 2001 to 2003. The number of substantiated incidents in 2011 is 17% less than the number recorded in 2001. In 2011, 19% were classified as being High or Medium Severity, which was the same as the 2010 level.

Figure W9: Severity of Substantiated Water Pollution Incidents (2001 – 2011)



Source: NIEA

### Commentary

**Indicator W1: River Quality** and **Indicator W2: Lake Quality** The results indicate that there is little improvement in overall status of rivers and lakes since 2008, and it is clear that more work is still required to meet the 2015 environmental objectives. However, at an individual quality element level more marked improvements in status are being observed. For example, the level of phosphorus and nitrates in rivers is stable or showing a decrease. As a result there has been a decline in aquatic plants and algae in rivers related to the presence of nutrients. A reduction in the suppression of invertebrates which is related to diffuse organic pollution has also been observed.

In the last State of the Environment Report, the indicators presented were primarily based on monitoring of water quality in rivers, lakes and groundwaters. Current reporting now includes the monitoring and classification schemes of the Water Framework Directive. These provide a broader assessment of ecological status in relation to biological elements, water quality, and hydromorphology, and focus on the achievement of the objectives set out in the River Basin Management Plans.

More work is needed to assess and understand diffuse pollution sources and the associated options for managing this pressure.

**Indicator W3: Salmon Fisheries** The on-going monitoring of stock numbers at the River Bush Salmon Station indicates marine survival of salmon remains at an all time low at 2.8%. This may be due to migratory changes as it appears salmon are moving further North. Additional factors may include climate change and a reduction in available feed for salmon in the marine cycle.

A number of management measures have been introduced to promote salmon conservation as follows:

- There is currently no commercial netting of salmon in the DCAL jurisdiction. This has been brought about by voluntary cessation and a commitment from license holders not to fish salmon. Where this commitment has not been given, licenses have not been granted.
- In January 2013, a mandatory catch and release of all salmon caught in DCAL Public Angling Estate waters was introduced. Changes in legislation are being progressed for 2014 for mandatory catch and release of all salmon for rivers in the DCAL jurisdiction where management targets have not been met.
- Further conservation measures are being considered following a public consultation exercise. A ban on the sale of all rod caught salmon was introduced in legislation in June 2013 (DCAL jurisdiction). For further information see the [Digest of Statistics for Salmon and Inland Fisheries in the DCAL Jurisdiction 2013](#)

**Indicator W4: Groundwater Quality** A major review of the groundwater monitoring network was undertaken in 2007 and it is not yet possible to assess any trends from when this recommenced in 2008.

**Indicator W5: Nitrates** Actions have been introduced under the Nitrates Action Programme and the Phosphorus (Use in Agriculture) Regulations (Northern Ireland) 2006 to help address eutrophication. During 2013, the Nitrates Action Programme is being reviewed and a new action programme will be in place by January 2015.

**Indicator W6: Industrial Discharge Quality** For trade effluent compliance there has been a steady increase in trade effluent compliance from 76% in 2001 to 91% in 2011. Training aimed at improving compliance with consents regulating the discharge of private sewage, has been introduced by Business in the Community in partnership with NIEA and [SIMM](#) (a collaboration between members of the water treatment industry supply chain in Northern Ireland).

**Indicator W7: Water Utility Discharge Quality** There has been ongoing improvement in water discharge quality to a high of 93% in 2011. This is linked to the reporting of performance indicators for the water utility sector and investment in infrastructure, in particular the upgrading of existing waste water treatment works and development of new treatment works facilities where required.

**Indicator W8: Drinking Water Quality** Since 2010 [NI Water](#) has been carrying out risk assessments on all stages of the supply chain for the public water supply from catchment, through water treatment facilities, and onwards through distribution networks to consumers. These risk assessments have been carried out to ensure effective controls are in place to safeguard drinking water quality for the population of Northern Ireland.

**Indicator W9: Water Pollution Incidents** The total number of water pollution incidents reported to NIEA has increased by 2% compared to 2010 figures. By Source, in 2011, **Farming** accounted for the largest proportion of substantiated incidents investigated by NIEA (33.9%), followed by [NI Water](#) (18.9%), Domestic (16.7%) and Industry (15.1%).



### Key Challenges

Although good progress has been made, more work is required to tackle complex issues and develop and implement appropriate solutions, for example to address chemical status. Work is on-going to refine the assessment of chemical status, particularly with regard to priority substances, and to develop pollution reduction plans.

**Eutrophication** remains a key challenge for the water environment. Actions have been introduced under the Nitrates Action Programme and the Phosphorus (Use in Agriculture) Regulations (Northern Ireland) 2006 to help address eutrophication.

#### Nitrates Action Programme: Water Quality and Agricultural Practice

In order to help tackle eutrophication, the [Nitrates Action Programme Regulations](#) in Northern Ireland limit the amount of Nitrogen (N) from livestock manure that can be applied to land to 170 kg N/ha/year. A report is prepared every four years on the status of water quality and the impact of action programmes on water quality and agricultural practices.



Key findings of the [report for 2008 to 2011](#) show that:

- Nitrate (N) levels in both groundwaters and surface waters are generally low and show either stable or decreasing trends.
- 40% of river water bodies across NI are considered to be of High/Good trophic status but over half are classified as Moderate/Poor status (indicative of eutrophic conditions). Phosphorus (P) levels in the majority of river monitoring sites are at levels which indicate a risk of eutrophication, but all show either stable or decreasing trends.
- There are few significant changes in land use and animal numbers in NI since the last reporting period. The average amount of livestock manure N produced on farms is now 117 kg N/ha/year.
- Agricultural N balance is currently 121 kg N/ha/year and N efficiency is 23%.
- Agricultural P balance is currently 9.5 kg P/ha/year and P efficiency is 46%.

In conclusion, over half of the rivers across NI and three quarters of the lakes still show signs of eutrophication, which causes problems for plant and fish life and also for drinking water purification, stock watering and leisure activities. The main cause of nutrient enrichment is excess phosphorus from agriculture and other human activity. Good work by farmers in complying with the Action Programme is starting to pay off; more still needs to be done in order to help tackle these ongoing problems.

See [http://www.doeni.gov.uk/index/protect\\_the\\_environment/water/nitrates\\_.htm](http://www.doeni.gov.uk/index/protect_the_environment/water/nitrates_.htm) for further detail.

Tackling **modifications of the beds, banks and shores of our rivers and lakes** has proved to be a challenging area. It can be technically difficult and requires co-ordinated partnership action across catchments. Some progress has been made in the development of biological tools to assess the ecological impacts from abstraction, flow regulation activities and barriers to fish migration. However, implementation of measures to improve status can be difficult due to scale, cost, complexity and feasibility of delivery.

The **threat of invasive alien species** is being addressed through the development of action plans, contingency plans and best management practice guidelines for a wide range of species. Control continues to be difficult in many catchments due to the nature of habitats, resource availability and effective control options for some species. This is particularly the case with some submerged aquatic plants and Zebra mussels.



Predicted **impacts of climate change** also provide a future challenge regarding how we manage our water resources to meet user demand and ecosystem requirements and services.

In recent years the **incidence of flooding** has increased in Northern Ireland and the [PEDU Report \(2012\)](#) indicates that the Northern Ireland Executive may need to reassess the investment priority allocated to counter flood measures and programmes. A recent stakeholder workshop hosted by Rivers Agency concluded that a catchment land use based approach to flood risk management is unlikely to yield significant reductions in flood risk on its own, particularly in extreme events. This area requires further research and consideration.

### Responses

It is envisaged that the Control of Pollution (Silage, slurry and Agricultural Fuel Oil) Regulations (Northern Ireland) 2003 and the Phosphorus (Use in Agriculture) Regulations (Northern Ireland) 2006 (introduced in support of the NAP Regulations, to reduce phosphorus from agricultural sources entering the water environment) will be reviewed concurrently.

More work is needed to assess and understand **diffuse pollution sources** and the associated options for managing this pressure. The Department of the Environment is working in partnership with the Department for Agriculture and Rural Development to identify high risk catchments for inclusion in the next Agri-environment scheme. Water quality models for each River Basin District have also been developed. The SIMCAT (SIMulation of the water quality of CATchments) model represents the behaviour of flow and pollutants in rivers. SIMCAT will be used to assist with the management of point and diffuse source pollution.

During 2013, the characterisation and risk assessment for the **second cycle river basin management plans** will be updated and published for public consultation in December 2013.

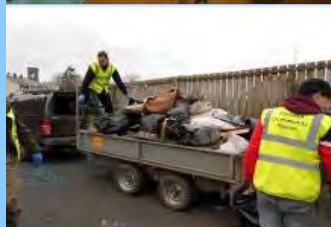
## 5 Water

As part of this work, the significant water management issues related to achieving environmental objectives in 2021 and 2027 will be reviewed. This work will inform the production of Second Cycle River Basin Management Plans for the period 2015 – 2021, which are due to be published by the end of 2015. Continued engagement with stakeholders is key to this process and provides an opportunity for stakeholders to shape the plans, the way that river basin planning is delivered and to be involved in how improvements to the water environment are prioritised.

These plans will also be informed by the development of a long term water strategy for Northern Ireland (2015-2039), led by the Department for Regional Development and due to be published in 2014. The strategy aims to encourage a sustainable and integrated approach to managing the different water needs within a catchment which promotes regional development without compromising the environment or increasing flood risk.

Since 2009, the Department of the Environment has dedicated resources to facilitate the establishment and development of **Rivers Trusts**. Rivers Trusts deliver practical river improvements in water quality, biodiversity and fisheries enhancement within river catchments and help raise awareness and educate the public on river issues. The Department is providing funding to cover start-up costs and support for the establishment of Trusts throughout Northern Ireland, including the Ballinderry, Six Mile, Lagan, Foyle and Maine River Trusts.

In 2012, NIEA established a pilot River Restoration (Water Quality Improvement) grant scheme. This allocated funds to non-government bodies to support delivery of improvement and protection measures for the water environment by implementing actions and projects in local areas.



### NIEA Water Quality Improvement Grant – Quiggery River

NIEA recently awarded £10,000 to the Fintona Community Forum for a project to tackle water quality issues in the Quiggery River. The river is an important area for salmon spawning but has been impacted by bank erosion and the spread of invasive alien species such as Japanese knotweed and Himalayan balsam. Thirty volunteers, along with NIEA staff, removed several trailer loads of rubbish from the river. The importance of a clean and healthy river was further emphasised with articles in the local media and a demonstration of invertebrates found within the river.

### ANNEX Water Legislation and Policy Drivers

EC Directives	Description
<a href="#">Water Framework Directive (2000/60/EC)</a>	Aims to create a framework for EC action in the field of water policy.
<a href="#">Urban Waste Water Treatment Directive (91/271/EEC)</a>	Aims to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors.
<a href="#">Nitrates Directive (91/676/EEC)</a>	Aims to protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices.
<a href="#">Environmental Quality Standards Directive (2008/105/EC)</a>	Calls on member states to establish an inventory of emissions, discharges and losses of all priority substances and pollutants.
<a href="#">Groundwater Directive (2006/118/EC)</a>	Establishes specific measures to prevent and control groundwater pollution.
<a href="#">Drinking Water Directive (80/778/EEC)</a> as amended by <a href="#">Directive (98/83/EC)</a>	Aims to protect human health from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean.
<a href="#">Floods Directive (2007/60/EC)</a>	The Directive is designed to help European Union member states prevent and limit floods and their damaging effects on human health, the environment, infrastructure and property.
International Agreements	Description
<a href="#">International Decade for Action 'Water for Life' 2005-2015</a>	A United Nations initiative to ensure promotion of efforts in the fulfilment of international commitments made on water and water-related issues by 2015.
Local Legislation	Description
<a href="#">The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003</a>	Sets out requirements for managing, protecting and improving the quality of water resources within river basin districts.
<a href="#">Urban Waste Water Treatment Regulations (Northern Ireland) 2007 (S.R. 2007/187)</a>	Sets out the requirements related to measures to control the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors.
<a href="#">The Nitrates Action Programme Regulations (Northern Ireland) 2010</a>	Aims to improve use of nitrates in agriculture and reduce contamination of the water environment.
<a href="#">Water Framework Directive (Priority Substances and Classifications) (Amendment) Regulations (Northern Ireland) 2012</a>	Sets out classification schemes, requiring NIEA to assign a type to each water body and apply defined environmental standards.

## 5 Water

<a href="#">Groundwater Regulations (Northern Ireland) 2009</a>	<p>These revoke the Groundwater Regulations (NI) 1998 but incorporate their requirements providing continuity and clarity for groundwater protection. They also provide for existing authorisations to remain valid whilst allowing a more comprehensive risk based approach to pollution prevention and control.</p>
<a href="#">Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006</a>	<p>Sets out a control regime for regulating the abstraction of water from underground strata and waterways and for constructing, altering or operating impounding works.</p>
<a href="#">The Water Supply (Water Quality) Regulations (Northern Ireland) 2007</a>	<p>The Regulations deal with the quality of water supplied for drinking, washing, cooking and food preparation and production.</p>
<a href="#">The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009</a>	<p>Requires the completion of the preliminary flood risk assessment by December 2011, <u>flood risk and flood hazard maps</u> for significant risk areas by December 2013 and <u>flood risk management plans</u> by 2015.</p>
<a href="#">The Water (Northern Ireland) Order 1999</a>	<p>Controls the discharge of any trade or sewage effluent into waterways or underground strata.</p>
<a href="#">The Pollution Prevention and Control (Northern Ireland) Regulations 2003</a> <a href="#">The Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013</a>	<p>Requires certain industrial activities to be regulated by the NIEA or district councils.  Updates the above regulation to reflect the requirements of the recast Industrial Emissions Directive.</p>





The Northern Ireland marine environment is an important asset which provides a home to over half of all our biodiversity. The majority of our coastline is protected for its special interest, much of it for its international importance. Balancing conservation, energy and resource needs from this rich resource is a huge challenge. This chapter provides information on our marine environment in the context of the new framework set out in the Northern Ireland Marine Act.

### Key Messages

- The **overall quality of the marine environment is improving** assisted by improvements to waste water treatment. Almost 90% of our marine coastal waters are classified as high or good.
- In 2013, **all 23 beaches monitored in Northern Ireland met the EC Bathing Water Directive** mandatory standards.
- The Marine Strategy Framework Directive requires 'good' environmental status by 2020. However, **marine litter continues to be an issue** with approximately 70% of litter being plastic.
- There has been **considerable investment in flood alleviation**, sea defences and drainage infrastructure works in response to the Floods Directive and innovation in flood management.
- Decision making using the best available scientific evidence will be essential for the protection of Northern Ireland's marine diversity. The **Marine Plan** which is currently in preparation aims to achieve better and sustainable management of our marine resources.

## 6 Marine

### Introduction



Northern Ireland has a close connection with the sea. We have over 650 kilometres of coastline and our largest towns are associated with ports. As an island society, the sea has always had an important role to play, offering a source of recreation and a place of work. Our seas and the marine life in them help to sustain social and economic activities such as fisheries, tourism and recreation for Northern Ireland's 1.8 million inhabitants. Shipping movements sustain our ports and rely on safe navigation through our waters and are a vital bridge for commerce with the wider world.

The sea is home to an amazing variety of marine life, some of which are found nowhere else in the world. It includes marine mammals such as harbour seals, whales and dolphins, seabirds, waterfowl and other species that migrate here from Canada, Iceland, Scandinavia and Russia. Much of Northern Ireland's coastline is protected for its special interest and includes internationally important coastal species and habitats. Almost the entire world population of Light-bellied Brent Geese use Strangford Lough during autumn and winter.

Our coastline includes productive and biologically diverse ecosystems, with features that serve as critical natural defences against storms, floods and erosion and the seabed is a repository of our maritime heritage. A growing demand for energy drives the search for new ways to harness the power of tides, waves and offshore wind.

Examples of the goods, services and benefits from Marine habitats provided for human well-being





Source: [UK National Ecosystem Assessment - Technical Report](#)




## 6 Marine


### Marine habitats

Northern Ireland's marine environment can be split into three categories as follows:


Intertidal Habitats		
Intertidal Muds	Restricted to the most sheltered loughs and sea coasts. Invertebrates such as lugworm, ragworm, <i>oligochaete</i> worms and molluscs such as <i>Macoma balthica</i> exist here. The snail, <i>Hydrobia ulvae</i> is found on the mud surface.	
Sandy, Shingle and Gravel Shores	Occur on more exposed shores and may appear barren. A number of species such as the isopod, <i>Eurydice pulchra</i> and a range of specialist burrowing amphipods and polychaete worms are characteristic of more sheltered sandy shores.	
Rocky Shores	Occur all around the Northern Ireland coast. Species here include: mussels, barnacles, wrack and kelp. These are found on the Ards Peninsula, Lecale, the Mourne Coast and Strangford Lough	

Sub-tidal Habitats		
Sub-tidal Mud sediments	Occur mainly in sheltered areas of sea loughs. Locally associated with this sub-tidal mud are extensive mussel beds e.g. Lough Foyle (which is also notable for the presence of native oyster beds). In Strangford Lough, extensive horse mussel beds are colonised by the bivalve and a highly diverse association of other species.	
Sub-tidal Sand	Generally found adjacent to intertidal sand in Lough Foyle, along Magilligan and the Causeway Coast (where much more extensive areas of relatively barren sand occur further offshore) and Dundrum Bay. Typical species include the sand eel, the burrowing brittle star, the lugworm, and the sea potato.	
Sub-tidal Gravel and Cobbles	Often typified by extensive beds of the brittle star, <i>Ophiothrix fragilis</i> . Mainly found in Strangford Lough and the Ards Peninsula, Lecale and the Mourne Coast. In some areas, such as at the mouth of Belfast Lough, the brittle star, <i>Ophiocomina nigra</i> , is abundant in muddy gravel. In areas of coarse, clean, shelly gravel the burrowing sea cucumber is often a characteristic species.	
Maerl Beds	Free-living calcareous algae occurring at Garron Point and Ballygalley Head on the North-east Coast.	
Rocky Sub-tidal Habitats	Include both bedrock and boulders. Algal communities dominated by one or more species of kelp are found in the shallow or infralittoral rock habitats. Where rocky habitats occur at greater depth and where tidal currents are stronger, animal groups such as bryozoans, hydroids and sponges dominate.	

## 6 Marine

Kelp Beds	Best developed around Rathlin Island where the kelp <i>Laminaria hyperborean</i> is dominant to a depth of 20-30m and the beds are very species rich. Kelp beds in the more turbid waters of the Mourne Coast extend only to 5m and are species poor. <i>Laminaria saccharina</i> is the dominant kelp in the sea loughs where beds extend to a depth of less than 10m.	
Tidal Rapids	Found in the narrows at the entrance to Strangford Lough and have an important assemblage of species. Sand scoured rocks are the habitats for a characteristic range of sponges, hydroids and bryozoan species. One associated habitat is formed by the polychaete worm, restricted to the seabed of Magilligan in Northern Ireland	
Saline Lagoons	Mainly associated with sea loughs in Northern Ireland and mostly man-made. Dominant plant species include tassel weeds and fennel-leaved pondweed. Several species of invertebrates are mainly found in this habitat including water beetles, corixids and molluscs.	

### Inshore Waters and the Open Sea

 <p data-bbox="209 1223 472 1285"><i>Bottlenose dolphin, Red Bay</i></p>	A large number of species occur in the open sea around Northern Ireland. Most of these are microscopic algae (phytoplankton) and grazing animals (zooplankton). In addition, many of the benthic species have free-floating stages. There are over 100 species of fish present in our coastal waters including several commercial species. The second largest fish in the world, the basking shark (a priority species) is sometimes found in large shoals between the County Down coast and the Isle of Man. Mammals such as seals and six species of cetacean also inhabit the open sea around Northern Ireland.
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### Marine Mammals

The diversity of marine mammals in Northern Ireland waters compares favourably to other parts of UK waters, with at least 17 species of whale, dolphin and porpoise (cetaceans) and two species of seal. Seals and all species of cetacean are highly protected under a range of legislation, including [The Conservation \(Natural Habitats, etc.\) Regulations \(Northern Ireland\) 1995](#), the [Wildlife \(NI\) Order 1985](#) (with amendment) and [Environment \(Northern Ireland\) Order 2002](#). The DOE coordinates seal and cetacean monitoring programmes around our coast.

Four [Special Areas of Conservation](#) (SACs) have been designated for marine mammals under Annex II of the EC Habitats Directive. Strangford Lough SAC and Murlough SAC both include the harbour seal as a qualifying species, and the more recently designated Maidens SAC includes grey seals. The Skerries and Causeway SAC is the first European protected site in the UK to include harbour porpoises as a qualifying species, in addition to the primary features of sandbank, reef and sea caves.

## 6 Marine



### Seal monitoring

The harbour seal *Phoca vitulina* and the grey seal *Halichoerus grypus* both inhabit the coast of Northern Ireland. Harbour seals are smaller in size and prefer sheltered environments whereas the large grey seals typically live in more exposed locations.

The Northern Ireland Seal Monitoring Programme uses a range of techniques to study seals, including visual counts from both the

shore and boat, aerial photography and thermal image surveys from helicopter. Data from the programme and developers is used to inform marine construction projects such as underwater turbines and offshore wind farms.

The [Northern Ireland State of the Seas report](#) 2011 is the first comprehensive report specific to Northern Ireland, aimed at helping Northern Ireland respond to the requirements of the EC Marine Strategy Framework Directive and associated UK legislation.

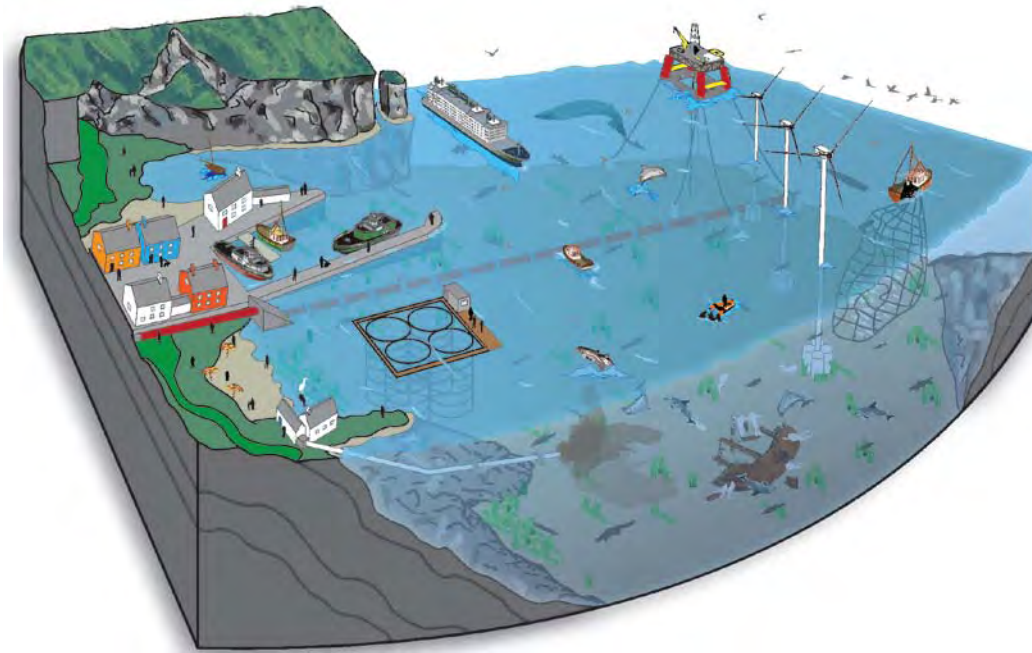
The report sets a baseline for marine planning and the importance of marine biodiversity in its contribution to over half of the biodiversity in Northern Ireland. It highlights success including the clean-up of our sea loughs and bathing waters by improvements in sewage and effluent treatment. It also identifies recovery in some of our fish stocks. Many of the datasets are crucial for the assessment of long-term changes such as climate change, and other pressures on the marine environment.



## 6 Marine

### Drivers and Pressures

The marine environment is subject to a wide range of pressures. These include economic activities, development on land and sea, and exploitation of its rich resources including fishing, minerals and energy.



Competition for a finite resource

**Point source pollution pressures** on marine water quality include effluent discharges from industry and waste water treatment in urban areas, towns and settlements, to coastal waters.

**Physical or morphological alterations** such as coastal defences, which account for around 15% of Northern Ireland's coastline, can put pressure on the marine environment. Land claim in coastal areas for agriculture, housing or industry, and activities associated with fishing and aquaculture in transitional and coastal waters, are also pressures.



## 6 Marine

**Fishing pressures** Although several key fish species are sustainably fished, several others have suffered reduced reproductive capacity and are at historically low levels, particularly cod and whiting. The low abundance of several species of sharks and rays is of concern and there is a need for more evidence to fully assess their status. If these trends are to be halted and reversed it is widely accepted that the management of marine fisheries must evolve towards an ecosystem-based approach, rather than trying to manage fisheries on a stock by stock basis.

**Offshore developments** such as wind farms and marine current turbines can also put pressure on marine areas. Wind farms can be located in large leased blocks throughout the Irish Sea. Marine current turbines are located in Strangford Lough.

### Proposed Offshore Wind Farm, County Down

The map shows the area for a proposed offshore wind farm off the Co. Down coast. Renewable energy company First Flight Wind Ltd were awarded an exclusivity agreement for the site by The Crown Estate in October 2012. This gives the company exclusive rights to carry out surveys to determine whether or not it is possible to construct and operate an offshore wind farm of up to 600 Megawatts of electricity. Environmental, technical and engineering assessments will be undertaken between 2013-2015 prior to applying for necessary consents. If successful, construction is scheduled from 2017 to 2020.



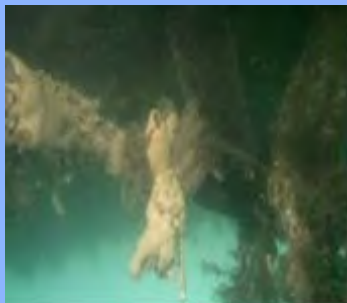
Source: RES & First Flight Wind

## 6 Marine

**Invasive non-native species** also put pressure on the marine environment. These are species that have been introduced either intentionally or unintentionally, outside their natural range. They thrive in our habitats and out-compete native species. It is now widely recognised that invasive species are one of the greatest threats to our native biodiversity, second only to that caused by habitat destruction.

Invasive species arrive through a variety of means. Non-commercial boating and commercial shipping pose a significant risk for introducing and spreading invasive species through a range of pathways. This occurs, for example, through cargo, ballast water discharge or species attached to the hulls or engines of watercraft. Historically, human activities such as aquaculture and boating have been associated with the introduction and further spread of invasive species in Northern Ireland's coastal waters. Overall, the increase in leisure time and international trade combine to increase the risk of invasive species being released to the wider environment.

### Carpet Sea Squirt (*Didemnum vexillum*) in Strangford Lough



*Didemnum vexillum* (commonly known as the Carpet Sea Squirt) was first identified in Strangford Lough in September 2012. *Didemnum vexillum* can hang from hard surfaces such as docks, lines and the hulls of boats. It can also form mats on the seabed smothering everything in its path. Within UK waters *Didemnum vexillum* has no known predators and may outgrow most native species.

If *Didemnum vexillum* is not controlled within Strangford Lough it could have major impact on the native biodiversity of the area. Both terrestrial and aquatic habitats could be negatively affected, resulting in severe damage to conservation and economic interests. All water users are encouraged to report all sightings of *Didemnum vexillum* to the 'alien watch' facility of the [Invasive Species Ireland website](#). The public are also urged not to remove any of the species from surfaces it has settled on, so as not to spread the contamination to other areas.

The cumulative number of high impact invasive species recorded is continuing to grow and many species are expanding their distributions, posing a threat to biodiversity and contributing to the degradation of ecosystem services. Examples include the Leathery sea squirt (*Styela clava*); the slipper limpet (*Crepidula fornicata*); the Pacific oyster (*Crassostrea gigas*); the carpet sea squirt (*Didemnum vexillum*); the Japanese skeleton shrimp (*Caprella mutica*); and the Japanese wireweed (*Sargassum muticum*).

For invasive species which are present, often control or eradication is possible. However, it can be very difficult, resource intensive and costly. In some cases there is little that can be done once they have become established here, other than increase awareness and try to prevent further spread.

## 6 Marine

### The Current Situation

#### Summary

The number of beaches measured against mandatory and guideline standards has increased from 16 to 23 since 2006, and in 2012 all but one of these passed the EC Bathing Waters Directive mandatory standard for water quality. Passing the mandatory standard means that beaches were classified as having good water quality or better. Compliance with the higher guideline standard is variable but overall shows some improvement since a low in 2008.

Almost 90% of marine water bodies around Northern Ireland's shores are classified as high or good, with the remaining water body areas being classified as moderate. Monitoring of shellfish waters also occurs, with all ten designated shellfish waters meeting the mandatory standards. There were no exceedences of the dangerous substances standards in shellfish waters in 2011.

Indicators for the marine environment are still evolving and future reporting will encompass reviewed monitoring programmes under the Water Framework and Marine Strategy Framework Directive.

#### Marine Indicators and Current Trends

Marine			
M1: Bathing Water Quality	Bathing water compliance for microbial standards of EC Bathing Water Directive (2002-2012)	↑	Green
M2: Blue Flag Beaches	Number of Blue Flag Awards – Beaches and Marinas (2002-2012)	No trend	Grey
M3: Marine Water Quality	Water Framework Directive overall status in transitional and coastal waters (% marine waterbody area) (2011 and 2012)	↑	Green
M4: Shellfish Waters	Compliance with more stringent guideline faecal coliform standard in shellfish waters (2011)	↔	Green
M5: Sea Temperature	Daily sea temperature, Irish Sea (April 1996-April 2012)	No trend	Grey

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

### Marine Indicators

#### Policy and Legislative Context

Indicators are used to measure the status of the marine environment under the [Water Framework Directive](#) (see **Chapter 5 Water**) and [The Marine Strategy Framework Directive](#).

All bathing waters are required to be classed as ‘sufficient’, or better, by 2015 under the revised [Bathing Water Directive](#). This Directive sets standards that are significantly more stringent than those of the current directive. Bathing water quality is measured against mandatory and guideline standards.

[The Marine Strategy Framework Directive](#) adopted in 2008 establishes a comprehensive structure within which EU Member States are required to develop and implement cost effective measures necessary to achieve or maintain “good environmental status” in the marine environment. Good environmental status (GES) must be achieved by the year 2020 at the latest. It encourages an ecosystem-based approach to the management of human activities, and also requires co-operation between Member States and with non-EU countries which share a marine region to develop coordinated strategies.

To help Member States interpret what GES means in practice, the Directive sets eleven qualitative descriptors which describe what the environment will look like when GES has been achieved.

#### What does Good Environmental Status look like?

1. Biodiversity is maintained
2. Non-indigenous species do not adversely alter the ecosystem
3. The population of commercial fish species is healthy
4. Elements of food webs ensure long-term abundance and reproduction
5. Eutrophication is minimised
6. The sea floor integrity ensures functioning of the ecosystem
7. Permanent alteration of hydrographical conditions does not adversely affect the ecosystem
8. Concentrations of contaminants give no effects
9. Contaminants in seafood are below safe levels
10. Marine litter does not cause harm
11. Introduction of energy (including underwater noise) does not adversely affect the ecosystem



## 6 Marine

The Department's overall policy is to maintain or improve water quality in line with the above and generally to manage coastal waters so that they have a classification of "good" at least, with no downward movement between classes.

The [Marine and Coastal Access Act 2009](#) and the [Marine Act \(Northern Ireland\) 2013](#) together set the national and regional framework for a new system of marine spatial planning. This will include improved management of marine nature conservation and the streamlining of a modern marine licensing and enforcement regime in Northern Ireland's waters.

This framework will support the work that is already being undertaken in accordance with the [Marine Strategy Regulations 2010](#), which transposed the Marine Strategy Framework Directive. For example, a number of marine indicators were addressed in the 2011 Northern Ireland State of the Seas report, and some of these have now been incorporated into the annual Northern Ireland Environmental Statistics Report.

Other applicable legislation includes the Assessment and Management of Floods Directive, which was adopted in 2007. This places obligations on a Member State to undertake a preliminary flood risk assessment for all of its river basins and coastal zones and to prepare and implement flood risk management plans by December 2015. The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009 were introduced in 2009 and a programme of flood risk assessment, mapping and development of flood risk management plans is continuing (see [Floods Directive Timeline](#)).

The indicators presented in this chapter are primarily based on monitoring of water quality relevant to the marine environment under the [Water Framework Directive](#). Future reporting of these indicators will encompass the reviewed monitoring programme which was put in place during 2007, and associated classification schemes. These schemes include broader assessment of ecological status and a range of supporting conditions, taking into account measures of water quality, water quantity and physical modifications.



DOE marine monitoring and marine fish teams

### Indicator M1: Bathing Water Quality

#### Bathing water compliance for microbial standards of EC Bathing Water Directive (2002 – 2012)

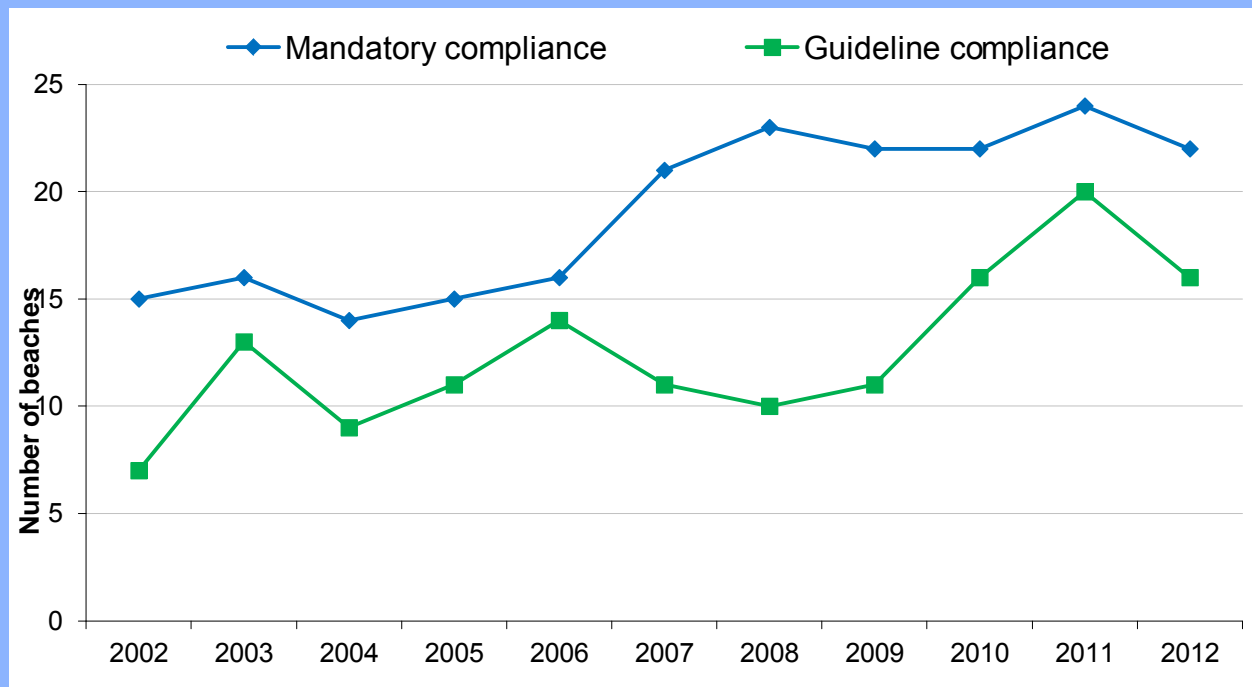
The microbial standards of the EC Bathing Water Directive have been set to ensure that waters where bathing is not prohibited and contain a large number of bathers comply with the mandatory and guideline microbiological levels. All bathing waters are required to be classed as 'sufficient', or better, by 2015.

The mandatory standard requires that 95% of samples collected throughout the bathing season must not exceed the limits set for total and faecal coliforms, which are 10,000 and 2,000 colony forming units (cfu)/100 ml respectively. To comply with guideline values, 80% of samples should not exceed 500 cfu/100 ml for total coliforms and 100 cfu/100 ml for faecal coliforms, and 90% of samples must not exceed 100 cfu/100 ml for faecal streptococci.

#### Data

As part of the transition to the standards of the 2006 revised Bathing Waters Directive, *Escherichia coli* and *Intestinal enterococci* are now measured instead of faecal coliforms and faecal streptococci. By UK agreement these have been used in the 2012 annual classification.

Figure M1: Bathing water compliance for microbial standards of EC Bathing Water Directive (2002 – 2012)



Source: NIEA

## 6 Marine

Northern Ireland Bathing Water Compliance by bathing water – 2012 and 2013		
Identified Bathing Water	2013 EC Bathing Water Directive Compliance	2012 EC Bathing Water Directive Compliance
Magilligan (Benone)	Pass - Excellent	Excellent
Magilligan (Downhill)	Pass - Excellent	Excellent
Castlerock	Pass - Good	Excellent
Portstewart	Pass - Excellent	Excellent
Portrush (Mill) West	Pass - Excellent	Excellent
Portrush (Curran) East	Pass - Excellent	Excellent
Portrush (Whiterocks)	Pass - Excellent	Excellent
Portballintrae (Salmon Rock)	Pass - Excellent	Good
Ballycastle	Pass - Good	Excellent
Waterfoot	Pass - Excellent	Good
Carnlough	Pass - Excellent	Good
Ballygalley	Pass - Excellent	Good
Brown's Bay	Pass - Excellent	Excellent
Helen's Bay	Pass - Excellent	Excellent
Crawfordsburn	Pass - Excellent	Good
Ballyholme	Pass - Good	Good
Groomsport	Pass - Excellent	Excellent
Millisle	Pass - Excellent	Excellent
Ballywalter	Pass - Excellent	Excellent
Tyrella	Pass - Excellent	Excellent
Murlough Co. Down	Pass - Excellent	Excellent
Newcastle Co. Down	Pass - Excellent	Poor
Cranfield (Nicholson's Strand)	de-identified	de-identified
Cranfield	Pass - Excellent	Excellent

Source: [DOE Marine Division](#)

### Indicator M2: Blue Flag Beaches

#### Number of Blue Flag Awards – Beaches & Marinas (2002 – 2012)

The Blue Flag Award is a voluntary eco-label for well managed beaches and marinas, and is administered by Tidy Northern Ireland.

The international Blue Flag Programme uses a number of criteria which beaches and marinas have to meet in order to gain the award, such as water quality, safety, facilities and information.

#### Data

Figure M2 shows that in 2012, 11 beaches and 2 marinas were awarded Blue Flag status, compared to 7 beaches and 1 marina in 2011.

Figure M2: Number of Blue Flag Awards – Beaches & Marinas (2002 – 2012)



Source: Tidy Northern Ireland

## Indicator M3: Marine Water Quality

### Water Framework Directive overall status in transitional and coastal waters (% marine waterbody area) (2011 and 2012)

Ecological monitoring provides an integrated and comprehensive picture of water quality encompassing water chemistry, plant life and sediment dwelling animals. Fish are also considered in transitional waters. This indicator measures status of transitional and coastal waters to meet standards required by the Water Framework Directive.

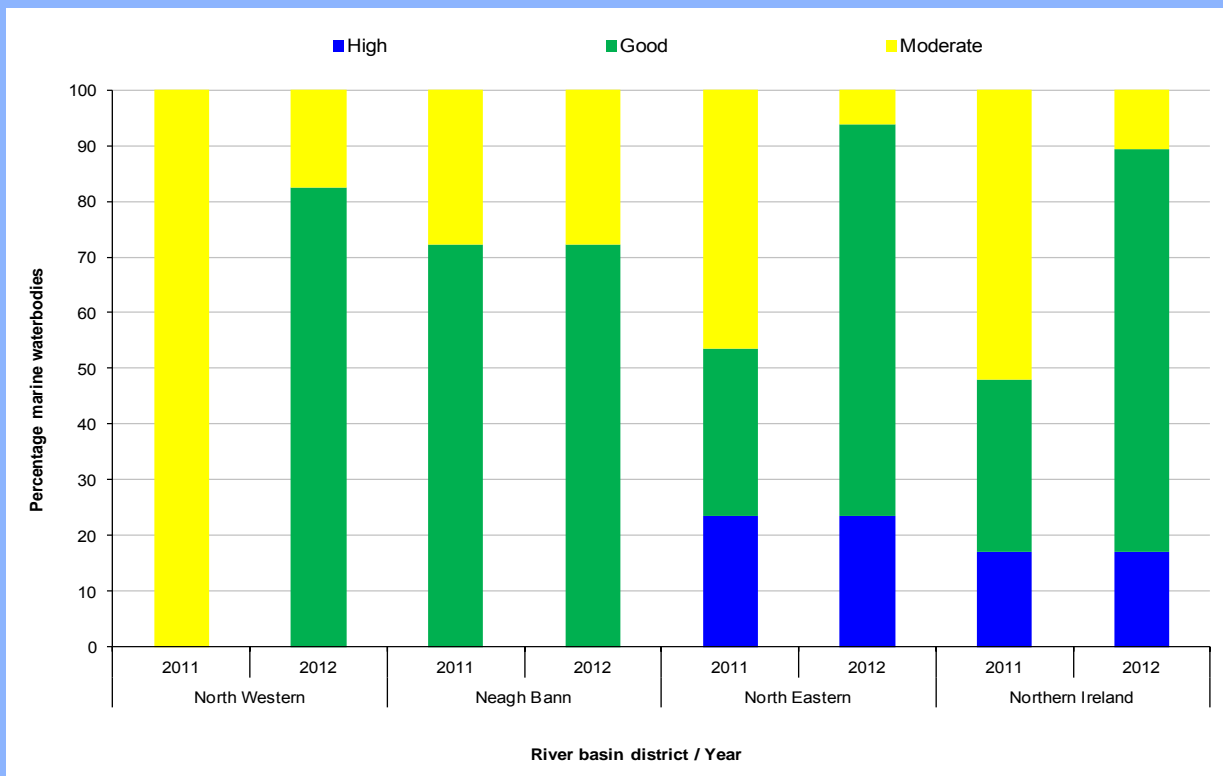
For each water body, a range of parameters are monitored including:

- Biology (phytoplankton, diatoms, macrophytes, invertebrates and fish)
- Hydromorphology
- Physio-chemical (including pollutants)
- Priority and priority-hazardous substances

#### Data

In 2012, 17% of transitional and coastal water bodies were classified at high status, 72% at good status and the remaining 11% at moderate status. The comparable figures for 2011 were 17%, 31% and 52% respectively.

Figure M3: Water Framework Directive overall status in transitional and coastal waters (% marine waterbody area), 2011 and 2012



Source: DOE Marine Division

### Indicator M4: Shellfish Waters

#### Compliance with more stringent guideline faecal coliform standard in shellfish waters (2011)

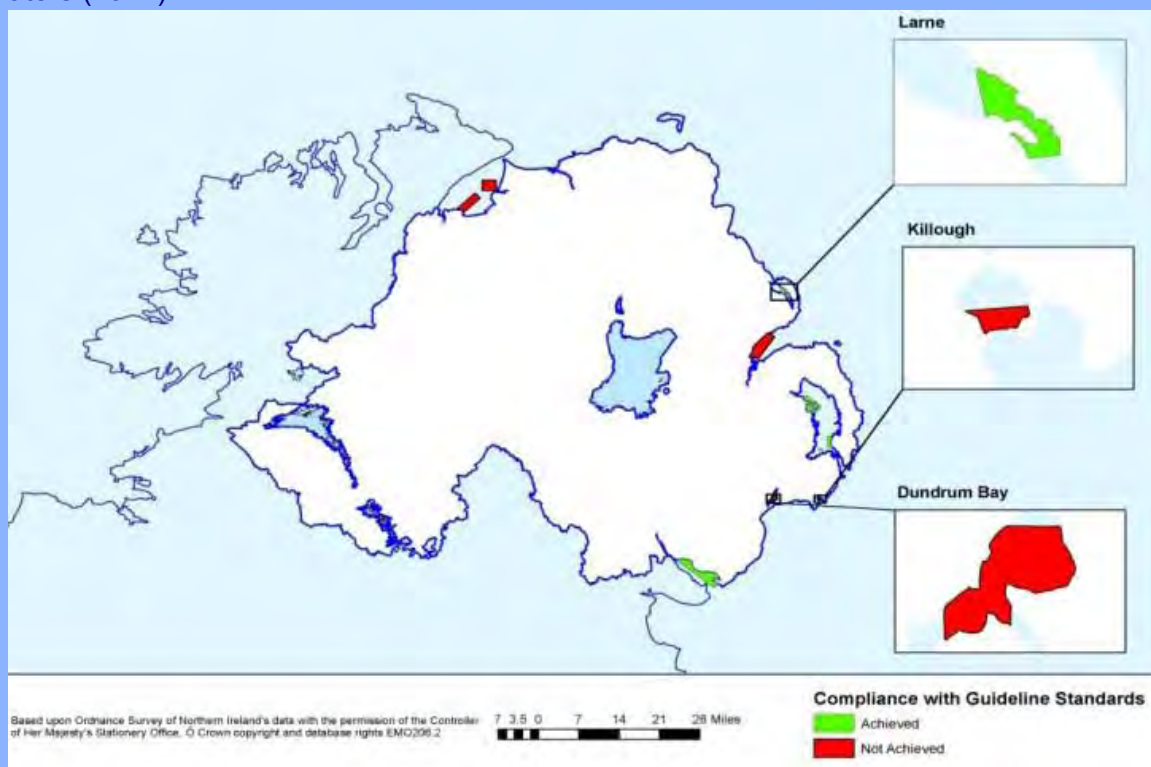
A total of ten shellfish waters are designated under the Shellfish Waters Directive. These are located within Lough Foyle, Larne Lough, Belfast Lough, Strangford Lough, Killough Harbour, Dundrum Bay and Carlingford Lough. This indicator measures compliance with guideline standards to ensure the safety of this food source and to provide reassurance regarding the continuing capability of our waters to support healthy stocks.

Compliance is determined by measuring shellfish flesh for faecal indicators and some dangerous substances, such as heavy metals and organochlorine compounds. Shellfish beds are monitored and classified by the Food Standards Agency before any stock is harvested and placed on the market for public consumption.

#### Data

All ten designated shellfish waters achieved the mandatory standard in 2011. Five of the ten waters met the more stringent guideline coliform standards, the same as in 2010. There were no exceedences of the dangerous substances standards.

Figure M4: Compliance with more stringent guideline faecal coliform standard in shellfish waters (2011)



Source: NIEA

### Indicator M5: Sea Temperature

#### Daily sea temperature, Irish Sea, (April 1996 - April 2012)

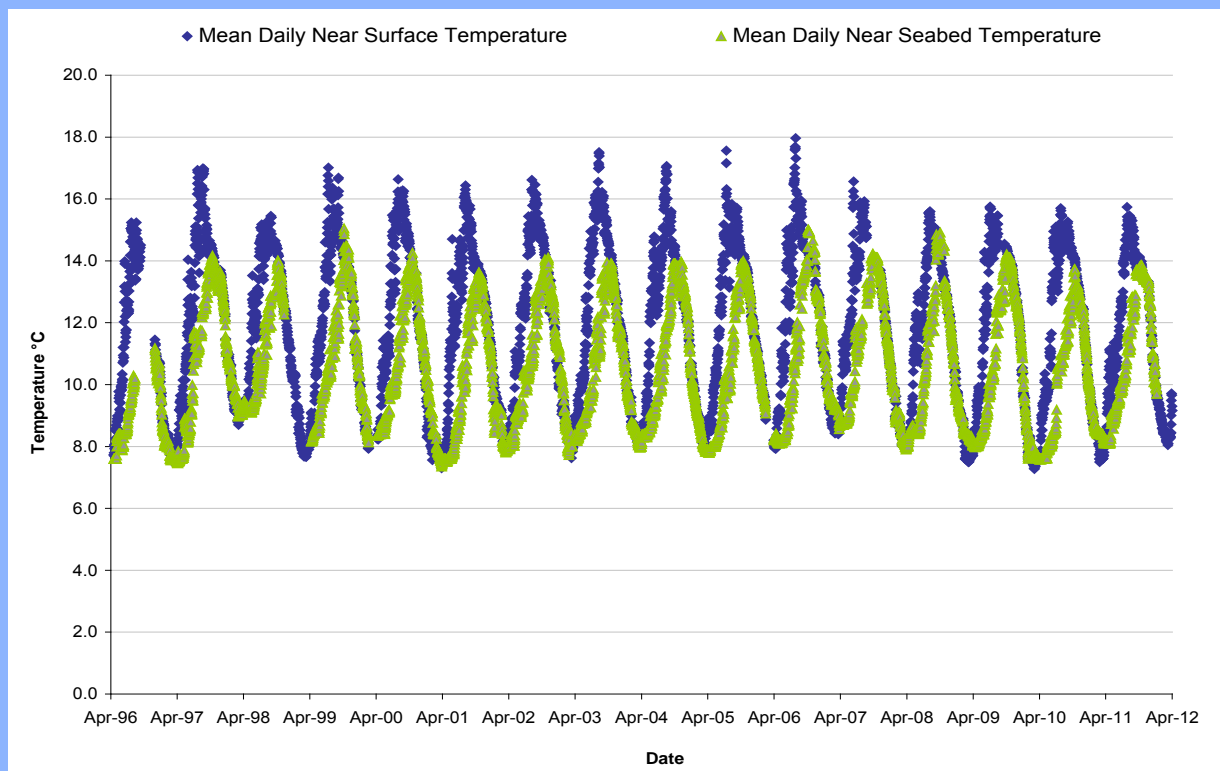
Sea temperatures will provide an indication of how our seas may be changing in response to global weather and climate patterns. Significant changes in mean temperatures that are sustained over a long period of time will provide evidence to help assess the rate of change. This factor, along with other factors will assist in determining the most appropriate response.

#### Data

Daily sea temperature levels are recorded every three hours and from these readings a daily mean is calculated.

The temperature is recorded by two moored thermistors. One of the thermistors is located close to an anchor on the seabed at a depth of 100m, while the other is attached to the underside of a moored buoy. These moorings are permanent and share the same grid reference point.

Figure M5: Daily sea temperature, Irish Sea (April 1996 - April 2012)



Source: AFBI

### Commentary

Coastal waters are an important resource for the tourism industry, and their quality is important to human health. Monitoring results show that there has been a reduction in faecal contamination of bathing waters. Nutrient levels in estuaries are declining due to actions to control sources of nitrogen. This includes increased investment in infrastructure and improvements in treatment levels, which have been accompanied by an increase in consent compliance for discharges.



**Indicator M1: Bathing Water Quality** Up until 2006, there were sixteen identified bathing waters in Northern Ireland. This increased to twenty three in 2007 and to twenty four in 2008, but was reduced again to twenty three in 2012. Twenty two of the twenty three beaches monitored in 2012 met the mandatory standards and sixteen achieved the higher guideline standards. In 2013 all twenty three beaches met the mandatory standards.

**Indicator M2: Blue Flag Beaches** Benone beach received the Blue Flag Award for the 22nd year in a row. The other recipients were Castlerock, Cranfield West, Crawfordsburn, Downhill, Murlough Beach, Portrush East, Portrush West, Portstewart Strand, Tyrella, Whiterocks, Ballyronan Marina and Ballycastle Marina.

**Indicator M3: Marine Water Quality - transitional and coastal waters** The main factors driving classification in Northern Ireland coastal waters are dissolved inorganic nitrogen (DIN) and marine plants status. In transitional waters the most important elements in determining status are DIN and dissolved oxygen. The number of coastal waters reaching good standard in 2012 was more than double that in 2011.

**Indicator M4: Shellfish Waters** The DOE Environment and Marine Group work closely with the Food Standards Agency and DARD in managing shellfisheries from both an environmental and public health perspective. The Shellfish Waters Directive is due to be subsumed into the WFD in December 2013.

**Indicator M5: Sea Temperature** During the autumn and winter months the profile is mixed. There is generally little difference between the surface and seabed temperatures. Between April and September the profile is generally stratified and there is a divergence between the two temperatures with the surface temperature rising above that of the seabed. The highest recorded difference was in July 2005, when on occasions there was a 7 to 8 °C difference. Otherwise, no long term trend is apparent.



### Key Challenges

Implementation of the **Marine Strategy Framework Directive** and meeting Water Framework Directive objectives remain a significant challenge. Just a third of our marine water bodies are currently meeting these objectives as of 2011.

**Marine litter** has potentially significant effects on marine life. Data on marine litter is monitored by NIEA on some bathing beaches and data are also collected by several NGOs for a number of beaches annually. However, most beach-based marine litter surveys are taken at infrequent intervals and may be subject to weather effects such as storms which affect the amount of litter washed up. Such statistical variability is likely to mask any longer-term temporal trend. Marine litter is not currently an indicator in the NIESR but will be included from 2013.



#### Marine Beach Litter

TIDY Northern Ireland carried out the first systematic survey of marine litter in Northern Ireland in 2012. It uses an internationally recognised standard method adopted by [OSPAR](#) countries to record the amount and type of litter on 14 reference beaches every three months. Once the survey has been carried out, the beach is cleaned by volunteers so that the next survey only counts litter that has washed up or been dropped since the last survey.

Over the first nine months of the survey, between September 2012 and April 2013, an average of over four thousand pieces of litter per kilometre of beach in Northern Ireland was counted. Of this litter, nearly three quarters was plastic, including cigarette lighters, crisp packets, and pieces of rope and string and plastic bottles. Beaches at Ardglass, Portavogie and Kilkeel were identified as being more heavily littered than other beaches - averaging 955 pieces of litter observed as opposed to 262 on the other beaches.

See [Marine Survey Northern Ireland 2012/13](#) for full results

Underwater camera surveys across the Irish Sea (currently used to assess *Nephrops norvegicus* burrow abundance and distribution as part of stock assessment) might be utilised to report subtidal litter levels, as in a pilot project reported in 2011 [State of the Seas](#) report.

### Responses

The Marine and Coastal Access Act 2009 and the Marine Act (Northern Ireland) 2013 legislate for the preparation and adoption of the first Marine Plan for Northern Ireland's inshore and offshore waters. This new plan-led system for marine activities will facilitate decision-making based on a balanced consideration of economic, social and environmental factors. Marine users, prospective developers and investors will be given greater certainty about our marine priorities, less regulatory burden and more confidence to proceed with individual proposals.

The Marine Plan will incorporate designated **Marine Conservation Zones** (MCZs) which will contribute to meeting the UK's aim of having an ecologically coherent network of Marine Protected Areas by 2020. The first Stakeholder Workshop on the MCZ designation process was held in November 2013 and a final workshop on the proposals and management options will be held in early 2015. Finalised proposals will follow later that year and all MCZs will be formally designated by December 2016.

#### What will Marine Conservation Zones protect?

MCZs will protect nationally important marine species, habitats and geological features, based on identification and designation from lists of Priority Marine Features. These lists include information from:

- OSPAR List of threatened and/or declining species and habitats
- UK Biodiversity Action Plan List
- Northern Ireland Priority Habitats and Species
- Species of Conservation Concern
- Nationally Important Marine Features



Seagrass in Waterfoot Bay (Dr Claire Goodwin)

Identification and designation of MCZs will bring together stakeholders from commercial fishing, marine industries, natural environment, leisure and recreation, heritage, land owners, marine research, local authorities and administrations in Scotland, Northern Ireland and the Isle of Man.

## 6 Marine

The Department launched the Northern Ireland [Marine Litter Strategy](#) in June 2013, which aims to help Northern Ireland meet its agreed target for marine litter on coastlines. The target is an “*Overall reduction in the number of visible litter items within specified categories/types on coastlines from 2010 levels by 2020*”. The Strategy aims to do this by reducing the levels of litter entering the marine environment through learning and communication, the enforcement of statutory deterrents, data collection and appropriate coastal infrastructure; and by the removal of litter which is already present on our coastline.



### Improving and protecting bathing waters

In October 2011, work commenced on investigative studies in five bathing water catchments; Waterfoot, Ballygalley, Brown's Bay, Ballyholme and Ballywalter. Faecal bacteria monitoring across each catchment was used to identify areas which required further investigation. River walks have focused on these target areas to determine activities which present the greatest risks to bathing water quality. The information obtained has been used to develop and implement actions within the catchments. Actions include, for example, repairs to silage clamps and re-location of farmyard manure heaps away from the river, improvements in septic tank discharges, and reductions in direct discharges due to misconnections.



Brown's Bay

These projects will contribute to improvements in the quality of local rivers and streams and will reduce the faecal bacteria risk to nearby bathing waters. This will benefit the biodiversity in the rivers, as well as beach users and tourism.

Source: NIEA

## 6 Marine

### ANNEX Marine Legislation and Policy Drivers

EC Directives	Description
<a href="#">Marine Strategy Framework Directive 2008</a>	To protect the marine environment throughout Europe and achieve good environmental status of marine waters by 2020.
<a href="#">Water Framework Directive (2000/60/EC)</a>	Aims to create a framework for EC action in the field of water policy.
<a href="#">Shellfish Waters Directive 2006</a>	The protection of the marine environment by way of shellfish waters from pollution hazards. Due to be subsumed into WFD in Dec 2013.
<a href="#">Bathing Water Directive 2006</a>	Aims to set more stringent water quality standards and also puts a stronger emphasis on beach management and public information.
<a href="#">EC Common Fisheries Policy</a>	Principal legal mechanism for managing fish stocks in EU waters.
International Agreements	Description
<a href="#">The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) 1998</a>	Prevention and elimination of pollution from land-based sources, dumping or incineration, offshore sources and assessment of the quality of marine environment.
UK Policy & Strategy	Description
<a href="#">UK Marine Policy Statement 2011</a>	Provides the framework for preparing marine plans and taking decisions affecting the marine environment. It will contribute to the achievement of sustainable development in the UK's marine area.
Local Legislation	Description
<a href="#">Marine and Coastal Access Act 2009</a>	Provides for the establishment of a strategic system of marine planning in Northern Ireland's offshore region; the designation of Marine Conservation Zones; and a streamlined marine licensing and enforcement regime.
<a href="#">Marine Strategy Regulations 2010</a>	Transposes the requirements of the Marine Strategy Framework Directive (see above).
<a href="#">Marine Act (Northern Ireland) 2013</a>	Provides for the establishment of a strategic system of marine planning in Northern Ireland's inshore region; the designation of Marine Conservation Zones; and the additional streamlining of the marine licensing regime.



Northern Ireland is known for its outstanding natural beauty and unique landscape. The 2013 G8 Summit brought leaders and media from around the world and showcased the splendour of the Fermanagh Lakelands and other sites.

This chapter considers our soil quality and the effects of development, land cover, forest and woodland planting and land management approaches such as agri-environment schemes on our landscape character, its protection and use.

### Key Messages

- Land use and landscape character in Northern Ireland are changing, for example, with the development of upland **wind farms**, but there has been a significant decline in **housing development** since 2008. Population growth, measures to stimulate recovery and adaptation to climate change are ongoing challenges for our rural and urban landscapes.
- In 2011 approximately 40% of Northern Ireland's farmed area was managed through **agri-environment schemes**. Major investment to meet targets for 60% growth in the **agri-food sector** will require further innovative approaches to future development in the countryside.
- Within the last decade there has been an overall reduction in **forestry planting**, however, **broadleaved woodland** is increasing as a result of colonisation, mainly of grassland habitats.
- A new policy initiative based on a **landscape scale approach** has been initiated to promote a sustainable approach to future planning. Urban communities and the voluntary sector will also have a greater role in community planning and development of green infrastructure in future.

### Introduction

The physical structure of our land, soil and land cover, together with changing land use define the character of our landscapes which play an important role in our natural and cultural heritage, economic activity and quality of life.

Developments in agriculture, forestry, housing, minerals and industry and in regional planning, town planning, transport, infrastructure, tourism and recreation all influence the landscape and our visual experience and appreciation of it. Our land and landscapes are a valuable and finite resource whose protection and management contribute to Northern Ireland's prosperity and well being.

The Northern Ireland landscape is the result of human interventions and land use change dating back to the first recorded human settlement some 9,000 years ago. Some of the elements which make our landscape special are summarised in **Chapter 2**. Whilst population growth in the late 20<sup>th</sup> and early 21<sup>st</sup> centuries has led to an increase in the extent of built up areas, our settlement is predominantly rural and agriculture remains the dominant land use.

### Soil

Land and soils are an integrated resource which provides food, fuel, water and basic materials to support the growth of plants and sustain life. Soils provide the foundation for Northern Ireland's **natural habitats**, **agricultural** and **forestry** systems and for **human habitation** and **landscapes**. As soils typically form slowly and can be damaged through our actions, it is important to manage them sustainably.

In Northern Ireland, diverse parent geology combined with the effects of glaciation and climatic history has created a wide diversity of soils which are recorded in a series of maps, documents and digital datasets published by [AFBI soils and environment](#). New digital soil mapping techniques using Geographical Information Systems (GIS), combined with traditional field surveying techniques for sampling and validation, will in future enable soil information to be brought together on an all-Ireland basis for public access. This complies with EU legislation such as the [INSPIRE Directive](#) (see [Irish Soil Information System](#) project and [SpatialNI](#) Northern Ireland Portal for Geographic Information).

### What is landscape?

The [European Landscape Convention](#) (2000) defines landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".

The scope of the Convention extends to all member states of the Council of Europe and covers natural, rural, urban and peri-urban areas. It takes in land, inland water and marine areas and relates to landscapes in various conditions, such as those which are outstanding and those which are of everyday appearance or degraded.

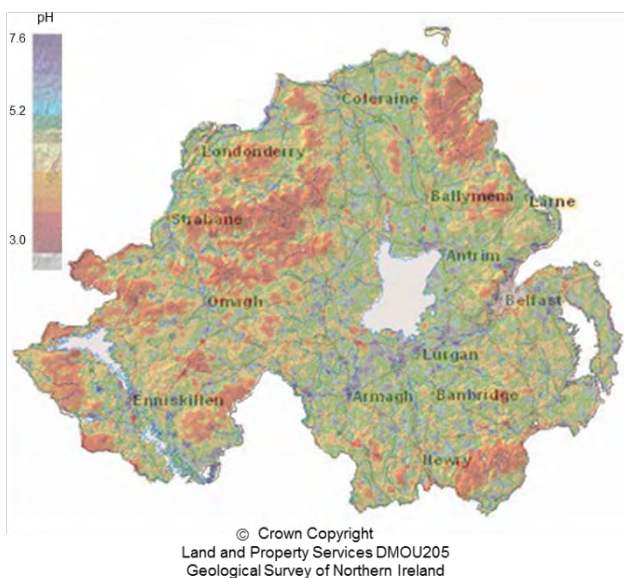
## 7 Land and Landscape

### Key functions of soils

- Recycle nutrients to make them available for plant growth
- Regulate surface and ground water flow and quality
- Provide a habitat for a huge range of invertebrates and fungi
- Provide a carbon store – if correctly managed some soils lock up carbon that would otherwise make a contribution to atmospheric carbon dioxide
- Provide raw materials for human activities including sand, gravel, stone and peat
- Provide a platform for construction of man-made structures
- Provide a protective layer for our cultural heritage
- Hold historical information about past climates, environments and land use

Agricultural Land Classification provides a method for assessing the quality of farmland to enable informed choices to be made about its future use. It helps underpin the principles of sustainable development. The highest quality, Class 1, does not occur in Northern Ireland. Classes 2 and 3A represent our best and most versatile agricultural soils and cover 31% of the total land area.

The [Tellus Project](#) is a geoscience mapping project undertaken between 2004 and 2007 by the Geological Survey of Northern Ireland (GSNI), comprising detailed geochemical surveys of soils and streams and a low-level airborne geophysical survey.



The information from Tellus supports the exploration and development of mineral and energy resources, informs land-use planning and provides a country-wide 'baseline' of terrestrial geochemistry. The geochemical results provide a new and consistent baseline standard for some 55 elements and compounds across rural Northern Ireland and in the main metropolitan centres.

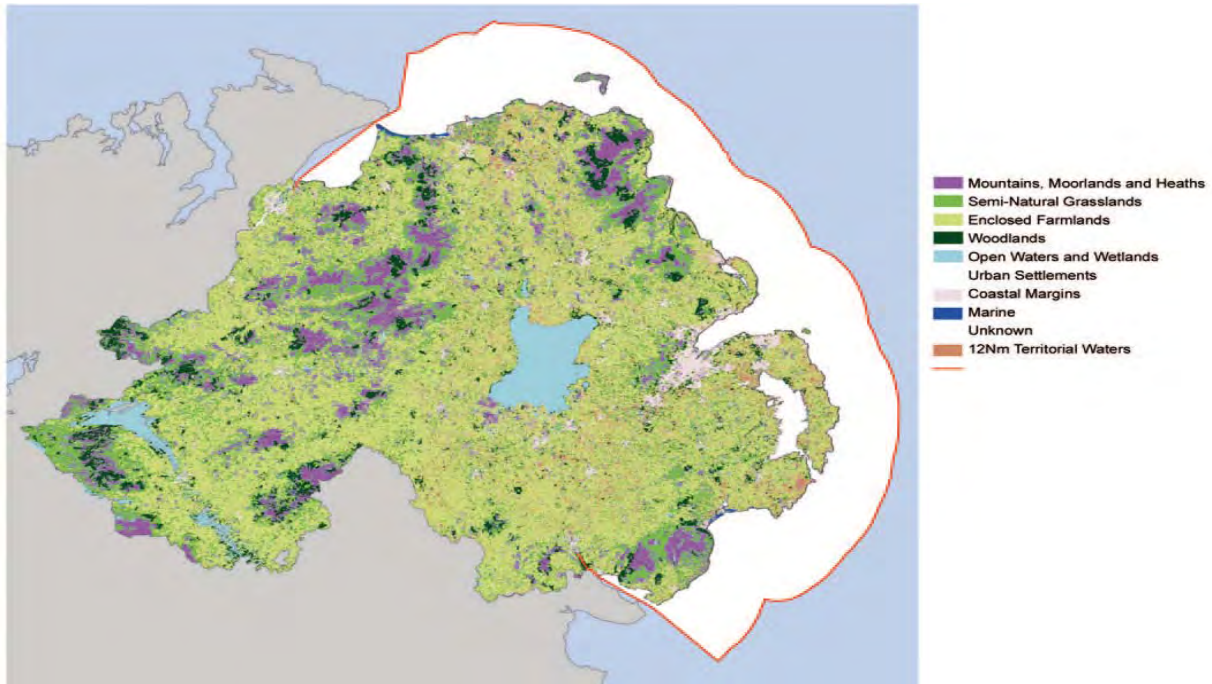
[Tellus Border](#) funded through EU INTERREG IVA, is a regional mapping project which extends the analysis of existing data into the six border counties of Ireland.

See [http://maps.bgs.ac.uk/gsni\\_geoindex/](http://maps.bgs.ac.uk/gsni_geoindex/) for the outputs of digital databases and maps.

## 7 Land and Landscape

### Land Cover

Land cover includes vegetation, man-made structures and surface water features. The [UK Land Cover Map 2007](#) shows the dominance of improved grassland and freshwater in Northern Ireland.



The broad habitat classification map of Northern Ireland is: Based upon LCM2007 © NERC (CEH) 2011.

The Northern Ireland Countryside Survey of 2007 reported that there were 31,161 hectares of semi-natural grassland throughout the country, with the majority of this (18,476 hectares) consisting of purple moor-grass and rush pasture. An update to the Northern Ireland Countryside Survey is currently going through the development process, and a revised land cover map depicting land classifications will be published in due course.

### Land Use

Agriculture accounted for approximately 73% of Northern Ireland's land use in 2011 with almost 60% of this in grass. Improved grassland dominates.

**Land management** refers to the activity taking place on an area of land. The Department of Agriculture and Rural Development (DARD) runs agri-environment schemes under the [Northern Ireland Rural Development Programme 2007-13](#). These provide funding to farmers and land managers to farm in a way that supports biodiversity, enhances the landscape, and improves the quality of water, air and soil. Approximately 40% of the farmed area in Northern Ireland is currently under agri-environmental schemes.





## 7 Land and Landscape

### Landscape Character

The interaction between physical structure of land, land cover and land management results in a distinct and recognisable pattern of elements which defines landscape character. The broad differences in landscape character across the regions of Northern Ireland, as described in the [Landscape Character Assessment Report 2000](#), are illustrated in the three examples below. This assessment is being refreshed to reflect changes in Northern Ireland's landscape including the housing boom in rural areas and the proliferation of renewable energy projects in the last 10 years.

Landscape Character Area (LCA)	Key Characteristics
<p>Upper Lough Erne (LCA 11)</p> 	<ul style="list-style-type: none"> <li>▪ A complex landscape with a small scale intricate pattern of land and water.</li> <li>▪ Rolling low drumlins and flooded hollows linked by streams and the River Erne.</li> <li>▪ Mosaic of small pastures on drumlins, woodland and wetland.</li> <li>▪ Thickly wooded shorelines, dense bushy hedgerows and hedgerow trees separating small fields give an enclosed and well vegetated character.</li> <li>▪ Attractive wooded estates with grand historic buildings.</li> <li>▪ Scattered small isolated settlements along twisting roads and on drumlin tops.</li> <li>▪ Occasional views across open water to wooded islands.</li> </ul>
<p>Belfast / Lisburn (LCA 97)</p> 	<ul style="list-style-type: none"> <li>▪ Belfast and Lisburn lie within the lowland basin of the River Lagan which is enclosed by steep ridges and escarpments.</li> <li>▪ Docks at head of Belfast Lough; principal industrial areas along the Lagan and new Lagan side development focusing towards the river.</li> <li>▪ Long red brick terraces and large red brick warehouses and industrial buildings are characteristic.</li> <li>▪ Formal parks such as Ormeau Park, the Botanic Gardens, Victoria Park and Wallace Park.</li> <li>▪ Informal open space such as the Lagan Valley Regional Park and the linear Connswater Park reach into the urban centre.</li> <li>▪ Elevated views over urban areas from the surrounding escarpment slopes.</li> </ul>
<p>Mourne Mountains (LCA 75)</p> 	<ul style="list-style-type: none"> <li>▪ Dramatic jagged peaks, forming a striking backdrop to views.</li> <li>▪ Steep rock and scree covered mountain slopes capped with granite tors, falling to the sea on their eastern edge.</li> <li>▪ Rough grass and heather used for sheep grazing.</li> <li>▪ Reservoirs and rocky mountain streams occupy steep combs and glens.</li> <li>▪ No settlement on upper slopes and mountain tops, sparse farmsteads, including derelict stone cottages on lower fringes; very few roads.</li> <li>▪ Panoramic views to sea and across the 'Kingdom of Mourne'. Popular area for tourism.</li> </ul>

## 7 Land and Landscape

A Northern Ireland Seascape Character Assessment has been commissioned by NIEA to complement the Northern Ireland Landscape Character Assessment. The map and an objective description of the different character areas of coastline and inshore waters will provide a baseline against which proposals for change can be assessed. The Seascape Character Assessment is scheduled for publication in 2013.

### Landscape Protection and Designation

The landscapes of Northern Ireland are renowned for their distinctiveness and are safeguarded with national and local planning policy and designations.

The Giants Causeway and Causeway Coast is designated as a [World Heritage Site](#) by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). This site is deemed to be of Outstanding Universal Value because the cliffs and rock formations are a 'classic locality' in the study of basaltic volcanism. In addition, they are of spectacular interest, easily accessible and the source of myths and legends. The Site extends to approximately 70ha of land and a further 160ha of sea. It is located on the North Antrim coast within an area of a spectacular and dynamic coastal landscape designated as the Causeway Coast Area of Outstanding Natural Beauty.



Northern Ireland has eight Areas of Outstanding Natural Beauty (AONB) designated for their distinctive landscape character and high scenic value.

About 325,000 hectares is designated as AONB, equivalent to nearly 20% of the total land area of Northern Ireland.

## 7 Land and Landscape

### Planning

Development Plans inform the general public, statutory authorities, developers and others of the policy framework which includes landscape policy areas and countryside protection areas at a local level.

Following a Review of Public Administration in Northern Ireland, the majority of planning functions will be transferred from the DOE to a new 11 Council model in April 2015. This is a significant change to the way planning is carried out. It will also provide an enhanced role for community planning, which is likely to influence the future shape of our urban landscapes across Northern Ireland.



Development proposals for £360M retail mixed use at Royal Exchange, Belfast City Centre 2012

As part of this reform process, a new Single Strategic Planning Policy Statement is being developed to provide a comprehensive consolidation of planning policy. In the meantime [Planning Policy Statement 2: Natural Heritage](#) was published in July 2013 to further the Executive's commitment to sustainable development and to conserving, enhancing and restoring our natural heritage.

The Department's Statement of Policy on Protected Landscapes, [Shared Horizons](#) sets out the issues associated with the protection of designated landscapes and how it proposes to address them.

### Drivers and Pressures

The main pressures on the land in Northern Ireland are **development** (including housing, industrial and recreational), **infrastructure**, **extraction industries**, **agriculture** and **forestry**, and **tourism**.

Population increases, changing household structures and employment patterns together with restructuring of agriculture have driven significant changes in our habitats and land cover over the last 30 years.

The rate of new **house building** has slowed since 2008 as a result of the economic recession. However, pressures on urban and rural landscapes continue in response to actions to stimulate economic growth, particularly in the agricultural sector.

**Agriculture and forestry** Major investment in Northern Ireland's agri-food industry has been identified as a priority in the [Programme for Government 2011-15](#) and a strategic action plan [Going for Growth](#) was published by the Agri-Food Strategy Board in 2013 (see **Chapter 11**).

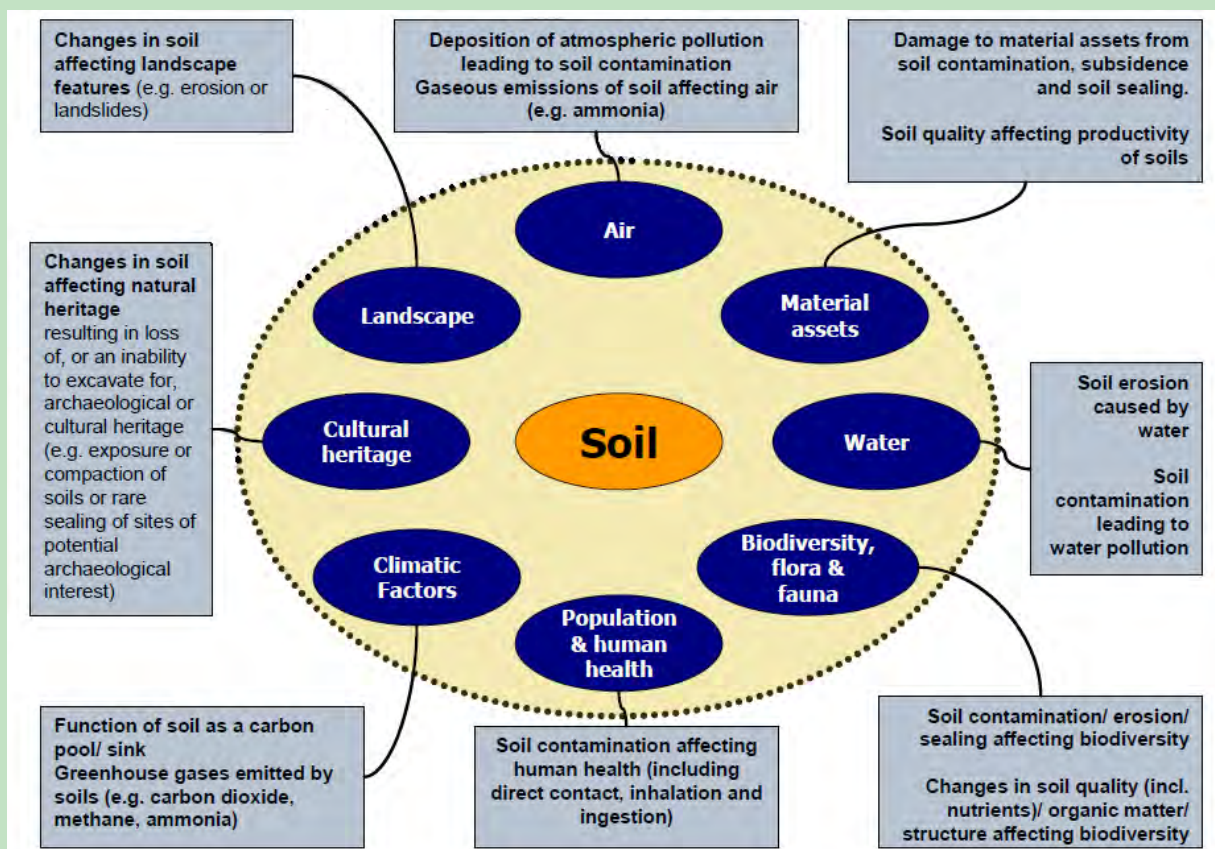
## 7 Land and Landscape



Meeting targets for a 60% growth in value in the agri-food sector is likely to have significant impact on our habitats and rural landscapes. Changing agricultural and forestry practices associated with implementing economic targets will place increased pressures on soils through increased risks of erosion, accumulation or leaching of nutrients, changing levels of soil organic matter, and water holding capacity (see box on inter-relationships).

Investment in value-added products, modernising production methods and changes to the scale and capacity of farm units may affect habitat loss and impact on landscape character or visual quality.

### Examples of inter-relationships between the soil and other environment sectors



Source: [SNIFFER 2008](#)

With the introduction of the [Forestry Act \(Northern Ireland\) 2010](#) there is now a provision for Forest Service to develop its land to obtain better value from the public estate whilst having due regard to its general duties to promote afforestation and sustainable forestry.

## 7 Land and Landscape

Agriculture and forestry provide a wide range of ecosystem services which can be impacted through land use change and associated pressures. For example, upland areas providing a range of valuable services for agriculture, forestry, water regulation, carbon storage and recreation have become increasingly vulnerable to losses from wildfires.

### Effects of Wildfires in Northern Ireland

It is estimated that the wildfires in spring 2011 affected about 10,000 hectares of land with heath and blanket bog the semi-natural habitats most affected.



In the Mourne, one single fire in the Annalong Valley/Ben Crom area was estimated to have affected as much as 7 km<sup>2</sup> of land, mainly dry heath, adding to an area of around 3 km<sup>2</sup> on the Rocky Mountain side of the valley that had been burnt two weeks previously. NIEA estimate that a total of 6,600 ha of land within designated sites (mostly blanket bog) was affected by the wildfires of 2011.

**Mineral extraction and peat cutting** both have significant impacts on the landscape character, visual quality and biodiversity through loss of land cover and habitats such as peat bogs. Over three-quarters of raised bogs have been cut for fuel at some time. Localised cutting has little long-term environmental impact but commercial extraction removes an irreplaceable resource. Landscape restoration is a priority planning requirement. On mineral extraction sites, restoring a site progressively as mineral is extracted is preferred.

Gas exploration and extraction activity using hydraulic fracturing or 'fracking' techniques became a new area of interest in 2012 and led to much public debate.

Research to understand the potential impacts on the environment from the use of this technology has been undertaken by EPA in Ireland, who released the report from a preliminary study in May 2012. See [Hydraulic Fracturing or 'Fracking': A Short Summary of Current Knowledge and Potential Environmental Impacts](#).



## 7 Land and Landscape

The [EU Environmental Liabilities Directive \(ELD\)](#) transposed into Northern Ireland regulations in 2009 uses the 'polluter pays' principle to prevent and remedy environmental damage caused by the **contamination of land**. The ELD may be used in the case of large-scale illegal dumping or fly tipping to assist in remediation of the site.



**Renewable energy developments** The number of renewable energy proposals has increased since the 2008 SOE report in response to policy developments on energy supply and managing greenhouse gas emissions (see **Chapter 4 Climate**). Some areas in Northern Ireland have been subject to increasing development pressure in relation to wind farms affecting landscapes and habitats. Supplementary Planning Guidance on wind farm developments [Wind Energy Development in Northern Ireland's Landscapes](#) (August 2010) includes general guidance on siting and design and advice on the landscape assessment of proposed developments. The Guidelines for Landscape and Visual Impact (Edition 3) published in April 2013 also provides guidance on the siting and design of wind farm applications to avoid sensitive habitats.

**Tourism** Northern Ireland's tourism industry depends heavily on the quality of its natural and built heritage which together forms our unique and diverse landscape character.

Tourism and recreational activities can have detrimental impacts on the quality of the environment and landscape character through damage or disturbance of semi-natural habitats and species. In popular areas, such activities can lead to erosion of footpaths, damage to monuments and significant littering. [Planning Policy Statement \(PPS\) 16](#) (2013) on tourism seeks to manage the provision of sustainable and high quality tourism developments to benefit the local economy whilst protecting assets from inappropriate development and conserving biodiversity.

### Global Geopark, Marble Arch Caves, Co Fermanagh

The Marble Arch Caves Global Geopark, situated just outside Enniskillen, County Fermanagh is one of Europe's finest show caves allowing visitors to explore a fascinating, natural underworld of rivers, waterfalls, winding passages and lofty chambers. Both Marble Arch Caves and the nearby Cuilcagh Mountain Park have jointly been recognised as a UNESCO Global Geopark due to the world importance of their geology and landscapes. The site is the only UNESCO Geopark in Northern Ireland. In 2012 the caves attracted over 53,000 visitors from across the world.



## 7 Land and Landscape

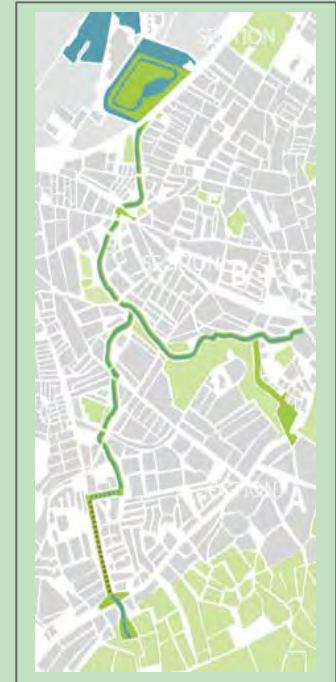
**Green space and community planning** The Northern Ireland Sustainable Development Strategy updated in 2010 recognises that access to a clean and attractive countryside supports a sense of social wellbeing. A [community planning toolkit](#) was produced in 2012 to assist future development of community planning by Councils. The Connswater Greenway (see box) is an example of community planning in practice.

### Connswater Community Greenway

The Connswater Community Greenway (CCG) is a £32 million investment in East Belfast. The project has been developed by the East Belfast Partnership and is funded by the Big Lottery Fund, Belfast City Council and the Department for Social Development. The Department of Agriculture and Rural Development's Rivers Agency is working in partnership with the CCG to deliver elements of the East Belfast Flood Alleviation Scheme which will help to reduce flooding in east Belfast.

The Connswater Community Greenway will:

- Create 9 km linear park for walking and cycling
- Create 30 new or improved bridges
- Serve 23 schools and colleges
- Clean up 5 km of rivers
- Create hubs for education, interpretation, tourism and heritage trails
- Create a civic square for celebrations and events
- Provide a wildlife corridor from Belfast Lough to the Castlereagh Hills



Source: Connswater Community Greenway

Government also recognises the value of “Green Infrastructure” in urban areas for health, wellbeing and sense of place. A manual entitled [Living Places: An Urban Stewardship and Design Guide for Northern Ireland](#), published in August 2013 focuses on green infrastructure and how this can be implemented in Northern Ireland. It is the intention that the concept will be embedded in the new development plans post April 2015.

Sensitive design of new buildings and regeneration of existing buildings can help to maintain the distinctive character of our landscape, natural habitats and cultural heritage. PPS7 and its addendums [Safeguarding the Character of Established Residential Areas](#) (2010) promote greater use of permeable paving to help reduce flooding risk from surface water runoff.

## 7 Land and Landscape

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### Monitoring Landscape Change

The [Northern Ireland Countryside Survey](#) (NICS) is an ongoing, sample-based, monitoring programme across Northern Ireland. It assesses the distribution and condition of land habitat types and provides reliable estimates of how land cover changes over time. Overall habitat change was assessed in 1998 (reported in SOE2008) and in 2007.

The [Northern Ireland Countryside Survey 2007](#) shows the following significant changes from the 1998 survey:

- an **increase of over 30% in built up areas** and gardens – largely as a result of building of new homes in the countryside;
- continued **increase in broadleaved/mixed and yew woodland** which grew by over 28% – the trend to more broadleaf tree planting on agricultural land being related to policy initiatives promoting farm woodland;
- continued **loss of semi-natural habitat**, in particular a decrease in neutral grassland which includes many of our biodiversity-rich grassland types, resulting from agricultural conversion and building in rural areas;
- a **5% increase in roads and hard verges**, reflecting development of infrastructure associated with changes in housing and rural building;
- a **decrease in hedges** and earth banks and an overall decrease in length of field boundaries.



## 7 Land and Landscape

### The Current Situation

#### Summary

Soil fertility measurements on managed grassland soils shows some variation from year to year. There is no clear long term trend, but the number of soils showing phosphorus enrichment or deficiency was slightly less in 2011/12 compared to 2005/06.

At the end of 2011, the amount of land under agri-environment scheme agreements was 444,000 hectares, almost double that of ten years ago.

Forests and woodlands provide important habitats, natural resources and diversity to Northern Ireland's landscapes. In 2011, there were 313 hectares of new plantings, of which 98% consisted of broadleaved woodland. All were planted by the private sector supported by grant aid from Forest Service.

The number of housing completions decreased by 53% (from 5,095 to 2,374) between 2009/10 and 2010/11. This reflects the current economic climate and downturn in the construction industry.

#### Land and Landscape Indicators

Land and Landscape			
LL1: Soil Quality	Soil phosphorus (as Olsen-P) by P-index for managed grassland soils (2004/05 – 2010/11)	No trend	
LL2: Sustainable Land Management	Northern Ireland Agri-environment schemes, area under agreements (2001-2011)	↑	
LL3: Area of woodland	Area of new forest and woodland plantings (2000/01 – 2011/12)	No trend	
LL4: Housing	Housing completions (2000/01 – 2010/11)	↓	

The trend and status assessment are based on expert opinion, see **Indicators and Trends** page ix

### Land and Landscape Indicators

#### Policy and Legislative Context

A hierarchy of strategies, policies and legislation operates to underpin the management of both land and landscape. Some of these enable statutory designation at national and European level, others provide for local designations and appropriate management, with the aim of conserving and protecting the quality of our geology, soils, habitats, species and landscapes.

At the EU level, the [European Landscape Convention](#) and the [Thematic Strategy for Soil Protection \(2006\)](#) provide a framework for the protection, management and planning of our landscapes and soils. The updated Thematic Strategy for Soil Protection (2012) notes the importance of the EU Biodiversity Strategy and Resource Efficiency Roadmap in working towards key goals of the Soil Thematic Strategy. It also highlights key findings reported under the European State of the Environment report (2010), such as the rate of continued soil sealing, loss of soil biodiversity (and consequential ecosystem services impacts), degradation through intensive use (such as by agriculture), contamination and acidification. The strategy emphasises the significant role of soils in climate change through carbon release (when soils are lost/intensively worked) and through their potential to buffer some of the impacts of climate change (e.g. effective drainage during flood events).

Key national legislation affecting landscape includes [The Nature Conservation and Amenity Lands \(Northern Ireland\) Order 1985](#).

Regional strategies, plans and programmes influencing land use, land planning and management include the [Regional Development Strategy 2035](#), [Sustainable Development Strategy Implementation Plan 2011-14](#) and [Northern Ireland Rural Development Plan 2007-13](#). A new [Rural Development Programme](#) for Northern Ireland will run from 2014-2020. This will incorporate measures to address six EU priorities for rural development.

#### EU Proposals for Rural Development

- Knowledge transfer and innovation in agriculture, forestry and rural areas
- Farm competitiveness and risk management
- Food chain organisation
- Restoring and enhancing ecosystems
- Promoting resource efficiency
- Social inclusion, poverty reduction and rural economic development

[Planning Policy Statements](#) provide guidance on land use and other planning matters such as the protection of natural and built heritage and siting, design and quality of both urban and rural developments.

### Indicator LL1: Soil Quality

#### Soil phosphorous by P-index for managed grassland soils (2004/05 – 2010/11)

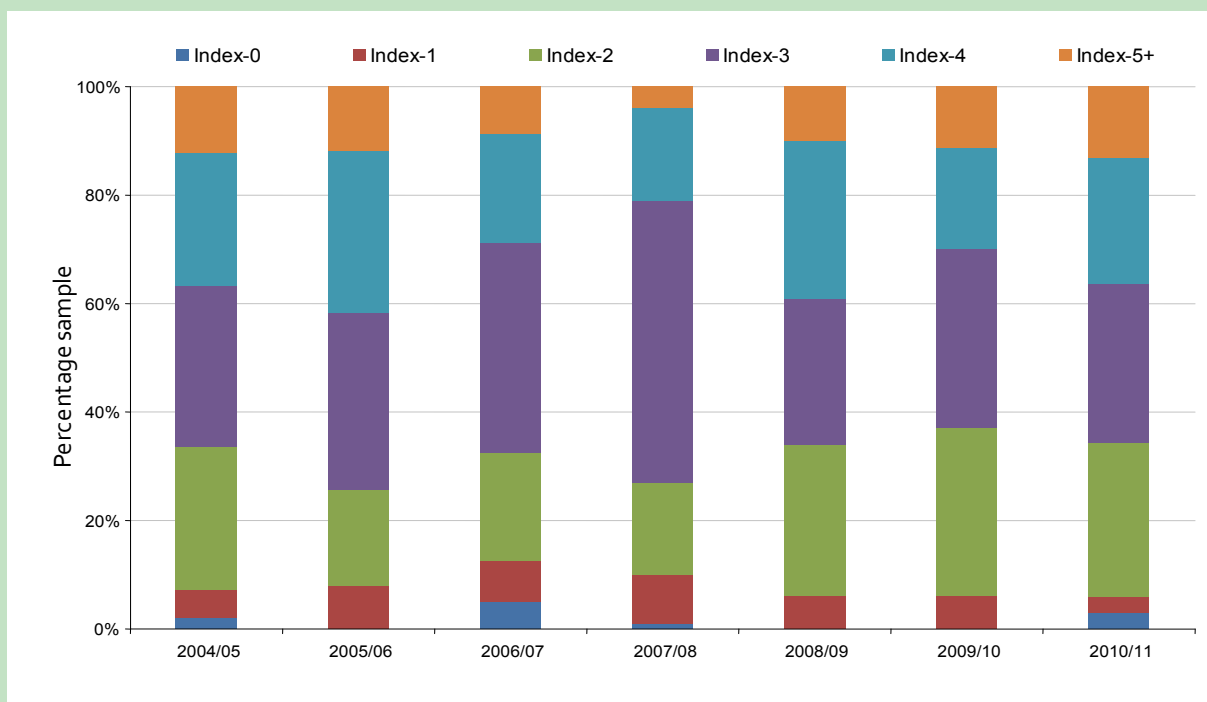
Soil phosphorus levels indicate the ability of soils to support agricultural production and the risk of leaching to water sources. Farm measures under the [Nitrates Action Programme](#) will impact on soil nutrient status and water quality. Soil organic carbon, pH and phosphorus are all indicators of agricultural soil quality. Phosphorus most relevant in Northern Ireland.

#### Data

This indicator measures the 'plant-available' phosphorous (P) in soil using the Olsen method. Results are expressed as an index from 0 (deficient in P) to 9 (excessive in P). For grassland, Olsen P-indices normally range from 0 to 5. A P-index of 0 means deficient in soil-P and a soil-P concentration of 0-9 mgP/l. For managed grassland soils, an Olsen P-index greater than 3, indicating a soil-P concentration greater than 45 mgP/l, is considered to be excessive and may lead to leaching to water courses.

The samples taken in 2010/11 provide an opportunity to compare results of soil samples taken from the same fields five years earlier. Using GPS, soils were re-sampled from the same transect used in 2005/06. This allows a direct comparison of changes in soil fertility over the five year period from 2005/06 to 2010/11.

Figure LL1: Soil phosphorous by P-index for managed grassland soils (2004/05 – 2010/11)



Source: AFBI

### Indicator LL2: Sustainable Land Management

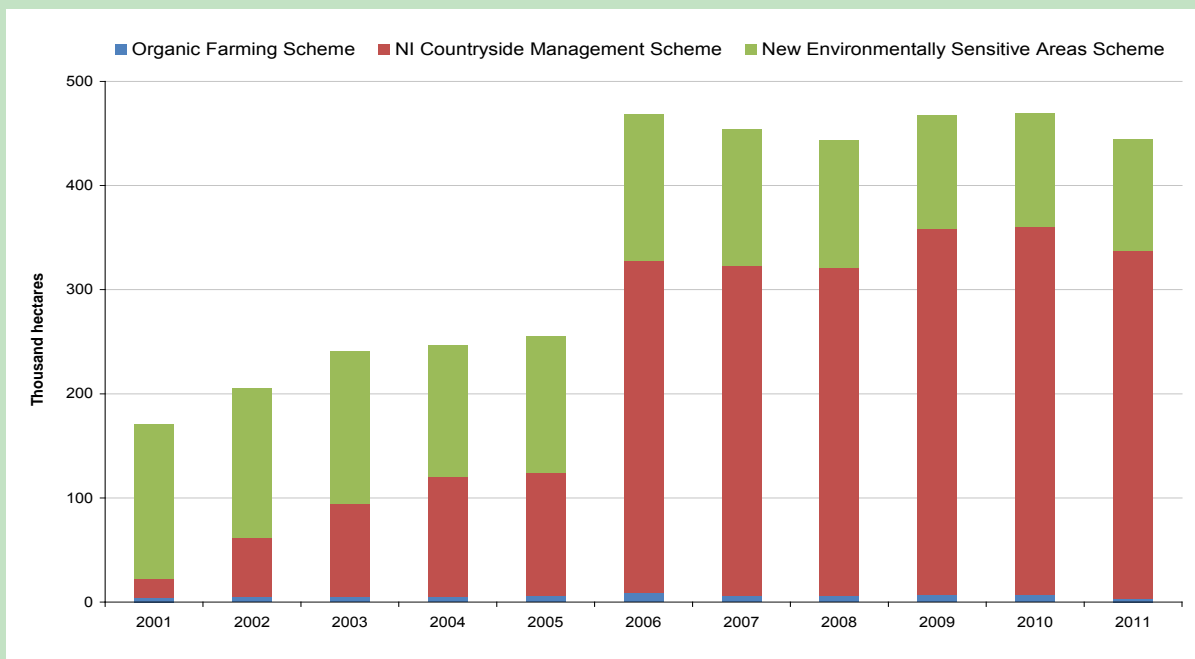
#### Northern Ireland agri-environment schemes, area under agreements (2001 – 2011)

The majority of our land is used for agriculture and therefore the proportion managed in a sustainable way under assessed schemes provides a useful indicator of the state of our land. [Agri-environment schemes](#) aim to enhance biodiversity, improve water quality, enhance the landscape and heritage features, and help reduce the impact of climate change by integrating sustainable environmental management into everyday workings of the farm.

#### Data

This indicator measures the number of hectares that were under agri-environmental agreements from 2001 to 2011. In 2011, 444,000 hectares (approximately 40%) of the farmed area in Northern Ireland were managed through the Northern Ireland Countryside Management Scheme (NICMS), the Environmentally Sensitive Areas Scheme (ESAS) and the Organic Farming Scheme (OFS). The percentage of the farmed area in Northern Ireland managed through these schemes reduced slightly from 2010, mainly due to the reduction in area managed through the NICMS from 350,000 hectares to 334,000 hectares.

Figure LL2: Northern Ireland agri-environment schemes, area under agreements (2001 – 2011)



Source: DARD

### Indicator LL3: Area of Woodland

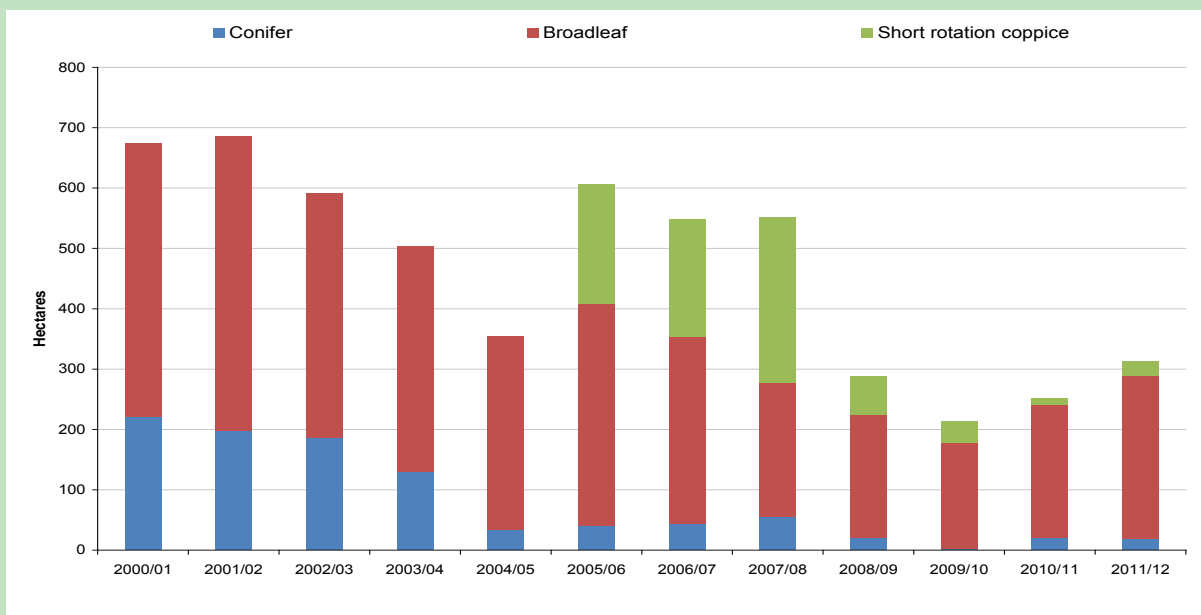
#### Area of new forest and woodland plantings (2000/01 – 2011/12)

Woodlands and forest provide important habitats for Priority Species (see **Chapter 8**), natural resources, landscape diversity and recreational opportunities. The total area of woodland in Northern Ireland is estimated to be 111,000 ha which is equivalent to 8.2% of the total land area. This indicator measures the amount of hectares of new forest and woodland planted from 2000 to 2012 in Northern Ireland.

#### Data

In Northern Ireland 55% of the woodlands and semi-natural forests are owned and managed by DARD Forest Service. The remainder is managed mostly by private landowners. In 2011/12, there were 313 hectares of new plantings. Of these, all were planted by the private sector supported by grant aid from the Forest Service and 98% comprised broadleaved woodland.

Figure LL3: Area of new forest and woodland plantings supported by forestry grants (2000/01 – 2011/12)



Source: Forest Service of Northern Ireland

### Indicator LL4: Housing

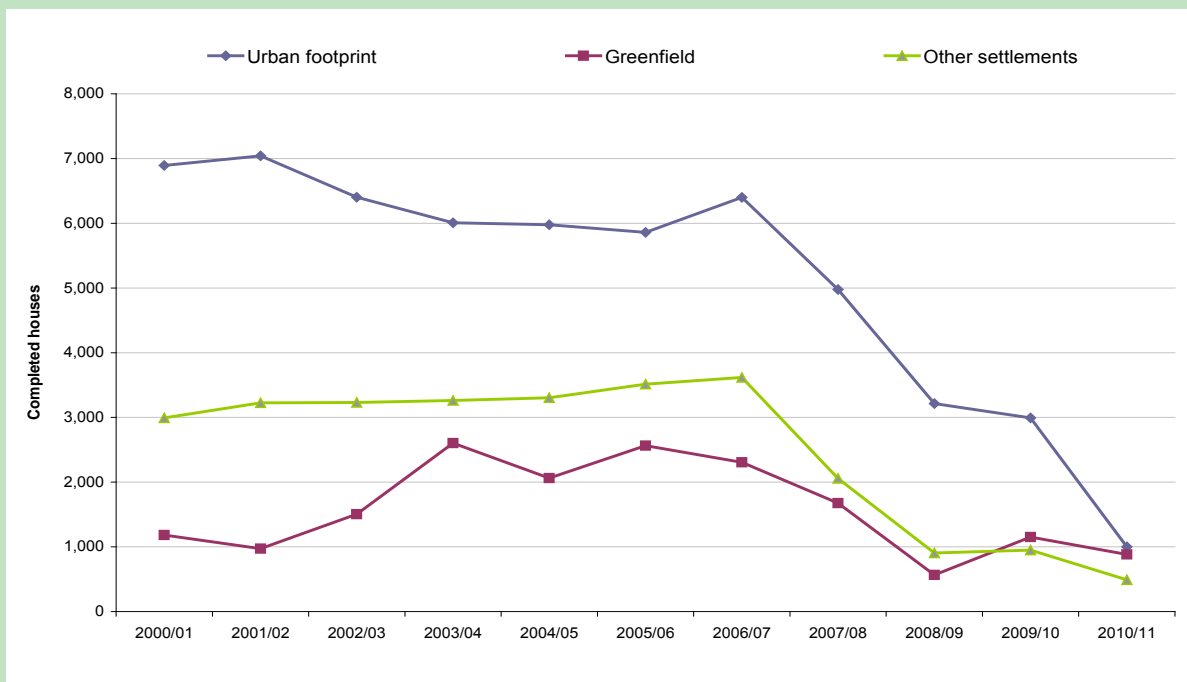
#### Housing Completions (2000/01 – 2010/11)

This indicator measures the total number of housing completions carried out within urban footprint, greenfield and other settlements from 2000 to 2011. Housing completions and the land available for housing in settlements across Northern Ireland are monitored with regard to the provisions of prevailing development plans.

#### Data

The data show, for each year, the total number of housing completions within all settlements. For those settlements with a population greater than 5,000 these are broken down in terms of those completed within the urban footprints of settlements and those completed on greenfield sites, which are outside of urban footprints but within settlement limits. The chart also shows the total number of houses completed in other settlements, which have a population less than 5,000.

Figure LL4: Housing Completions (2000/01 – 2010/11)



Source: DOE Planning

### Commentary

**Indicator LL1: Soil Quality** Comparison of annual summary soil datasets for 2005/06 and 2010/11 shows that there has been a decrease in the number of samples at P-index 1, P-index 3 and P-index 4 with a corresponding increase in those at P-index 0, P-index 2 and P-index 5. The figures suggest that there were fewer soils in 2010/11 which are deficient in phosphorus and fewer soils which have excessive phosphorus concentrations compared with 2005/06, although there is considerable annual variation in sampling results.

**Indicator LL2: Agri-environment schemes** The new Northern Ireland Countryside Management Scheme (NICMS) and Organic Farming Scheme (OFS) were launched in 2008 with 943 and 33 agreements issued respectively to begin from 1 January 2009. Both NICMS and OFS opened to new applications in 2010 and funding is available to progress approximately 2,300 NICMS agreements and 30 OFS agreements. 1,000 agreements began in 2012 with a further 1,300 scheduled to start in 2013.

**Indicator LL3: Woodland** In the last decade there has been an overall reduction in new forest and woodland plantings, particularly conifer plantings. The trend in new plantings has been towards broadleaved woodland in response to policy initiatives promoting farm woodland; short rotation coppice has also been established since 2005 as a renewable energy resource.

The [Northern Ireland Countryside Survey 2007](#) data showed a significant increase in broadleaved/mixed woodland cover overall between 1998-2007 (see [Drivers and Pressures](#) above). The NICS increase to 2007 predominantly reflects the succession of broad-leaved woodland from scrub habitat, although new broadleaved woodland planting, evident in the Forest Service data, has also contributed to the increase in woodland cover.

The future interpretation of Northern Ireland's woodland cover will be influenced by emerging initiatives for measuring and establishing new woodland. The [woodland register](#), published by Forest Service in March 2012, estimates the area of Forest Service and non-Forest Service woodland in Northern Ireland, compiled from datasets from statutory and non-statutory bodies. The use of the woodland register has resulted in a step change in the non-Forest Service woodland areas reported for Northern Ireland. This should be interpreted as an improvement in the data reported, rather than an actual increase in woodland area, but will provide an enhanced baseline for moving forward.

The Forest Service encourages the creation of new woodlands and the management of existing woodlands by providing grant aid towards the cost of the work to meet a strategic target of 12% (170,000 hectares) woodland and forest cover by the middle of this century.

**Indicator LL4: Housing** The number of housing completions decreased by 53% between 2009/10 and 2010/11, from 5,095 to 2,374, which reflects the current economic climate and downturn in the construction industry.

### Conclusions and Key Challenges

The way we respond to economic and social policy drivers to build a prosperous and healthy society, and adapt to climate change, will determine our future landscape.

Land cover and land use result from policies to control and manage development in association with environmental factors. Available datasets tend to provide baseline data and exhibit relatively slow rates of change, so trends can only be quantified over timescales of ten years or more. The availability of earth observation data, such as aerial photography, LiDAR, and satellite imagery, together with countryside and landscape sampling and use of Geographic Information Systems, will enable more powerful exploration and analysis of land cover, land use and landscape scale changes in future updates.

Ensuring sustainable management of our finite land resources for future generations is recognised as an ongoing challenge. Agriculture remains the dominant land use in Northern Ireland and proposals to grow the agri-food sector by up to 60% over the next ten years will require new and innovative approaches. To date significant progress has been made to balance production with environmental quality, biodiversity and landscape through agri-environment schemes. Adopting a holistic approach in future based on National Ecosystem Assessment and Natural Capital will be essential to ensure that new Rural Development Programmes incorporate sustainable management appropriate to Northern Ireland.

There are also new threats to agriculture, forestry and woodland habitats and landscapes through spread of disease, which may be exacerbated by climate change.

The spread of *Phytophthora ramorum* in Ireland and Britain continues to give concern to those in the timber industry as larch trees are especially susceptible to the disease. Both movement and processing of logs from infected sites are subject to bio-security precautions to prevent the accidental spread of disease. Infected larch trees have been promptly felled to help restrict the spread of disease by windborne spores. Ongoing monitoring of larch plantations within forests has proved invaluable in identifying the early stages of disease.

The spread of *Chalara Fraxinea* or Ash Dieback throughout much of Europe and during 2012 into the UK and Ireland has become a major concern. Restrictions on the use of ash in forestation programmes are resulting in a decrease in the planting of new native woodlands.

Climate change, and adaptation to this, may be a significant force in changes to land cover and landscape. Our response will determine land management strategies in the future.



## 7 Land and Landscape

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### Responses

The amended and consolidated [Planning \(Environmental Impact Assessment\) Regulations \(Northern Ireland\) 2012](#) provide a method of ensuring that the likely effects of new development on the environment are fully understood and taken into account before consent is given for development to proceed.

The value of our landscapes continues to be recognised in the designation of Areas of Outstanding Natural Beauty (AONBs). Significant progress has been made in reaching an agreed framework for maintenance of the landscape quality in Northern Ireland's most special landscapes. For example, a management plan for Strangford and Lecale AONB will be published for public consultation late in 2013 and NIEA continues to provide funding to assist AONB management bodies in their work.

The DOE has also committed to producing a draft European Landscape Convention Action Plan for Northern Ireland during 2014 which will include a Northern Ireland Landscape Charter. This charter will set out principles to guide a vision for Northern Ireland's landscape with commitments on developers, land managers and public agencies including new local planning authorities who sign. It will lay the foundation for future statutory landscape policy.

Development of a new policy initiative based on consideration of the value of Natural Capital commenced in 2013. This aims to inform future actions to support and improve Northern Ireland's land, landscape and ecosystems and guide development decisions that affect our natural environment.



## 7 Land and Landscape

### ANNEX Land and Landscape Legislation and Policy Drivers

EC Strategies and Programmes	Description
<a href="#">Soil Thematic Strategy 2006</a>	To protect soil and to safeguard its capacity to carry out its functions in environmental, economic, social and cultural terms.
<a href="#">The Implementation of the Soil Thematic Strategy and Ongoing Activities Report 2012</a>	A report on the progress of the Soil Thematic Strategy since its' implementation in 2006. The report noted the importance of the EU Biodiversity Strategy and Resource Efficiency Roadmap in working towards key goals of the Soil Thematic Strategy.
<a href="#">7<sup>th</sup> EC Environmental Action Programme</a>	Will be an update to the 6 <sup>th</sup> EAP and will set out the development of EU Environment Policy to the year 2020.
International Agreements	Description
<a href="#">European Landscape Convention</a>	The European Landscape Convention is an international treaty, adopted in 2000, which aims to promote European landscape protection, management and planning, and encourage European co-operation in this area.
UK Policy & Strategy	Description
<a href="#">NI National Ecosystem Assessment (NEA) 2011</a>	This report was the first independent assessment of the services provided by Northern Ireland's environment. It was part of the UK National Ecosystem Assessment and provided an analysis of the state of Northern Ireland's ecosystems as of 2011, looked at changes over time, examined the factors driving current changes and provided recommendations on how Northern Ireland's land and sea can be managed to ensure delivery of a wide range of benefits to enhance well-being.
Local Legislation	Description
<a href="#">The Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</a>	Provides for the establishment of nature reserves, acquisition of land and management agreements
<a href="#">Wildlife and Natural Environment Act (Northern Ireland) 2011</a>	This is the amendment to the Wildlife (Northern Ireland) Order 1985, Part 4 of the Environment (Northern Ireland) Order 2002 and the Game Preservation Act (Northern Ireland) 1928.
<a href="#">Waste and Contaminated Land (Amendment) Act (Northern Ireland) 2011</a>	Provides powers to deal with illegally dumped waste, and changes the legislative framework for management of land that has been contaminated.
<a href="#">The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009</a>	Seeks to achieve the prevention and remedying of environmental damage.
<a href="#">Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012 SR 59</a>	Amends the previous 1999 regulations and ensures likely effects of a new development on the environment are fully understood and taken into account before consent is given for development to proceed.

## 7 Land and Landscape

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<a href="#">Planning Policy Statements</a>	Provide guidance on land use and other planning matters such as the protection of natural and built heritage and siting, design and quality of urban and rural developments
<a href="#">Planning Policy Statement 2 (PPS 2) Natural Heritage 2013</a>	Sets out the DOE's planning policies for the conservation, protection and enhancement of our natural heritage, defined as "the diversity of our habitats, species, landscapes and earth science features".
<a href="#">Tree Preservation Orders (TPOs)</a>	A TPO can protect individual trees, a group of trees or woodlands which add to the character and appearance of an area.
<a href="#">The Plant Health (Amendment No.3) Order (Northern Ireland) 2012</a>	Establishes the conditions under which certain harmful organisms, plants, plant products and other objects may be introduced into or moved within the Community or certain protected zones thereof, for trial or scientific purposes and for work or varietal selections.
<a href="#">Regional Development Strategy 2035.</a>	Northern Ireland's overarching spatial framework to influence the future distribution of activities throughout the region.



## 8 Biodiversity

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Northern Ireland has a rich diversity of habitats and species. This biodiversity is of central importance to the health of our environment, people and economy.

This chapter reports on the extent of nature conservation designations, the condition of designated areas, bird populations, and the status of priority habitats and species.



### Key Messages

- Many **key elements** of Northern Ireland's biodiversity continue to decline despite increased action to halt biodiversity loss.
- **Priority habitats** have continued to show an overall decline since 2000, with grassland habitats declining most. However, priority woodland habitats have increased.
- A significant number of **priority species**, such as breeding waders, are declining, but lack of data remains a significant problem for most priority species despite recent improvements in data gathering.
- The **key pressures** on biodiversity are land-use change, particularly agriculture and development, pollution, invasive species and fisheries practices
- The area covered by **nature conservation designations** continues to increase. Sympathetic management under agri-environment schemes is helping to produce some improvement in the condition of Areas of Special Scientific Interest.

## 8 Biodiversity

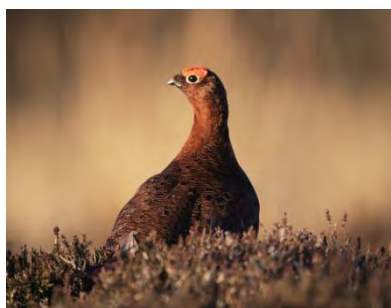
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### Introduction

The [Convention on Biological Diversity](#) defines biological diversity as: “*The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*”. The state of biodiversity can be assessed through species and the habitats in which they occur. For its size, Northern Ireland has a particularly diverse range of habitats and species.

Trends in the broad habitats and land use in Northern Ireland are presented in **Chapter 7 Land and Landscape**. Semi-natural habitats are those least modified by man and these are divided into Northern Ireland [priority habitats](#). These are of particular importance for our native biodiversity and require conservation action if we are to reduce, halt or reverse biodiversity loss.

Some of these, such as lakes, fens, bogs, wet grasslands and some marine and coastal habitats are particularly well represented in Northern Ireland. Others, such as native woodlands are comparatively poorly represented but nonetheless are important for biodiversity. Further information relating to Northern Ireland priority habitats is available at <http://www.doeni.gov.uk/niea/biodiversity/habitats-2.htm>



Northern Ireland [priority species](#) are considered to require conservation action because they have declined, are rare or of significance at UK, Ireland or European level.

The most important sites for priority habitats and species are protected in Northern Ireland through the use of [statutory nature conservation designations](#) (see **Indicator BD1**).

Increasingly the state of biodiversity has been measured in terms of the ecosystem services or Natural Capital it provides to people. The relationship of semi-natural biodiversity-rich habitats and ecosystem services can be complex. The [National Ecosystem Assessment](#) attempts to tease out some of these relationships. In general this has highlighted the hitherto unrecognised economic value of some of our most biodiversity-rich semi-natural habitats such as peatlands, freshwater and coastal habitats.

Although part of the United Kingdom, Northern Ireland forms a unique biogeographic unit with the Republic of Ireland, which also is a signatory to the Convention on Biological Diversity and shares EU environmental legislation. Consequently a number of issues are being tackled at an all-island level including information gathering, establishing conservation priorities and delivering conservation programmes, such as species action plans and work on invasive species.

## 8 Biodiversity

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### Driving Forces and Pressures

The impacts of human activities, like **agriculture**, **fisheries** and **development**, are the main pressures affecting biodiversity in Northern Ireland. Biodiversity is further impacted by non-native species, and the yet unquantified effect of **climate change**.

Developments in the **agri-food sector** have resulted in a general increase in land reclamation, drainage, agricultural production and increased silage production, stocking rates, reductions in mixed farming and impacts on water and air quality over many years. Pressures on biodiversity are likely to increase with the implementation of Government targets to grow the value of the sector by 60%. See **Chapter 11 Environment and Economy**.



A growing **population** is placing increasing pressure on our countryside to provide more housing and associated infrastructure. Since the 1950s, more than 40,000 hectares of countryside has been lost to urban development. This has contributed to the loss of terrestrial and freshwater habitats, and a decline in native species.

Associated activities such as mineral extraction and energy generation also place significant pressure on biodiversity. The impact of land-use change between 1998 and 2007 was a net loss of over 26,000 ha of terrestrial semi-natural habitats (see [NICS 2007](#)).

In **marine habitats**, fishery practices remain an important driver of change. Without suitable controls, fishing may cause both physical disturbance to the seabed and alter the community ecology, for example by removing predators and competitors and reducing juvenile or breeding populations. Management of fishing and aquaculture activities is necessary to ensure sustainable use of this resource.

In all habitats [non-native invasive species](#) have impacted negatively on the native environment and economy by predation, competition or the spread of disease. It is widely considered that invasive species are the second biggest threat to biodiversity after habitat destruction. Examples of non-native species in Northern Ireland which are causing a problem include grey squirrel, feral ferret and giant hogweed.

The impact of introduced plant and animal pathogens on biodiversity has become an increasingly important issue with outbreaks in recent years of *Phytophthora ramorum* on larch and *Chalara fraxinea* on ash. The potential spread of *Chalara* ash die-back could have profound impacts on our native woodlands (see Key Challenges in **Chapter 7, Land and Landscape**). Increasing effort through better regulation and targeted incentives have had significant impact in addressing many of the drivers and pressures in recent years (see **Chapter 5 Water, Chapter 6 Marine and Chapter 7 Land and Landscape**). However, at best this has only served to partly reduce their impact on biodiversity.

## 8 Biodiversity

### The Current Situation

#### Summary

The state of biodiversity is most directly measured through the area and condition of our semi-natural habitats. Habitats are critical to the survival of species, provide high natural capital and strong ecosystem services. Biodiversity can be also directly assessed through trends in widely distributed species.

Indicators on the state of biodiversity have been developed for the EU and UK. These indicators have been applied in this report where possible. However, where data is insufficient or uninformative other contextual information is provided.

#### Biodiversity Indicators

Biodiversity			
BD1: Nature Conservation Designations – area	(a) Area of nature conservation designations (2000/01 – 2011/12) (b) Areas of Special Scientific Interest (ASSI), designated as at March 2012 (c) Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites, designated as at March 2012	↑	Green
BD2: Nature Conservation Designations – condition	Condition of features within ASSIs for six year rolling period ending March 2012	↑	Green
BD3: Wild Birds	Wild bird populations in Northern Ireland (1994-2011)	No trend	Yellow
BD4: Wetland Birds	Wetland bird populations in Northern Ireland (1994/95 – 2010/11)	↓	Red
BD5: Priority Habitats	Trends in the status of Northern Ireland priority habitats (2000-2012)	↓	Red
BD6: Priority Species	Trend for Northern Ireland priority species (2000-2012)	↓	Red

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix



## 8 Biodiversity

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**Protected sites** The best examples of habitats and species in Northern Ireland are protected by a series of statutory designations. These include Areas of Special Scientific Interest (ASSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites (areas of wetland and waterfowl conservation), National Nature Reserves, Marine Nature Reserves and Local Nature Reserves. Small but encouraging improvements have been reported since the first full cycle of reporting in 2008.

**Birds in the wider countryside and at sea** Bird populations are considered to be a good indicator of the broad state of the wildlife and the countryside. All are subject to the provisions of the Birds Directive. Breeding bird data exists for Northern Ireland, but only for a limited range of species. Recent wintering wetland bird surveys have shown a decrease of 23% between 1994 and 2011.



**Status of threatened habitats** Priority habitats are semi-natural habitats which are especially important for native biodiversity. Forty Northern Ireland priority habitats were identified in 2000 with action plans published for most of these in 2003 and 2005. A major review of UK priority habitats resulted in a revised list of 51 being accepted as Northern Ireland priority habitats in 2010. These include habitats subject to the Habitats Directive which are reported through [Article 17 Reporting for the Habitats Directive](#). Most showed a decline, were stable or showed no clear trend between 2000 and 2012. The overall status for all European protected habitats in Northern Ireland has been reported as unfavourable.

**Status of threatened species** Priority species are those species where information indicates they require conservation action. In 2004, a list 271 Northern Ireland priority species were identified. This increased to 481 following a review in 2010, of which 86 priority species subject to European protection and reporting are presented in this report and reported on a three year cycle. Whilst data for individual priority species is varied, a significant number of species are showing decline.

**Other indicators of biodiversity** Other UK and European indicators of biodiversity pressures or sustainable management are addressed in other Chapters. These include:

- Soil quality (see LL1)
- Area of land in agri-environment schemes (see LL2)
- Area of forestry land certified as sustainably managed (see LL3)
- Water quality (see W1 and W2)
- Nitrates (see W4 and W5)

Other European and UK biodiversity indicators have been identified but these are still to be developed or their application in Northern Ireland needs further consideration.

## 8 Biodiversity

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### Biodiversity Indicators

#### Policy and Legislative Context

Key legislation for protecting priority species and habitats includes:

- [EC Habitats Directive](#) and [EC Birds Directive](#)
- [Conservation \(Natural Habitats, etc\) Regulations \(Northern Ireland\) 1995](#)
- [Environment \(Northern Ireland\) Order 2002](#)
- [Nature Conservation and Amenity Lands \(Northern Ireland\) Order 1985](#)
- [Wildlife \(Northern Ireland\) Order 1985](#)

The [EC Habitats Directive](#) (together with the [EC Birds Directive](#)) forms the cornerstone of Europe's nature conservation policy. It is built around two pillars: the [Natura 2000 network](#) of protected sites and the strict system of species protection. The directive protects over 1,000 animal and plant species and over 200 "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

In Northern Ireland, protection is mainly afforded through the designation of networks of statutory sites with some species afforded additional protection under the [Wildlife \(Northern Ireland\) Order 1985](#) and the [Conservation \(Natural Habitats, etc\) Regulations \(Northern Ireland\) 1995](#). [Planning Policy Statement 2 Planning and Nature Conservation](#) was revised in June 2013 and contains planning policies relating to statutory designated sites, priority habitats and priority species.

The European Community and its Member States are contracting parties to the [UN Convention on Biological Diversity](#) which recognises that biological diversity is a global asset of value to present and future generations. The European Commission Communication on [Halting the loss of biodiversity by 2010 – and beyond](#) underlined the importance of biodiversity protection as a pre-requisite for sustainable development, and set out a detailed [EU Biodiversity Action Plan](#) to achieve this including meeting obligations under the Habitats and Birds Directives.

In 2002, the [Northern Ireland Biodiversity Strategy](#) committed Government to recognising biodiversity within its policies and establishing delivery mechanisms. In 2010 the [Convention on Biological Diversity](#) developed new targets – the Aichi targets – which will be reflected in a revised Northern Ireland Biodiversity Strategy. This put a greater emphasis on the value of biodiversity to people through the ecosystem approach, which aims to ensure that the natural environment continues to provide us with essential services and benefits long term.

A range of other policies and legislation detailed in other sections, particularly **Air**, **Climate**, **Water**, **Marine**, and **Land and Landscape**, directly and indirectly benefit biodiversity.

## 8 Biodiversity

Summary of Nature Conservation Designations 2012 (As at March 2012)			
Designation	No of Sites	Area ha	Description
Area of Special Scientific Interest (ASSI) 	345	104,200	Sites of special value for their plant, animal, geological or physiographical features. ASSIs are designated under the <i>Environment (Northern Ireland) Order 2002</i> . Certain operations in these areas, such as reseeded, may require prior consent from NIEA.
Special Areas of Conservation (SAC) 	74	85,900	These protect some of the most seriously threatened habitats and species across Europe. They are designated under the <i>Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995</i> which transposes the EC Habitats Directive in Northern Ireland.
Special Protection Areas (SPA) 	17	114,600	These are classified for the protection of internationally important bird populations. They are designated under the <i>Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995</i> which transposes the EC Birds Directive in Northern Ireland.
Ramsar 	21	77,700	Internationally designated sites under the <a href="#">RAMSAR Convention</a> for wetland habitats and species. Most are of particular significance to wetland birds.

*Note: SAC and SPA sites are often collectively referred to as Natura 2000 sites*  
 Source: NIEA

## 8 Biodiversity

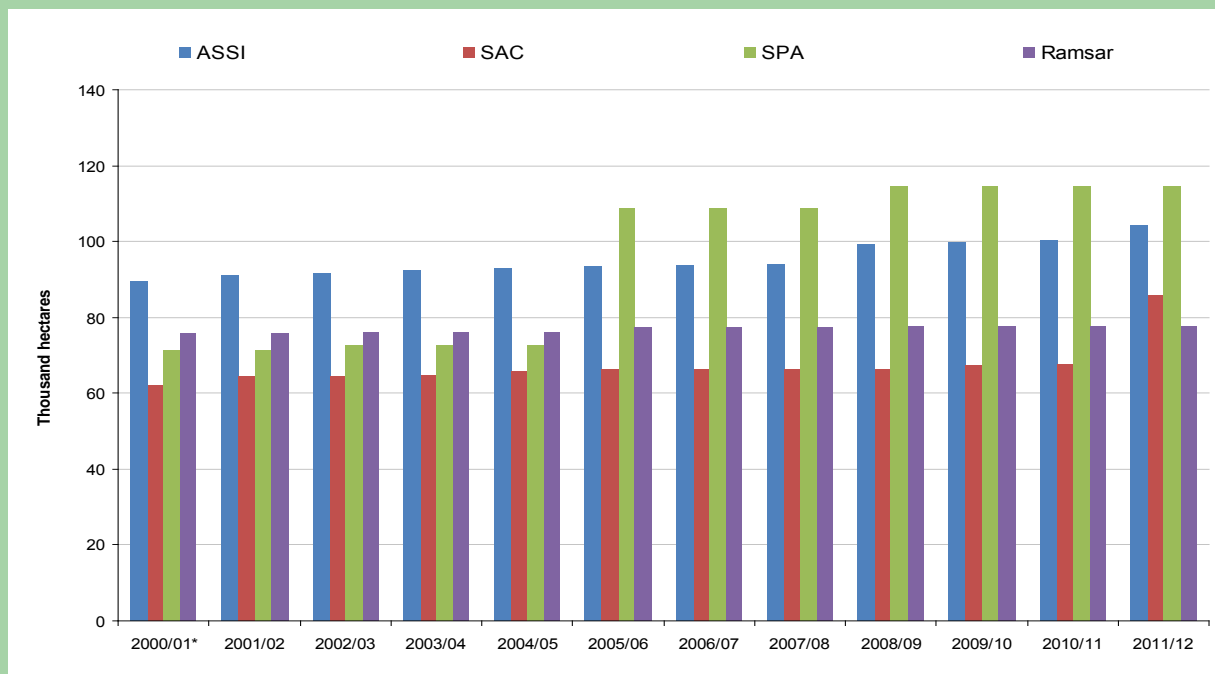
### Indicator BD1: Nature Conservation Designations – Areas

Identifying and protecting areas of special nature conservation interest, and the flora and fauna they support, has been a cornerstone of nature conservation action in the UK during the last 50 years. Such protection has been afforded to areas on land, to rivers and lakes, to parts of our coastline, and to areas of the surrounding sea. The different types of designation and associated data for Northern Ireland are summarised in Figure BD1.

Designated sites fulfil the requirements of European Birds and Habitats Directives, Ramsar Convention and [Nature Conservation and Amenity Lands \(Northern Ireland\) Order 1985](#). Sites are designated on the basis of their 'selection feature(s)', such as a particular species or habitat, which are monitored against a set of attributes which define favourable condition.

The total area covered by each of the four key international and national designations in Northern Ireland is shown in Figure BD1(a). Designations overlap, as some areas are deemed to be of such importance that they have been formally identified for protection under more than one statute. Therefore, the areas in Figure BD1(a) cannot be totalled to give an absolute figure on the extent of protected areas overall. Figures BD1(b) and BD1(c) show the spatial distribution of each designation.

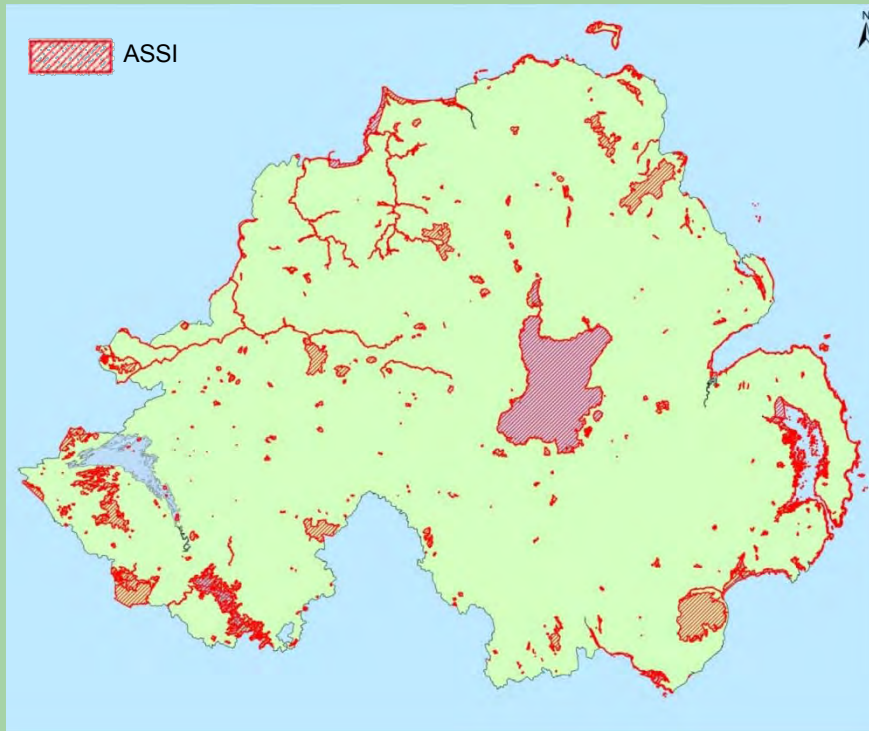
Figure BD1(a) Area of nature conservation designations (2000/01 – 2011/12)



Source: NIEA

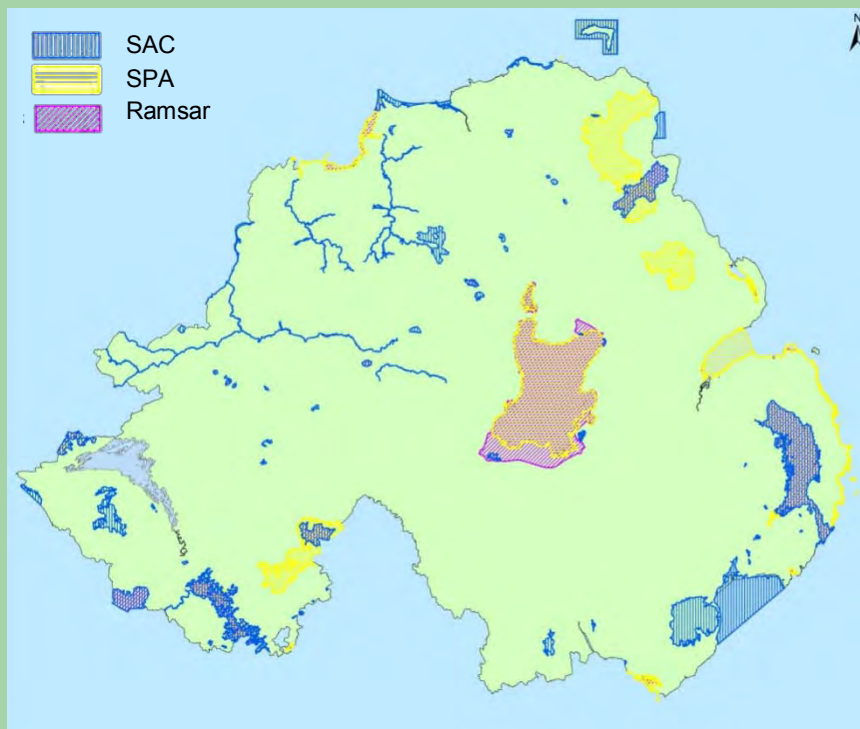
## 8 Biodiversity

Figure BD1(b) Areas of Special Scientific Interest (ASSI), designated at March 2012



Source: NIEA

Figure BD1(c) Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites, designated at March 2012



Source: NIEA

### Indicator BD2: Nature Conservation Designations – Condition

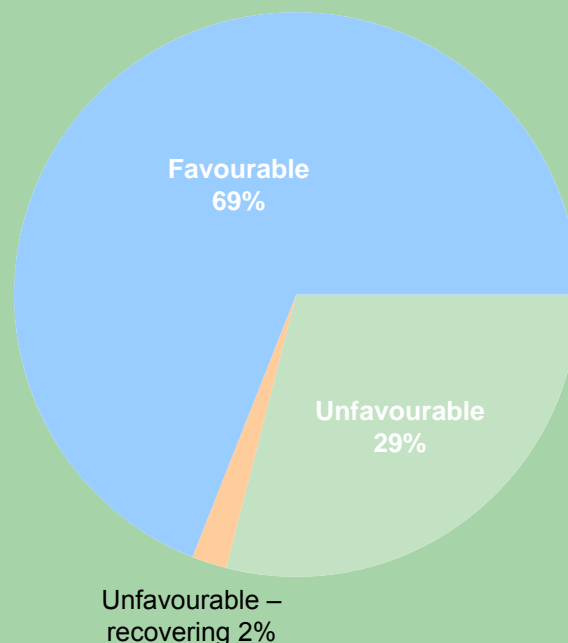
Areas of Special Scientific Interest (ASSIs) are designated sites protected under Northern Ireland law. They are selected based on specific qualifying features including earth science features, habitats and species. The condition of these features is assessed over a six year monitoring programme.

#### Data

The first full cycle was completed in March 2008, during which 916 features from 195 ASSIs were assessed. This data has been updated with the results from the subsequent four monitoring years. Over 1,000 features have now been assessed, including features re-assessed as part of the second six-year cycle, in addition to a number of new features on recently declared ASSIs.

69% of the features were in favourable condition and 29% in unfavourable condition as at March 2012. This is a slight improvement, as comparative figures for 2011 show 30% were in unfavourable condition in the previous year.

Figure BD2: Condition of features within Areas of Special Scientific Interest (ASSI), for the six year rolling period ending March 2012



Source: NIEA

## 8 Biodiversity

### Indicator BD3: Wild Birds

Northern Ireland's wild bird population is monitored as part of the UK BTO/JNCC/RSPB Breeding Bird Survey, which is undertaken annually at just over 3,000 sites across the UK. A similar survey, the Countryside Bird Survey, is undertaken in Ireland.

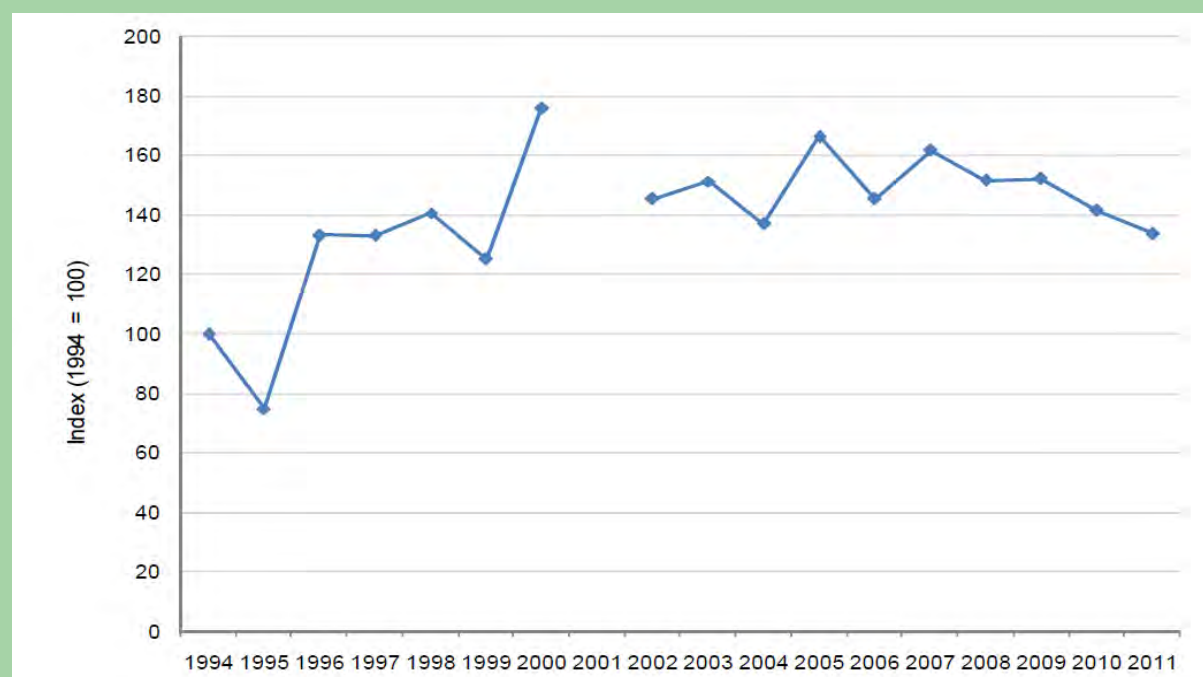
This indicator monitors the most common bird species, which tend to be generalist species and able to thrive in the wider countryside. Despite its limitations this allows consistent monitoring and easy identification of declining species.

#### Data

The [Wild Bird Index \(WBI\)](#) measures average population trends of a suite of representative wild birds, as an indicator of the general health of the wider environment. The WBI is an easy-to-understand indicator that can be calculated for different geographic areas and habitats. This means that different Wild Bird Indices (WBIs) can be produced for areas such as farmland and woodland, or inside and outside protected areas if suitable data is available.

In Northern Ireland, information on trends is available for 31 of the most common species. Data is absent for 2001 due to difficulties in collection resulting from the foot and mouth outbreak.

Figure BD3: Wild bird populations in Northern Ireland (1994 – 2011)



Source: BTO

## 8 Biodiversity

### Indicator BD4: Wetland Birds

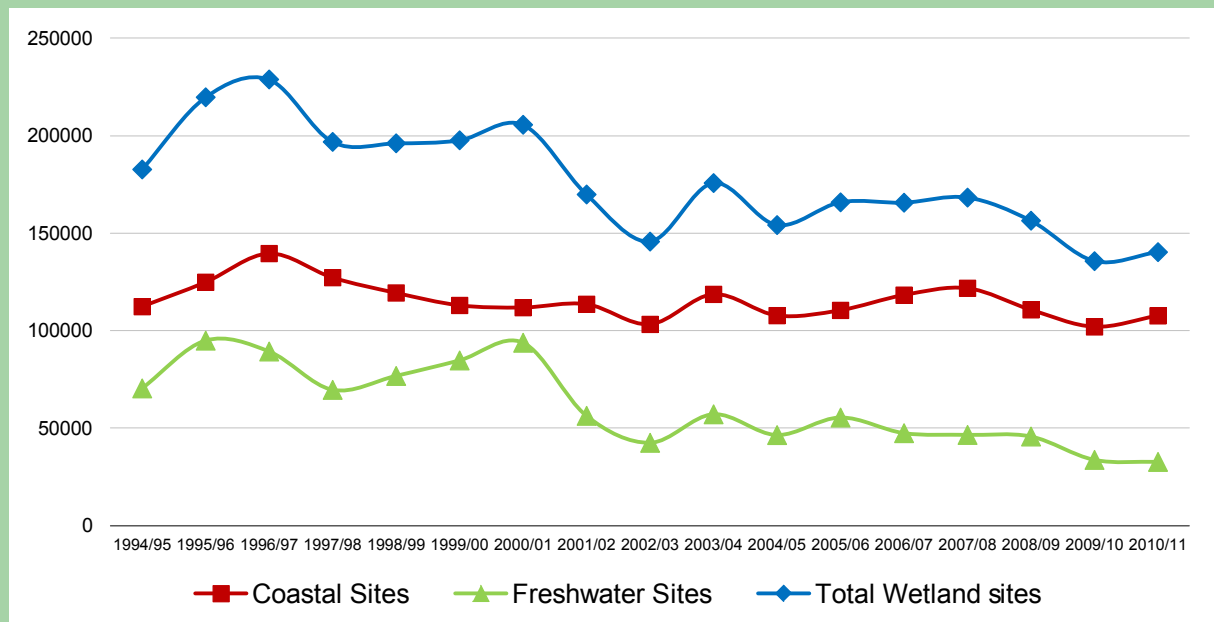
Northern Ireland's wetland bird populations are monitored as part of the [UK Wetland Bird Survey](#) (WeBS). This survey monitors non-breeding waterbirds across the UK, collectively identifying population sizes at local and regional scales, determining trends in numbers and identifying important sites. Numbers of all waterbird species, as defined by Wetlands International (Rose & Scott 1997), are recorded. In the UK, this includes divers, grebes, cormorants, herons, spoonbill, swans, geese, ducks, rails, cranes, waders and kingfisher.

#### Data

There are two main counts which make up WeBS: *Core Counts* are made at the most important sites for waterbirds in Northern Ireland including lakes, freshwater marshes, sections of open coast and estuaries. *Low Tide Counts* provide information on the relative importance of intertidal feeding areas of UK estuaries for wintering waterbirds and complement the information gathered by WeBS Core Counts.

Data in Figure BD4 are based on the ten main sites for waterbirds in Northern Ireland. These comprise seven coastal sites: Belfast Lough; Carlingford Lough; Dundrum Bay (Inner); Larne Lough; Lough Foyle; Outer Ards shoreline; Strangford Lough; and three freshwater sites: Lough Neagh, Lough Beg, and Upper Lough Erne.

Figure BD4: Wetland bird populations in Northern Ireland (1994/95 – 2010/11)



Source: BTO



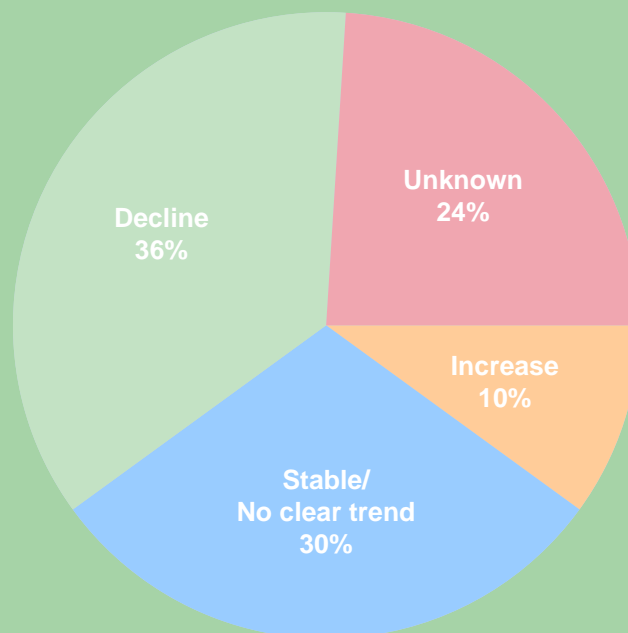
### Indicator BD5: Priority Habitats

The Northern Ireland Biodiversity Strategy 2002 listed priority habitats which are important for native biodiversity and require conservation action. This includes the habitats listed in the EU Habitats Directive. The list of UK priority habitats which are known to occur in Northern Ireland has been updated following a review of UK priority habitats started in 2005. NIEA has published 37 Habitat Action Plans which are used as a focus for the maintenance and enhancement of these habitats.

#### Data

A list of 51 Northern Ireland priority habitats was published in 2010, rising from 41 Northern Ireland priority habitats in 2000. Most of these were UK priority habitats reported on every three years and for the last time in 2008. Figure BD5 presents a summary of the trends in the status of the 51 current Northern Ireland priority habitats between 2000 and 2012.

Figure BD5: Trends in the status of Northern Ireland priority habitats (2000-2012)



Source: NIEA

## 8 Biodiversity

### Indicator BD6: Priority Species

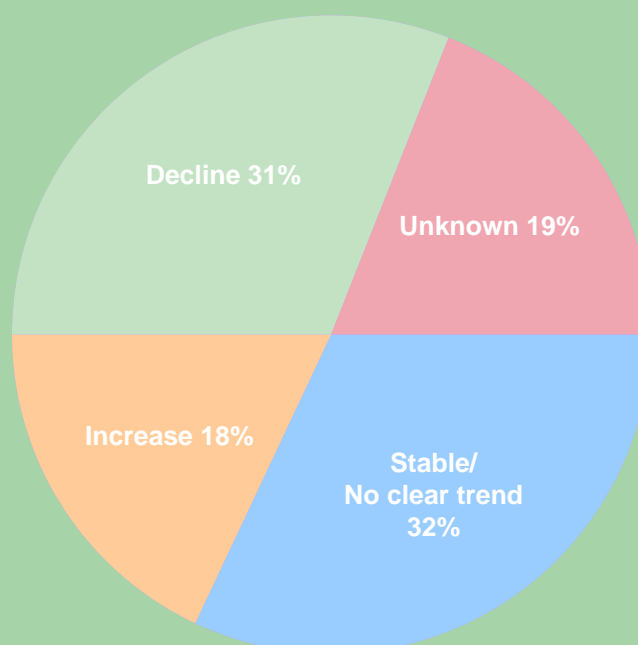
The status of priority species provides an indicator of change for a wide range of ecosystems and natural processes throughout the UK and is thus an indirect indicator of biodiversity. The need for Northern Ireland priority species requiring conservation action was identified in the Northern Ireland Biodiversity Strategy 2002, with a list of 271 published in 2004. These include those mentioned in EU Directives.

Currently, the list of [Northern Ireland priority species](#) stands at 481. Species Action Plans have been published for 35 species. The Northern Ireland priority species have been included as part of a range of government policies and actions such as for planning and agriculture.

#### Data

Reporting on all 481 Northern Ireland priority species is difficult because data for most species is not available. For this reason, only the status of 86 Northern Ireland priority species which are subject to European protection (Annex 1 of the Habitats Directive and all birds) is presented here.

Figure BD6: Trend for European protected Northern Ireland priority species (2000–2012)



Source: NIEA

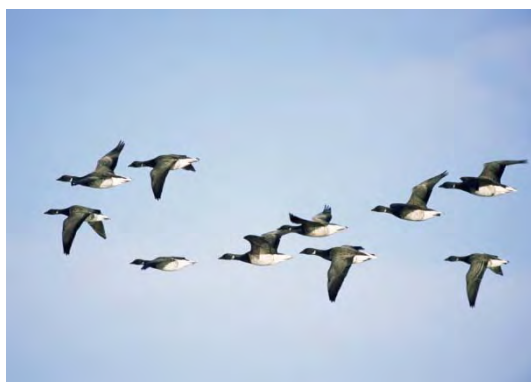
## 8 Biodiversity

### Commentary

**Indicators BD1 and BD2: Nature Conservation Designations** The number and area of designated ASSIs has increased since 2008 as the programme of designations has progressed. A slight improvement has also been recorded in the condition of ASSIs. Although small, this improvement is encouraging. However, restoration is a lengthy process and rapid improvement is not expected. NIEA is working with landowners and other stakeholders – in particular the Department of Agriculture and Rural Development through its NI Countryside Management Scheme and other agri-environment schemes – to ensure that sympathetic management of ASSIs is in place.

**Indicator BD3: Wild Birds** Between 1994 and 2011, the wild bird index has increased by 34%. However not all of the underlying bird populations are increasing. For example, the Blackbird and Chaffinch are increasing whereas the Mistle Thrush, Skylark and Meadow Pipit are decreasing. Overall the indicator has remained relatively static since 2001.

**Indicator BD4: Wetland Birds** Between 1994/95 and 2010/11 the total wetland bird population is estimated to have decreased by 23%. Coastal populations declined by 4% while freshwater populations declined by 54%. The declines in the total and freshwater figures relate to the major, and perhaps ongoing, decline of wintering waterbirds (principally diving duck) at Lough Neagh.



The most notable change has been the decline in diving duck on Lough Neagh (including Pochard, Tufted Duck and Goldeneye) while Wigeon and a range of shorebirds (Ringed Plover, Golden Plover, Lapwing, Dunlin and Turnstone) have also declined. It is thought that milder winters may be a factor for some of these species resulting in their wintering closer to their breeding sites.

In contrast, there have been increases in wintering populations of Whooper Swan, Canadian Light-bellied Brent Goose (for which Northern Ireland is the most important location in the world), Eider and Black-tailed Godwit.

**Indicator BD5: Priority Habitats** Most habitats showed a decline or were stable (or showed no clear trend) between 2000 and 2012. Of the 18 declining habitats, grassland and associated wetland habitats had the largest decline due to changes in farming practices. Conversely, woodland priority habitats have increased due to succession. Overall, a reduction in nutrients has generally benefited rivers although some lake habitats, especially marl lakes, continue to show declines. Trends for half of the 18 marine priority habitats are unknown.

## 8 Biodiversity

[Article 17 Reports](#) for the Habitats Directive have concluded that the overall status for all European protected habitats in Northern Ireland is unfavourable and, for most, their future prospects are bad / unfavourable. Key factors affecting priority habitats are changes in farming practices (especially over-grazing and under-grazing), water and air quality (particularly nutrient enrichment), development, invasive species and fisheries practices. See <http://www.doeni.gov.uk/niea/biodiversity/habitats-2.htm>

**Indicator BD6: Priority Species** Trends for Northern Ireland mirror the long-term declines being reported for many UK species which were presented in the "[State of Nature Report](#)" published in May 2013.

The data for individual European protected priority species is very varied and in many cases expert judgement is required to interpret this. Relatively good data exists for most birds and some other species such as seals.

For other species their true status is not clearly understood. These include the slender green feather-moss, which was thought to be extinct in Northern Ireland but was found at two new sites in 2012, and the marsh fritillary butterfly which continues to be found at new sites although the main habitats where it occurs are declining. However, a significant number of species are showing clear declines. These include breeding waders such as the curlew (see Box).



### Curlew

The curlew formerly bred on wet grassland throughout Northern Ireland with an estimated 5000 breeding pairs in 1988. By 2000 it had declined by more than 50% and as result became the subject of a Northern Ireland Species Action Plan. Research into the factors causing the decline has failed to halt it, despite site designation, targeted agri-environment options and more careful consideration of the siting of recent wind farm development.



Recent work led by the RSPB on nature reserve management and the [INTERREG IV Halting Environmental Loss Project \(HELP\)](#) are showing encouraging signs of success. The need to build on this work is critical if we want to retain this iconic bird as a breeding species in Ireland.

## 8 Biodiversity

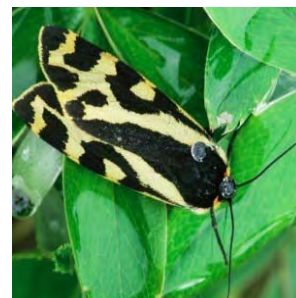
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### Key Challenges

The general aim of both the current and the revised Northern Ireland Biodiversity Strategy is to halt overall biodiversity loss. This remains one of our most difficult environmental challenges as data presented in SOE2013 shows a clear loss of biodiversity since 2000 and a decline in important elements of our natural capital.

The overall loss of biodiversity is uneven, with some habitats such as woodland showing increases while others such as grasslands show a decrease. Losses have been caused by six key factors:

- Changes in farming practice, including both intensification and agriculture abandonment
- Invasive species
- Nutrient enrichment in freshwater habitats
- Aerial deposition of nitrogen
- Plant and animal pathogens
- Rural development and urbanisation



The lack of robust data for developing and reporting on biodiversity indicators is an important issue. Relevant data may not be available or can only be reported on over relatively long timescales, and the potential to increase supporting data to address new challenges for Northern Ireland is limited. However, further development of indicators will be required to help prioritise actions to halt biodiversity loss.

A decline in biodiversity will have adverse effects on our [Natural Capital](#), which provides a wide range of ecosystem services as detailed in the [NEA report \(2011\)](#). The benefits that ecosystems have to society will be a central focus of the revised Northern Ireland Biodiversity Strategy, anticipated in 2014. This will also outline actions required to address underlying causes of biodiversity loss, direct pressures on biodiversity and safeguard ecosystems and species.

### Responses

Considerable action has been taken in recent years to halt and reverse biodiversity loss, primarily through the designation of protected sites. Practical conservation and improvement work takes place on the ground through engagement with public, private and NGO stakeholders, while the identification of priority species and habitats continues to inform government policy. Action is being taken to improve the data required to report on the Habitats Directive and support the key role which volunteers are playing in monitoring species.

## 8 Biodiversity

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There will be an increasing need to build on the actions already taken including ongoing designation and management of nature conservation sites. New opportunities exist through the Rural Development Plan, through the Biodiversity Duty in the [Wildlife and Natural Environment \(Northern Ireland\) Act 2011](#) and encouraging the adoption of an ecosystem approach. The last in particular will facilitate a broader base for addressing biodiversity loss which will benefit the Northern Ireland economy and the well-being of its people.



## 8 Biodiversity

### ANNEX Biodiversity Legislation and Policy Drivers

EC Directives	Description
<a href="#">Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora</a> (Habitats Directive)	The provisions of the Directive require Member States to introduce a range of measures including the protection of habitats and species listed in the Annexes; to create and maintain a network of protected sites known as “Natura 2000”; to undertake surveillance of habitats and species and produce a report every six years on the implementation of the Directive.
<a href="#">Directive 2009/147/EC</a> (Birds Directive)	The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe.
International Agreements	Description
<a href="#">RAMSAR Convention</a>	The convention seeks to protect wetlands for their value and for the species which they support.
UK Policy & Strategy	Description
<a href="#">UK Biodiversity Action Plan</a> <a href="#">UK Biodiversity Framework</a>	The UK Biodiversity Action Plan identified priority species and habitats as being the most threatened and requiring conservation action.  The UK Post-2010 Biodiversity Framework (published 2012) is a joint agreement between the environment departments of the four UK governments designed to identify the activities needed to galvanise and complement country strategies, in pursuit of the Aichi targets.
Local Legislation	Description
<a href="#">Wildlife and Natural Environment Act (Northern Ireland) 2011</a>	This amends the Wildlife (NI) Order 1985 and the Environment (NI) Order 2002 and adds new provisions to protect a greater range of plants, animals, birds and to increase protection to Areas of Special Scientific Interest. The legislation gives authorities new powers.
<a href="#">Nature Conservation and Amenity Lands (Northern Ireland) Order 1985</a>	Makes provision with respect to nature conservation, enjoyment and conservation of the countryside, and amenity lands. Places particular emphasis on the establishment of a network of Areas of Special Scientific Interest and Nature Reserves.
<a href="#">Sites of Local Nature Conservation Importance (SLNCIs)</a>	These are important local sites of substantive biodiversity or geological value which have been adopted into Area Plans. Special planning policies apply to SLNCIs.
<a href="#">Local Biodiversity Action Plans (LBAP)</a>	Based on the UK Biodiversity Action Plan published in 1994 as a result of the UK’s sign up to the Convention on Biological Diversity (CBD) in Rio de Janeiro in 1992. LBAPs aim to aid recovery of the most threatened habitats and species
<a href="#">Areas of Special Scientific Interest (ASSIs)</a>	SACs and SPAs are primarily protected by the Habitats Regulations and most are underpinned by declaring the site as an ASSI. This provides specific legislative protection and places obligations on public bodies.

## 8 Biodiversity

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Northern Ireland has a rich heritage of archaeological sites, monuments and buildings representing the aspirations and achievements of past societies and providing evidence of settlement, industrial, agricultural and ritual activity from 9,000 years ago to the present day. This chapter looks at the heritage assets of

Northern Ireland including those at risk, and grants given to encourage building conservation.

### Key Messages

- New opportunities for the historic environment to provide a focus for regeneration, tourism and **economic development** are emerging.
- Northern Ireland's **archaeological resource** remains at risk from agricultural land use practices such as ploughing and tree planting and from development in urban areas. Surveying of historic monuments is also being reprioritised to target areas most likely to be affected by **climate change**.
- The **Second Survey of Buildings of architectural or historic interest** has led to a modest increase in the number of listed buildings. 50% of Northern Ireland is now covered.
- An increase in **building preservation notices** in the last decade may be a result of increased development pressures. A sudden increase in fires in listed buildings since 2011 reflects the increased need to address threats from heritage crime.
- The number of structures on the **Built Heritage at Risk in Northern Ireland** database has increased from 456 to 509 since 2005. This may be associated with the downturn and continuing survey work to identify such buildings.

## 9 Built Heritage

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### Introduction

Built Heritage includes both the rich archaeological resources of Northern Ireland, including terrestrial, coastal and maritime, and the historic buildings representing Northern Ireland's architectural heritage. Built heritage provides an important resource for providing insight into the history of the province, and is a key aspect in providing our sense of place. Identifying, protecting and conserving the best of our **heritage assets** is vital to ensuring that they are adequately maintained and enhanced for the appreciation and enjoyment of current and future generations.

Our landscape is influenced greatly by our **historic environment** (that part of environment affected by the action of man) and the two are inseparably linked. Monuments and buildings, which we have inherited from our ancestors, are important spiritual and visual landmarks and each contributes to the overall character of a place. They are also an important source of architectural, historic, archaeological and scientific information.

Our historic environment provides an important educational resource, with some sites visited by up to 25,000 school pupils each year. NIEA has developed curriculum based resources linked to monuments in State Care, such as Carrickfergus Castle, Dunluce Castle, Bellaghy Bawn, Devenish Island and Dundrum Castle. It also contributes significant resources to the annual [European Heritage Open Days](#) event.

Our **Heritage Assets** (see table below) are buildings and landscapes, buried remains and areas of architectural or historic interest. Some of these assets have statutory protection as listed buildings, state care or scheduled monuments. Others may be included in designated conservation areas, historic parks and gardens, World Heritage Sites, and Areas of Outstanding Natural Beauty.

The Second Survey of Buildings of Architectural or Historic Interest, currently being carried out by NIEA, seeks to identify and record those structures with the potential to become listed buildings. Around 50% of Northern Ireland has now been surveyed with a target date for completion of 2020.

Research has also been commissioned on the overall condition of Northern Ireland's Listed Buildings.

NIEA's approach to surveying archaeological sites and historic monuments is being reprioritised to target areas most likely to be affected by climate change, following a review undertaken by the Centre for Maritime Archaeology at the University of Ulster on behalf of NIEA and completed in January 2013 (see [Drivers and Pressures](#)).

## 9 Built Heritage

Table BH1: Heritage Assets

Feature	Number 2012	Description
<a href="#">Sites and Monuments</a> 	Approx 16,000	Sites and monuments include a wide range of features, such as megalithic tombs, prehistoric ritual earthworks, occupation sites, churches and castles. The most significant examples are protected as Scheduled Historic Monuments. Information on all these sites is available online through the <a href="#">Northern Ireland Sites and Monuments Record</a> .
<a href="#">Monuments in State Care</a> 	190	Monuments in State Care are historic monuments which are owned by or in the guardianship of the state, and are fully maintained by the State. They are among the sites and monuments which are of the greatest importance within Northern Ireland.
<a href="#">Scheduled Historic Monuments</a> 	1,939	Scheduled Historic Monuments are a selection of the best or most rare and vulnerable of our archaeological sites. They include a range of site types, such as megalithic tombs, prehistoric and Early Christian ritual and settlement earthworks, church and castle ruins and features of industrial, defence or maritime heritage importance. These sites are generally in private ownership and the purpose of scheduling is to provide statutory protection to them.
<a href="#">Historic Buildings</a> 	Over 9,000	NIEA has recorded information on a wide sample of historic buildings in order to select buildings of special architectural and historic interest for listing under the Planning (NI) Order 1991. Over time the online <a href="#">Historic Buildings Database</a> will contain information on all of these structures as well as listed buildings. Information is currently available for 50% of Northern Ireland.
<a href="#">Listed Buildings</a> 	8,497 (2011-12)	Listed Buildings are defined as buildings of special architectural or historic interest and date principally to the past three hundred years. They include many structures, from post boxes, bridges, simple thatched cottages, and large stately homes, to commercial and industrial buildings. The purpose of listing is to protect the special interest of the building.

## 9 Built Heritage

<p>Historic landscapes and townscapes</p> 	<p>10 Areas of Significant Archaeological Interest</p> <p>60 Conservation Areas</p>	<p>Historic landscapes and townscapes may be designated in their own right as <a href="#">Areas of Significant Archaeological Interest</a>, <a href="#">Conservation Areas</a>, <a href="#">Areas of Townscape Character</a> or <a href="#">Local Landscape Policy Areas</a>. These reflect the importance of group value and the historic character of an area because of history, archaeological potential, setting, association, integrity or uniqueness. Scale ranges from large landscapes to city and town centres, villages, small parks and individual streets.</p>
<p><a href="#">Industrial Heritage</a></p> 	<p>Approx 15,000</p>	<p>The Industrial Revolution had a major impact on life and left a legacy of sites related to Northern Ireland's world dominance of the linen and shipbuilding industries. These include many water and steam-powered mills, an extensive canal system and the remains of a once extensive railway system. The Industrial Heritage Record is being developed to include details of these sites, cross referenced from the Buildings Database.</p>
<p><a href="#">Defence Heritage features and battlefields</a></p> 	<p>650 and 330 respectively</p>	<p>Defence heritage refers to 20<sup>th</sup> century defence structures throughout Northern Ireland including observation posts, airfields, harbours, naval and flying boat bases, air raid shelters, training trenches, gun and search emplacements and pillboxes. The Battlefields Register is currently in preliminary development.</p>
<p><a href="#">Parks, Gardens and Demesnes</a></p> 	<p>700 Heritage Gardens Inventory of which 154 registered 150 supplementary list</p>	<p>Historic parks, gardens and demesnes recorded in the <a href="#">Heritage Gardens Inventory</a>, are often associated with grand country houses, or public and private institutions. They are distinguished by carefully composed designs of trees, meadow and water features or plants collections. The most significant have been identified for designation in the <a href="#">Register of Historic Parks, Gardens and Demesnes of Special Historic Interest, and associated Supplementary list</a>.</p>
<p><a href="#">Maritime Heritage</a></p> 	<p>Over 3,000 shipwrecks</p>	<p>The coast and the surrounding sea holds a great deal of archaeological evidence, providing information on our maritime past. This record includes objects and structures of historical or archaeological importance on the foreshore and sea bed to 12 nautical miles offshore and historic wrecks which may be designated for protection. NIEA has established a maritime record which is being incorporated into the <a href="#">Northern Ireland Sites and Monuments Record</a>.</p>

Source: NIEA. For further information on location see the NIEA [Built Heritage Map Viewer](#).

## 9 Built Heritage

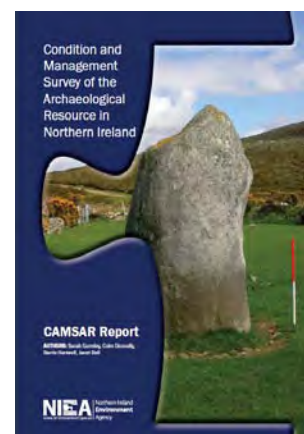
### Drivers and Pressures

Northern Ireland's built heritage has been affected by **population growth** and **agricultural expansion** since the 18<sup>th</sup> century. However, with the decline in population after the 1840s famine the rate of destruction of field monuments was low until the UK joined the EU in the 1970s. This precipitated major landscape changes in reclamation of marginal land and the removal of peatland. A trend to replace historic rural buildings, many of which were very small, has developed over the last thirty years. The 1998 publication on rural buildings [A Sense of Loss, the survival of rural traditional buildings in Northern Ireland](#) noted that 49% of buildings indicated on the 1909 map had gone by that time. Further losses have continued in the 21<sup>st</sup> century.

### Agricultural pressures

Archaeology and built heritage resources in rural areas tend to be most susceptible to impacts associated with **agriculture**, particularly those arising from cultivation, but also stock density and machinery. Since the 1980s strong policies on environmental protection largely administered through the [Department of Agriculture and Rural Development](#) have brought protection to all known archaeological sites and much incentivised good management. The [Common Agricultural Policy](#) has greatly improved the condition of land in general and earthwork monuments in particular by reducing herd sizes.

Northern Ireland's archaeological resource still remains at risk from arable practices including re-seeding of grassland and development pressures in urban areas. The [Condition and Management Survey of the Archaeological Resource \(CAMSAR\)](#) report published by NIEA in 2009 identified prehistoric monuments in arable and improved grassland as most vulnerable and recommended that statutory protection through scheduling should be targeted at these areas.



### Development pressures

The current population of Northern Ireland stands at 1.8 million and there have been many societal changes over the last 50 years which have altered family units, and resulted in a huge increase in demand for housing and rural development.

A range of development pressures in the last five years may have had both positive and negative impacts on our historic environment. At the time of the first State of the Environment report, there were high numbers of planning applications and requests from the public to protect unlisted historic buildings threatened with removal. New powers were used to temporarily list buildings where it appeared that the building was of special architectural or historic interest and under a clear threat. The number of such notices rose to a peak of 20 in 2009/10 but declined rapidly after that as pressure for development declined.

## 9 Built Heritage

The economic downturn has also led to a reduction in schemes to conserve historic buildings including those at risk. In 2012, an increase in grant assistance from 35% to 45% for repair work to most listed buildings resulted in a 20% increase in applications.

Increased demand for road improvements exposed previously unknown archaeological sites, such as Drumclay Crannog (see box).

### Infrastructure development pressures: Drumclay Crannog, Enniskillen



The Drumclay Crannog, once an artificial island set in one of the hundreds of dried-up lakes in County Fermanagh dates back to the 7<sup>th</sup> century AD and was occupied until the 17<sup>th</sup> century. An excavation carried out on the Crannog during 2012-13, in advance of a road scheme, uncovered the remains of over 30 houses with wattle walls, timber thresholds, numerous hearths and intact subfloor timbers within a 4m depth of deposits.

Items found by the archaeologists during excavation included many ornate dress pins and display combs made by very skilled crafts people. Several open days at the Crannog excavation proved very popular with the public attracting around 1,500 visitors.

Source: NIEA



Pressures on the use of land, its value, and relative redevelopment costs may, however, lead to abandonment, or demolition in favour of new build. Once lost, heritage sites cannot be replaced.

A further pressure from the economic downturn included the increased frequency of fires at listed buildings. In the three month period from April to June 2011, the number of fires increased from around one or two per year to eleven. The upsurge in arson attacks against Listed Buildings has resulted in damage ranging from minor scorching to the complete loss of interiors. The worst of these was the fire at Herdman's Mill in Sion Mills, County Tyrone in 2011. This led to a series of Heritage Crime Summits and the development of a 12 point action plan. A key action has included funding to enable the issue of urgent works notices and warning letters. This has resulted in a significant drop in the incidence of fires.



## 9 Built Heritage

### Economic drivers

Numerous features of the historic environment have provided a focus for **regeneration** and **tourism**. In May 2010 NIEA published a report highlighting [Heritage Led Regeneration in the Derry City Council Area](#). The agency along with partners such as Derry City Council, [Northern Ireland Tourist Board \(NITB\)](#) and [Ilex](#) has worked hard to realise this potential.

#### Regeneration opportunities: Ebrington Barracks, Derry~Londonderry

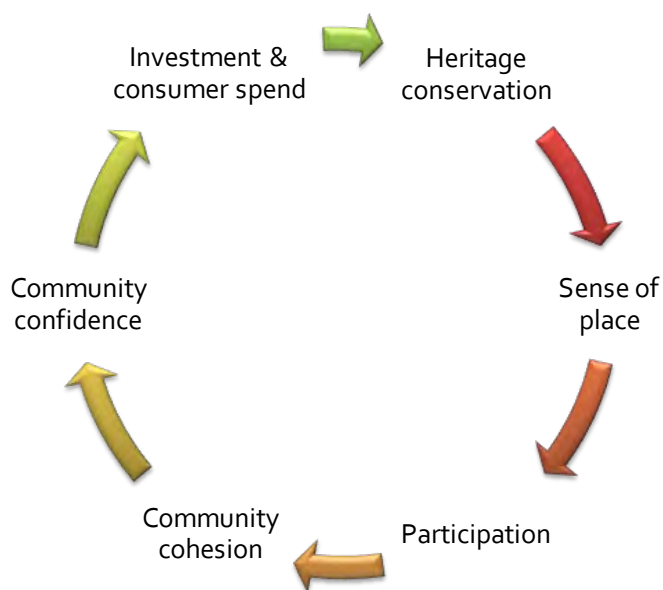


Built in 1841 and previously used as a military/navy base, the defensive “star fort” walls of the barracks are a scheduled historic monument, enclosing a number of listed buildings within. The heritage-led regeneration scheme has retained the historic assets of the site, and used them as the basis for a vibrant new development, which is bringing life, business and new opportunities into this Waterside area and providing a connection, across the Peace Bridge, to the City centre.

Many of our historic sites and buildings are visitor attractions. The [Study of the Economic Value of Northern Ireland’s Historic Environment](#) published in June 2012 placed a strong emphasis on realising the potential social, economic and environmental benefits of our heritage assets (see **Chapter 11**). This includes not just the iconic state care monuments but historic villages and towns and the wider historic environment.

Historic assets will have a limit to their capacity to absorb visitor numbers, especially if fragile or where demand is high. When combined with the perceived need for modern visitor facilities, there is potential for negative impacts from accidental damage, wear and tear or inappropriate development.

Social and cultural values are generally the drivers for investment which then provides tangible economic benefits to various sectors, including tourism and construction. Such economic benefits ensure the conservation of the historic environment and hence sustain social and cultural benefits.



### Dunluce Innovation Trial



The Dunluce Project, led by NIEA and supported by development funding from the Heritage Lottery Fund, aims to realise the full economic, social, heritage and environmental potential by delivering:

- An exciting and engaging heritage destination, through the excavation, conservation and interpretation of the 17<sup>th</sup> century town and historic castle gardens.
- World-class visitor facilities that tell the story of the castle and its surrounding landscape.
- A highly accessible visitor destination, integrated with other sites on the Causeway Coastal Route.

### Climate change

The [Climate Change and Cultural Heritage](#) project identified four main projected changes in our future climate which have the potential to impact on our historic environment (see **Chapter 4**). These include:

- Rising temperatures
- Reduced summer rainfall and higher summer temperatures
- Increased winter rainfall and more intense summer storms
- Sea level rises.

All four projected changes are likely to have negative consequences for the historic environment in Northern Ireland. There are strong additional negative consequences for archaeological features near coasts or in freshwater and wetlands which will need particular attention to record them in advance of major change. Human intervention to deal with these predicted changes, such as engineered coastal safeguards, also has potential to cause significant harm to the built heritage if not carefully managed.



## 9 Built Heritage

### The Current Situation

#### Summary

The recorded numbers of scheduled monuments and listed buildings have increased since 2001/02 reflecting ongoing survey, designation and assessment. This provides an indication of the extent of these historical assets and recognises the value of our built heritage within Northern Ireland. The number of scheduled monuments has increased by 26% in the last decade from 1,500 in 2001/2002 to 1,900 in 2011/2012. Nearly 8,500 buildings are now listed because of their special architectural or historic interest.

**Scheduled sites** are managed by their owners and the condition of scheduled monuments is assessed by regular Field Monument Warden visits. The [CAMSAR assessment of the archaeological resource](#) published in 2009 identified that 70% of protected sites in State Care, Scheduled or in Agri-Environment management agreement are in good condition.

However the numbers of **buildings at risk** recorded on the Built Heritage at Risk in Northern Ireland (BHARNI) database increased to 509 in 2011/12. Twelve buildings had been removed since the previous year.

During 2011/12, over £4 million in funding was spent on 141 grants for listed buildings with 60.6% of the total grant funding spent on those properties recognised as being of outstanding or exceptional merit.

#### Built Heritage Indicators

Built Heritage			
BH1: Monuments	Number of scheduled historic monuments (2001/02 – 2011/12)	↑	Green
BH2: Listed Buildings	Number of listed buildings by grade (2003/04 – 2011/12)	↔	Yellow
BH3: Built Heritage at Risk	Number of buildings and monuments at risk (2003/04 – 2011/12)	↑	Red
BH4: Listed Buildings Grant Funding	Value of grant paid and the number of buildings in receipt of grant in each listed building grade (2007/08 – 2011/12)	No trend	Grey

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

# 9 Built Heritage

## Built Heritage Indicators

### Policy and Legislative Context

There are upwards of 35,000 historic monuments and sites in Northern Ireland dating from 9,000 years ago to the recent past.

**Scheduled Historic monuments** are those which are designated for protection under the [Historic Monuments and Archaeological Objects \(NI\) Order 1995](#). The Schedule is compiled and maintained by NIEA and sites and monuments may be added to it after evaluation against the criteria identified in [Planning Policy Statement 6: Planning, Archaeology and the Built Heritage \(PPS 6\)](#).



Scheduling protection is extended to features in private or public ownership, including those on the foreshore and the seabed. It cannot be applied to any building occupied as a dwelling house (except by a caretaker) or churches in use for worship. No works may be undertaken which may affect a scheduled monument without first obtaining Scheduled Monument Consent from the Department.

[The Planning \(Northern Ireland\) Order 1991](#) enables **lists of buildings of special architectural or historic interest** to be compiled. In choosing buildings to be listed, criteria such as its architectural features, condition and setting are taken into account. The building's historical associations, historical importance, social importance and scarcity are also considered.

NIEA is consulted in regard to planning applications which may affect archaeological sites, monuments of local importance and non-listed vernacular buildings, as well as listed buildings and scheduled or State Care monuments under [Planning Policy Statement 6: Planning, Archaeology and the Built Heritage \(PPS 6\)](#).

Listed Buildings explained
<b>Grade A</b>
Buildings of national importance including both outstanding grand buildings and the fine, little altered example of some important style or date.
<b>Grade B+</b>
Buildings that might have merited A status but for relatively minor detracting features such as impurities of design, or lower quality additions or alterations. Also buildings that stand out above the general mass of grade B1 buildings because of exceptional interiors or some other features.
<b>Grade B1 and Grade B2</b>
Buildings of local importance or good examples of some period of style. Some degree of alteration or imperfection may be acceptable.



Area Plans will often designate specific local heritage features for protection, for example a historic garden site, and may introduce tailored local policies. Regional Policies also exist in regard to heritage assets, which apply to both those which have existing statutory protection, such as a State Care monument, and those which are not currently designated.

### Indicator BH1: Monuments

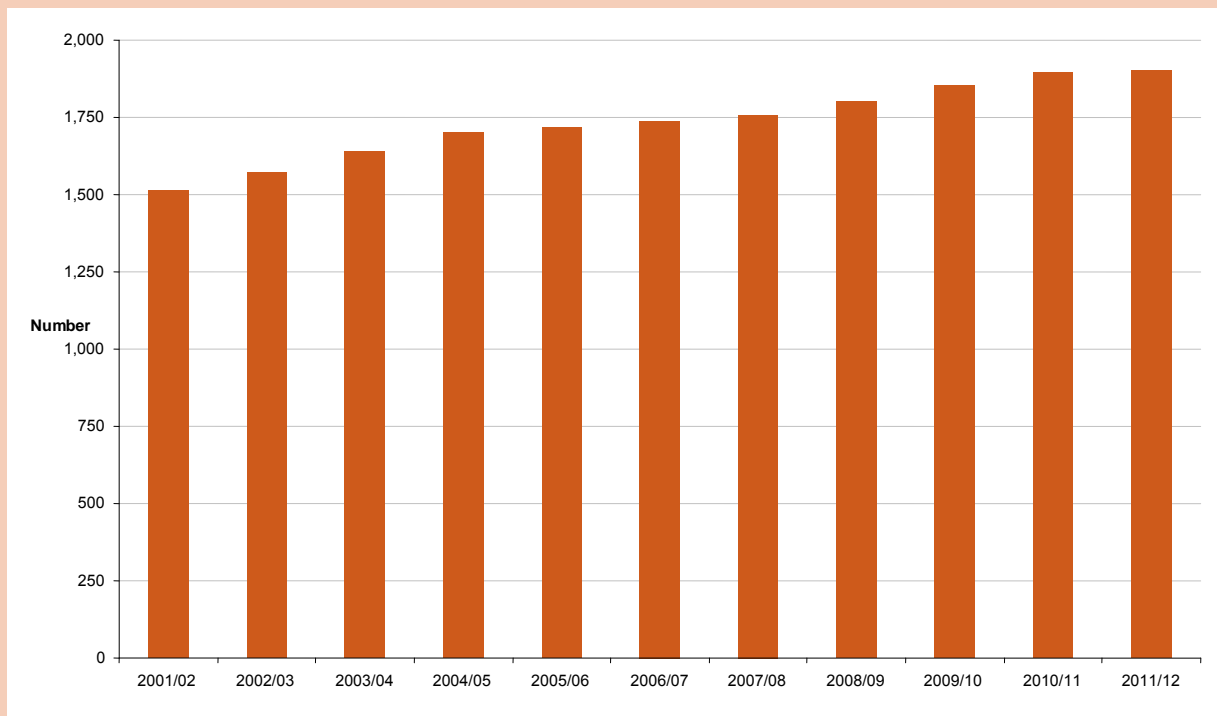
#### Number of Scheduled Historic Monuments (2002/03 – 2011/12)

Monuments and sites provide evidence of prehistoric and historic human activity and processes. They may range from visible burial places, fortifications and ruins, to below ground archaeological sites spread across wide tracts of land. Monuments may also be located in maritime environments. Scheduled sites are managed by their owners under Built Heritage guidance and are monitored for condition and risk by Field Monument Wardens.

#### Data

Overall there has been a 26% increase in the number of scheduled monuments rising from 1,513 in 2001/02 to 1,900 in 2011/12.

Figure BH1: Number of Scheduled Historic Monuments (Cumulative Total) (2001/02 – 2011/12)



Source: NIEA

## 9 Built Heritage

### Indicator BH2: Listed Buildings

#### Number of listed buildings by grade (2003/04 - 2011/12)

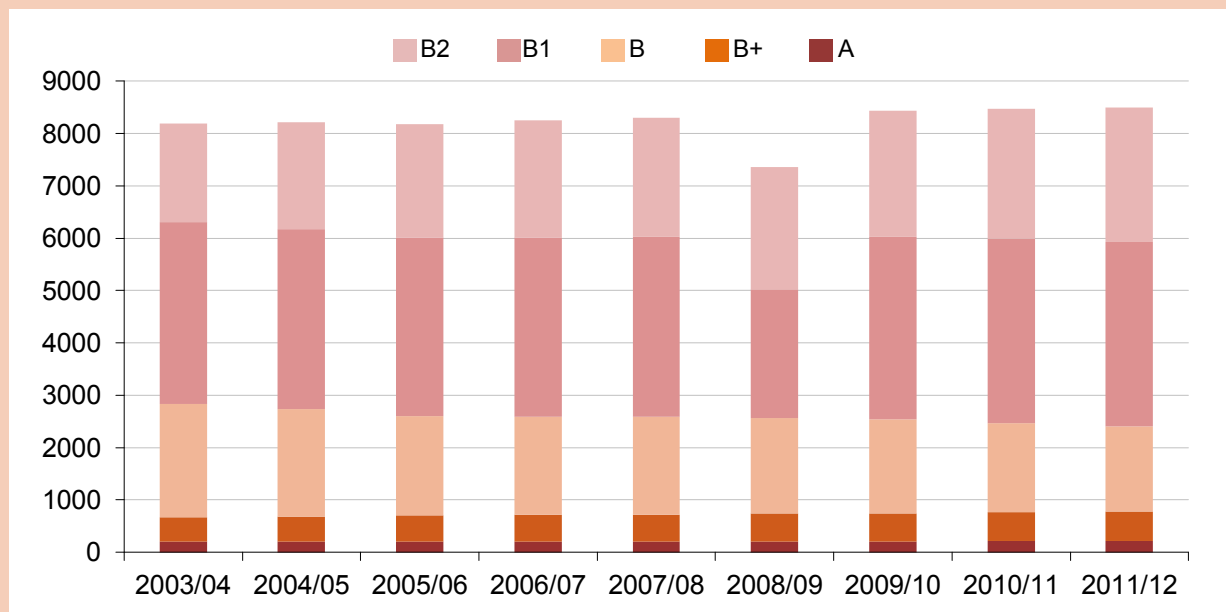
Listed buildings are those of special architectural or historic interest and represent our most important historic buildings.

#### Data

There has been a modest increase in the number of buildings listed in recent years with a total of 8,497 statutory listings in 2011/12, compared to 8,191 in 2003/04. Because some listings include multiple buildings, the total number of individual buildings protected in this way is actually slightly higher.

Grade A and B+ listings (properties recognised as being of outstanding or exceptional merit) comprise 9% of the total.

Figure BH2: Number of Listed Buildings by Grade (2003/04 – 2011/12)



Source: NIEA

## 9 Built Heritage

### Indicator BH3: Built Heritage at Risk

#### Number of buildings and monuments at risk (2003/04 - 2011/12)

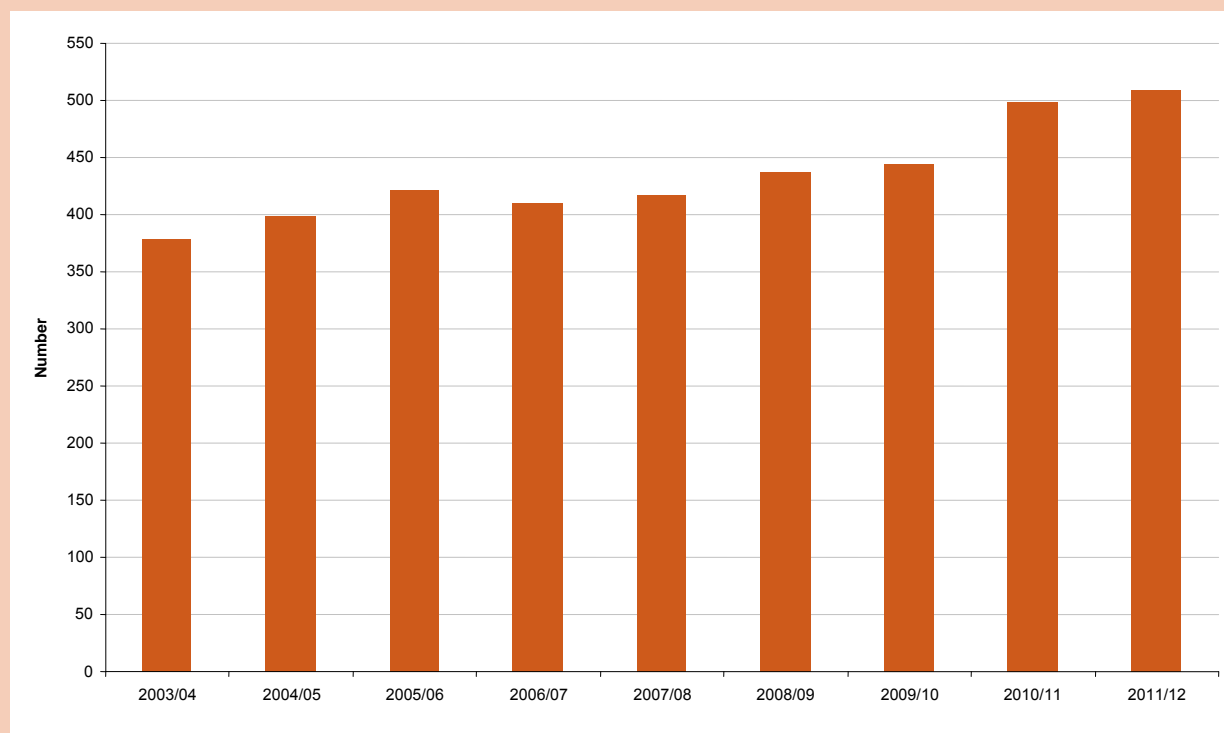
A building or structure is at risk when its condition and management are deemed to be poor and unsustainable, placing it under threat of deterioration and/or demolition. Such listed buildings, structures and some scheduled monuments are recorded on an online database [Built Heritage at Risk in Northern Ireland](#) (BHARNI) register.

#### Data

The BHARNI register provides an indicator of changes in the number of buildings judged to be at risk. In 2011/12, there were 509 buildings and structures on the BHARNI database. Twelve buildings were saved during 2011/12 and removed from the register

The number of buildings on the register can be expected to rise as more detailed information is made available through ongoing survey work.

Figure BH3: Number of buildings and monuments at risk (2003/04 - 2011/12)



Source: NIEA

## 9 Built Heritage

### Indicator BH4: Listed Buildings Grant Funding

#### Value of grant paid and the number of buildings in receipt of grant in each listed building grade (2007/08 – 2011/12)

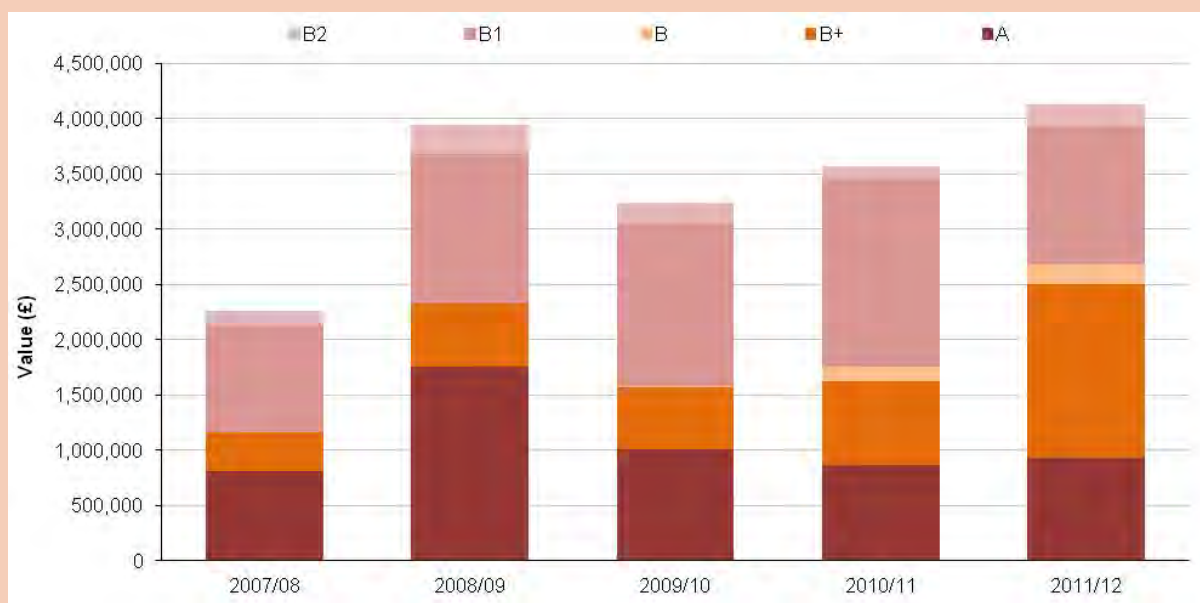
There is no statutory requirement for owners of listed buildings to maintain their properties in a good condition. While owners can be prosecuted for deliberately damaging or destroying listed buildings, they cannot be prosecuted for allowing them to fall into disrepair. Grant aid is made available to owners of listed buildings to assist in their maintenance and conservation.

The rate of grant payable is intended to reflect the higher costs of approved repairs to listed buildings relative to more modern buildings, in order to conserve their special architectural features.

#### Data

During 2011/12, some £2.5 million of the total grant funding available was spent on the most important listed buildings graded as A and B+. In November 2012, the scheme was expanded and extra funding was made available to increase the rate of assistance available to most types of listed building from 35% to 45% of the cost of repairs.

Figure BH4: Value of grant paid and the number of buildings in receipt of grant in each listed building grade (2007/08 – 2011/12)



Source: NIEA

### Commentary

**Indicator BH1: Monuments** There has been a 26% increase in the number of scheduled monuments, from 1,513 in 2001/02 to 1,900 in 2011/12. The scheduling programme is ongoing and the observed decline in the number of scheduled monuments added in 2011/12 reflects the rate of survey in that year rather than the number of sites and monuments within the overall record which might merit special protection.

Scheduled sites are managed by their owners and the condition of scheduled monuments is assessed by regular Field Monument Warden visits. The [CAMSAR assessment of the archaeological resource](#) published in 2009 identified that 70% of protected sites in State Care, Scheduled or in Agri-Environment management agreement are in good condition. It also identified practices causing damage and the sites most vulnerable to such damage. This information is being used to target activities and inform negotiations with landowners and agents to improve the condition and maintain our irreplaceable historic monuments.

**Indicator BH2: Listed Buildings** A second, area-based survey of all historic buildings (The Second Survey) has been underway since 1997 and is largely responsible for the modest increase in numbers listed, as newly identified buildings and structures are added. A number of buildings have also been identified during the Second Survey which no longer meet the test for listing and these have been removed from the list. The survey work is providing robust information on these assets which will help their future protection.

**Indicator BH3: Built Heritage at Risk** The [Built Heritage at Risk in Northern Ireland](#) (BHARNI) register provides an indicator of change in respect of the condition of our listed buildings. The 509 buildings and structures on the database in 2011/12 compares with 456 in 2005. However since that time, a total of 116 buildings have also been saved and removed from the register. The [Northern Ireland Sustainable Development Strategy \(2010\)](#) sets a target of removing 200 buildings from the BHARNI Register (based on 2006 figures) by 2016. Conditions for the rescue of listed buildings have become less favourable since the economic downturn but with increased, targeted grant assistance the Agency remains focused on meeting the 2016 objective. It has drawn up a prioritised list of buildings/structures on the BHARNI Register to help target action to remove buildings from the register.

**Indicator BH4: Listed Buildings Grant Funding** The grant funding scheme began in 1974 to help conserve our built heritage but as noted in a 2012 Public Accounts Committee review, the scheme does not provide evidence on its effectiveness. Work is underway to complete a baseline survey of the condition of all Northern Ireland's listed buildings by December 2013. This will allow for the performance of the grant scheme, as well as other sources of investment in conserving listed buildings, to be measured over time.

Since 30 November 2012 the capping level for the [Listed Building Grant-aid scheme](#) has been increased from £150,000 to £500,000 and support for most types of repair increased from 35% to 45%.

### Key Challenges

Overall recording has shown continuing progress with the identification of many new heritage sites and buildings worthy of special protection, however, whilst NIEA has extensive listing and recording programmes for monuments and buildings, the rate of survey is slow. Comprehensive information on the nature and condition of our historic sites, monuments, buildings and structures remains incomplete, which increases the risk that our heritage assets could be demolished or damaged before they are assessed.

The completion of the Second Survey will provide a more complete picture of our architectural heritage. In 2012, NIEA reassessed its approach and developed a programme towards achievement of a revised target date of 2020. Assessing the condition of the most vulnerable sites, monuments and buildings is also being targeted more effectively following assessments such as the [CAMSAR assessment of the archaeological resource](#).

A key challenge is to find new ways of managing our heritage that will enhance and protect the historic environment to provide economic and social benefit. Our built heritage is now recognised not only as an important part of our lives and communities but as a major element in economic growth, tourism and spend. The regeneration of previously developed sites and historic buildings and identification of new uses for our historic assets is an opportunity to demonstrate our unique history. However this requires careful handling to avoid potential negative impacts from insensitive development. In April 2015, planning and listed building consent powers will be devolved to local councils. This will provide an opportunity to engage local communities to realise the potential of this environmental asset.

Potential threats to our heritage assets include criminal activity and there is a need to respond quickly and effectively to heritage crime. Over a longer period, our historic features may be affected by climate change and planning is required now to put measures in place that will preserve important sites and buildings in the future.

### Responses

The 2012 study of the economic value of the historic environment showed that better use of Northern Ireland's built heritage could provide more benefits to local communities, better protection of historic assets and direct economic gain. To demonstrate this in practice, NIEA has initiated innovation trials at two of Northern Ireland's most iconic sites, Dunluce Castle and Carrickfergus Castle. The aims are to increase understanding and appreciation of the value of built heritage and to establish how many more jobs, visits and heritage tourism can be created through innovative action by working in partnership with business groups, local communities, councils and others.

Wider use of these assets and improved integration within their localities will demonstrate how creative thinking and collaboration can maximise both economic and heritage outcomes.



### ANNEX Built Heritage Legislation and Policy Drivers

International and EC Agreements	Description
<a href="#">European Convention on the Protection of the Archaeological Heritage</a>	Deals with the inventory and protection of sites, the mandatory reporting of chance finds and the control of illicit trade in antiquities. It promotes high standards for all archaeological work, which should be authorised and carried out by suitably qualified people. It also requires the conservation of excavated sites and the safe-keeping of finds. It contains provisions for protection, funding and recording of archaeology during development. It also deals with the collection and dissemination of information and the promotion of public awareness and access.
<a href="#">Venice Charter for the Conservation and restoration of monuments and sites (1964)</a>	A code of professional standards that gives an international framework for the conservation of monuments and historic buildings.
<a href="#">Florence Charter on Historic Gardens (1981)</a>	A charter dealing with the conservation of historic gardens.
<a href="#">UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage</a>	Adopted by the UNESCO General Conference in 2001, this convention intends to enable States to better protect their underwater heritage.
UK Policy & Strategy	Description
<a href="#">The Protection of Wrecks Act (1973)</a>	This provides for the Designation of a wreck on account of the historical, archaeological or artistic importance of the vessel or of the objects associated with it.
Local Legislation & Policy	Description
<a href="#">Historic Monuments and Archaeological Objects (NI) Order 1995</a>	Monuments may be protected by taking them into state care or by scheduling them for protection. A licence is required to search for archaeological objects, or to carry out an excavation, and any archaeological object found must be reported.
<a href="#">The Planning (Northern Ireland) Order 1991</a>	Enables lists of buildings of special architectural or historic interest to be compiled by NIEA. Protects historic parks, gardens and demesnes through a register maintained by NIEA
<a href="#">Planning Policy Statement 6 Planning, Archaeology and the Built Heritage (PPS 6)</a>	NIEA is consulted by Planning NI regard to planning applications which may affect archaeological sites and monuments of local importance and non-listed vernacular buildings.





Waste is produced by every one of us and by industry, businesses and public services which support our economy and lifestyles. It is widely accepted that waste should be treated as a resource with a value. Significant changes in behaviours and legal obligations in the last decade are changing the way we look at waste management and deliver resource efficiency.

This chapter provides information on the waste we produce and how we are managing it more efficiently to decrease our reliance on finite natural resources, promote a low carbon circular economy and reduce impacts on the environment.

### Key Messages

- There has been a fourfold increase in **household waste recycling** since 2002.
- Local authority collected **municipal waste arisings** fell by just under 10% between 2004/05 and 2011/12
- Over half of Northern Ireland's municipal waste is still sent to **landfill**.
- The new Northern Ireland Waste Management Strategy '**Delivering Resource Efficiency**' supports the objectives of the EU '*Roadmap to a Resource Efficient Europe*' which requires a greater focus on waste prevention, re-use and recycling in line with the Waste Hierarchy.
- The **single use carrier bag levy** has to date reduced consumption of single-use carrier bags in major supermarkets by more than 80%.
- The Department is committed to taking action to tackle serious environmental crime such as large scale **illegal waste activity** and will develop and implement an Action Plan to address this.

# 10 Waste and Resources

## Introduction

### What is waste?

'Waste' means any substance or object which the holder discards or intends or is required to discard.

[Waste Framework Directive 2008/98/EC](#)

Waste is produced by households, by industrial processes, by the construction and demolition industry, through commercial activities and agricultural practices and by public services and utilities.

Waste generation, treatment and disposal places significant pressure on the environment, the severity of which very much depends on the volume of waste produced, its composition, how it is regulated and finally managed and disposed. Waste can affect the environment through its visual impact or by emissions to the air, groundwater and surface water as well as the contamination of land.

Historically, we have relied heavily on landfilling as a means of managing our waste in Northern Ireland, which can lead to the generation of potentially polluting substances. Leachate is produced when water filters downward through a landfill, picking up dissolved materials from the decomposing wastes. Methane and carbon dioxide, both major greenhouse gases, are formed as a result of the decomposition of biodegradable wastes.

We now have the knowledge and technology to control these emissions effectively and regulation requires the waste management industry to adopt high standards of engineering. Landfilling is considered a waste of valuable resources which could otherwise be reused or recycled.

The Waste Hierarchy is a core principle of the revised Northern Ireland Waste Management Strategy 2013 [Delivering Resource Efficiency](#). The primary purpose of this hierarchy is to minimise adverse environmental effects from waste and to increase resource efficiency. It places high importance on waste prevention as the key to achieving the [EU Resource Efficiency Roadmap](#) milestone of turning potential waste into a resource.

To achieve resource efficiency and address the socio-economic problems which we currently face, government and its partners continue to adopt the principles of better regulation and a risk-based approach to regulation, complemented by effective enforcement to target unscrupulous operators who undercut legitimate businesses.



Source: DOE Waste Management Strategy 2013

## 10 Waste and Resources

### Drivers and Pressures

Consumption patterns drive resource use and household consumption is a key factor as consumers make decisions about products and services. Industry is a significant consumer of raw materials. The production of waste and continued use of raw materials to produce more products for our consumption is not sustainable. Our reliance on landfill is decreasing but we still send over half of our waste to landfill. The [EU Waste Framework Directive 2008/98/EC](#) requires Member States to adopt waste management plans and waste prevention programmes.

#### Waste Types

**Household Waste:** Waste from a domestic property or other specified premises.

**Municipal Waste:** Waste from households and other waste which is similar in nature. This includes some commercial waste.

**Local Authority Collected Municipal Waste:** Waste that is collected by, or on behalf of, a district council.

**Commercial and Industrial Waste:** Waste from premises used wholly or mainly for the purposes of a trade or business, sport, recreation or entertainment.

**Construction, Demolition and Excavation Waste:** Waste from construction or demolition works, including waste from any preparatory works

**Waste prevention** is key to optimising resource efficiency across all waste streams and is at the top of the waste hierarchy. This requires us to engage in sustainable consumption and production through for example, product design and behavioural change. Since 2006/07 there has been a decrease in the amount of local authority collected municipal waste, in spite of the fact that in the same period, Gross Value Added (GVA) per capita in Northern Ireland has increased. An important challenge is to continue this trend towards decoupling waste arisings from economic growth. This will be a true reflection that waste prevention measures are indeed working, and that Northern Ireland is delivering resource efficiency.

The **commercial and industrial** sector is also the largest producer of hazardous waste in Northern Ireland. This includes materials such as waste electrical and electronic equipment, batteries and paints, and end of life vehicles. There is currently no dedicated hazardous waste landfill facility in Northern Ireland and only a small number of hazardous waste treatment options available, limited mainly to oil recovery. The main proportion of hazardous waste material is exported to Great Britain for disposal or recovery.



The construction industry results in the generation of large quantities of **construction, demolition and excavation** waste. Although most of this material is inert and suitable

## 10 Waste and Resources

for recycling and reuse, traditionally a large proportion of it has ended up in landfill or dumped illegally.



There is a developing industry in Northern Ireland tackling the recovery and recycling of waste materials, including composting, glass recycling, paper reprocessing, waste electrical and electronic equipment dismantling, materials recovery and metal reprocessing facilities.

District Councils currently operate 100 licensed Civic Amenity Sites for collection of domestic and commercial wastes for recovery.

Additionally 300 licensed recycling sites are operated by the private sector and 443 recycling sites are registered as exempt from licensing (where collection activities are solely for recovery).

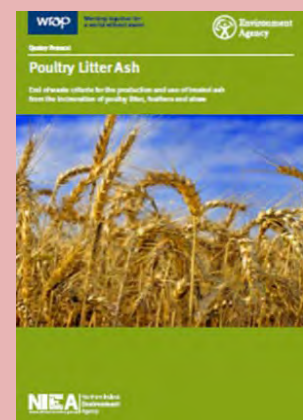
**Agricultural practices** produce large quantities of animal manures, slurries and effluents, the disposal of which is usually managed by land spreading. These are important nutrient resources and soil conditioners and are not controlled waste where spread as fertiliser in accordance with the requirements of the Nitrates Directive.

However, excessive and uncontrolled application of these materials can lead to polluting run-off and emissions to air. See **Chapter 7 Land and Landscape**.

### Waste Quality Protocols

NIEA in partnership with the Waste and Resources Action Programme (WRAP) has published a series of protocols on the recovery and reuse of waste.

The benefits to the Northern Ireland economy are around 300,000 tonnes diverted from landfill, saving 40,000 tonnes carbon dioxide and £16 million.



## 10 Waste and Resources

### The Current Situation

#### Summary

The total amount of local authority collected municipal waste arising reduced by around 10% between 2004/05 and 2011/12, but more than half is still sent to landfill, (just over 58% in 2011/12).

Recycling of waste is becoming much more common. In 2011/12, almost 40% of household waste and over 38% of municipal waste was sent for recycling, including composting. Compostable materials were the most common municipal waste type, (43%) collected by local authorities. In recent years, the amount of waste produced per household has been approximately 1.2 tonnes per year, which equates to around 23 kg per week.

The 2009 [Northern Ireland Commercial and Industrial \(C&I\) Waste Estimates](#) showed that there were 1.3 million tonnes of C&I waste produced of which 70% was recycled. In the same year, there were 1.2 million tonnes of [construction, demolition and excavation waste arisings](#) produced, of which 70% was diverted from landfill, (WRAP 2011).

#### Waste and Resources Indicators

Waste and Resources			
WR1: LAC Municipal Waste Arisings	LAC municipal waste arisings (2004/05 – 2011/12)	↓	Green
WR2: LACMW Recycled or Composted	LAC municipal waste sent for recycling (including composting) (2004/05 – 2011/12)	↑	Green
WR3: LACMW Recycled or Composted by Material Type	LAC municipal waste material types collected for recycling 2011/12	N/A	Grey
WR4: LACMW Landfilled	LAC municipal waste landfilled (2004/05 - 2011/12)	↓	Green
WR5: Household Waste	Household waste collected per household per year (2004/05 – 2011/12)	↓	Green
WR6: Household Waste Recycled or Composted	Household waste sent for recycling (including composting) (2004/05 – 2011/12)	↑	Green
WR7: Household Waste Landfilled	Household waste landfilled (2004/05 – 2011/12)	↓	Green

Trend and status assessment based on expert opinion. For key see **Indicators and Trends** page ix

### Waste and Resources Indicators

#### Policy and Legislative Context

The underlying principles and approach to waste management in Northern Ireland are established in European Directives. The revised [EU Waste Framework Directive 2008/98/EC](#) sets the basic concepts and definitions related to waste management. It explains when waste ceases to be waste and becomes a secondary raw material (so called end-of-waste criteria), and how to distinguish between waste and by-products. These basic principles require that waste is managed: without endangering human health or harming the environment, without causing a nuisance through noise or odours and without adversely affecting the countryside or places of special interest.

The objective of the [Landfill Directive 99/31/EC](#) is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills. It places an obligation on the UK to reduce the amount of biodegradable municipal waste that it landfills to 35% of 1995 levels by 2020. The aim is to reduce the environmental problems resulting from such waste decomposing in landfills and producing methane. Northern Ireland Regulations set out requirements for the control of pollution and emissions from landfill, and to limit the amount of biodegradable local authority collected municipal waste that can be landfilled each year to 2020.

A succession of [European legislation on specific waste streams](#) is implemented in the UK and Northern Ireland through producer responsibility law covering packaging, electrical and electronic equipment, batteries and vehicles. Producer responsibility regulations encourage the minimisation of waste from these products and promote their re-use. They also set targets for the recovery and recycling of waste materials. Specifically, producer responsibility is aimed at shifting the costs of recovering, recycling or disposing of a product in support of the polluter pays principle, i.e. from the end-user to retailers, wholesalers and manufacturers. It is intended to incentivise the producer to use eco-design and manufacture products that:

- Use fewer resources
- Reduce or eliminate the use of hazardous substances in their manufacture
- Minimise waste from the product and reduce the amount of waste going to landfill
- Are able to be repaired or reused
- Are more easily treated, dismantled and recycled

These European principles, policies and strategies for the sustainable use of natural resources, management of waste and resource efficiency provide the context for Northern Ireland's [Waste Management Strategy](#) (2013) which describes interventions and actions for delivering resource efficiency.



### Indicator WR1: LAC Municipal Waste Arisings LACMW arisings 2004/05 – 2011/12

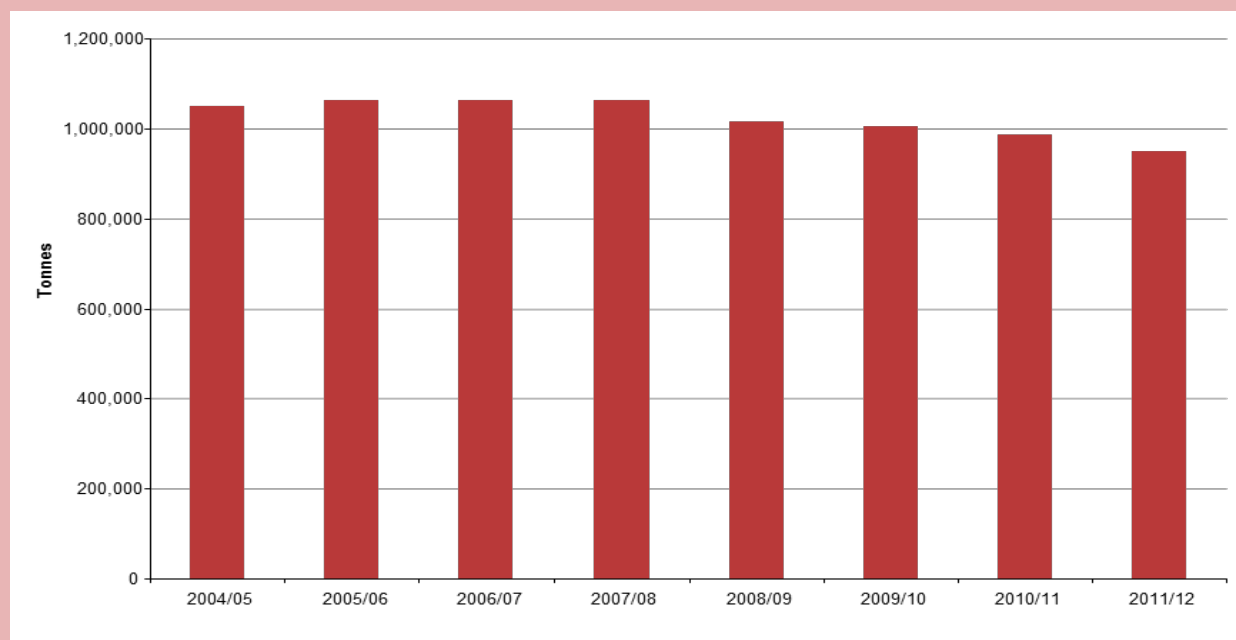
Local authority collected municipal waste (LACMW) in Northern Ireland is defined as all of the waste from households and any other sources that come under the control or possession of any of the 26 district councils. It is predominantly made up of kerbside household collected wastes, but also includes waste collected from civic amenity sites and some commercial waste. This indicator measures total municipal waste arisings which is important for meeting statutory limits for the amount of biodegradable municipal waste that can be landfilled and for sustainable use of resources.

The revised Waste Framework Directive requires that Member States create national waste prevention programmes by 12 December 2013. The objective of these programmes is to present a co-ordinated approach to waste prevention, delineating targets and policies with the aim of decoupling economic growth from the environmental impacts of waste generation. The Department consulted on proposals in September 2013.

#### Data

LAC municipal waste data for Northern Ireland are collected via quarterly data returns submitted by all district councils through the WasteDataFlow system. In 2011/12 there were 949,491 tonnes of LAC municipal waste collected in Northern Ireland, a decrease of just over 3.6% on the 2010/11 total.

Figure WR1: LAC Municipal Waste Arisings (2004/05 – 2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

## 10 Waste and Resources

### Indicator WR2: LAC Municipal Waste Arisings Recycled or Composted LAC municipal waste sent for recycling (including composting), 2004/05 – 2011/12

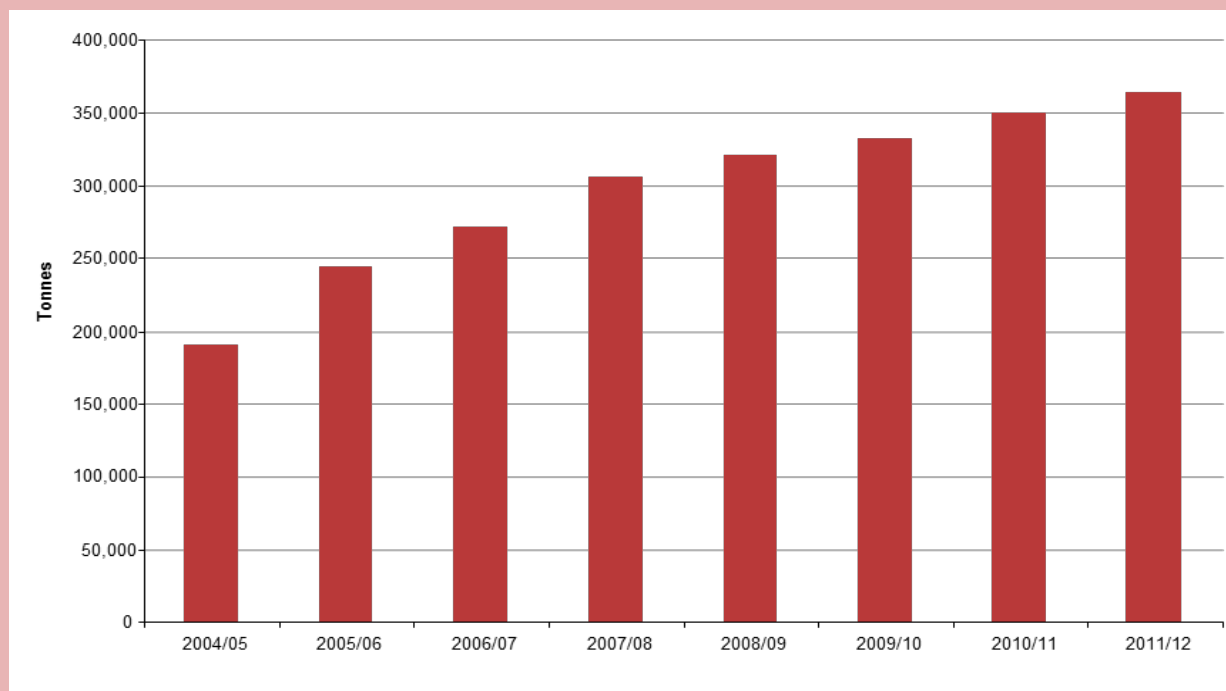
The management of LACMW is through recycling, composting and landfill, with a small portion being prepared for reuse or energy recovery.

The Northern Ireland Waste Management Strategy, *Delivering Resource Efficiency*, commits the Department to consulting on legislative change to implement a recycling target of 60% of LACMW by 2020. Recycling and composting is based on kerbside collections, materials brought to civic amenity and bring sites, and materials collected by a third party, such as charities/voluntary groups.

#### Data

In 2011/12 364,342 tonnes of LAC municipal waste were sent for recycling or composting, an increase of 4.1% on the previous year and an increase of 90.6% on the 2004/05 level. The proportion of LAC municipal waste sent for recycling or composting has increased from 18.2% in 2004/05 to 38.4% in 2011/12.

Figure WR2: LAC municipal waste sent for recycling (including composting) (2004/05 – 2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

## 10 Waste and Resources

### Indicator WR3: LAC Municipal Waste Recycled or Composted by Material Type LAC municipal waste material types collected for recycling, 2011/12

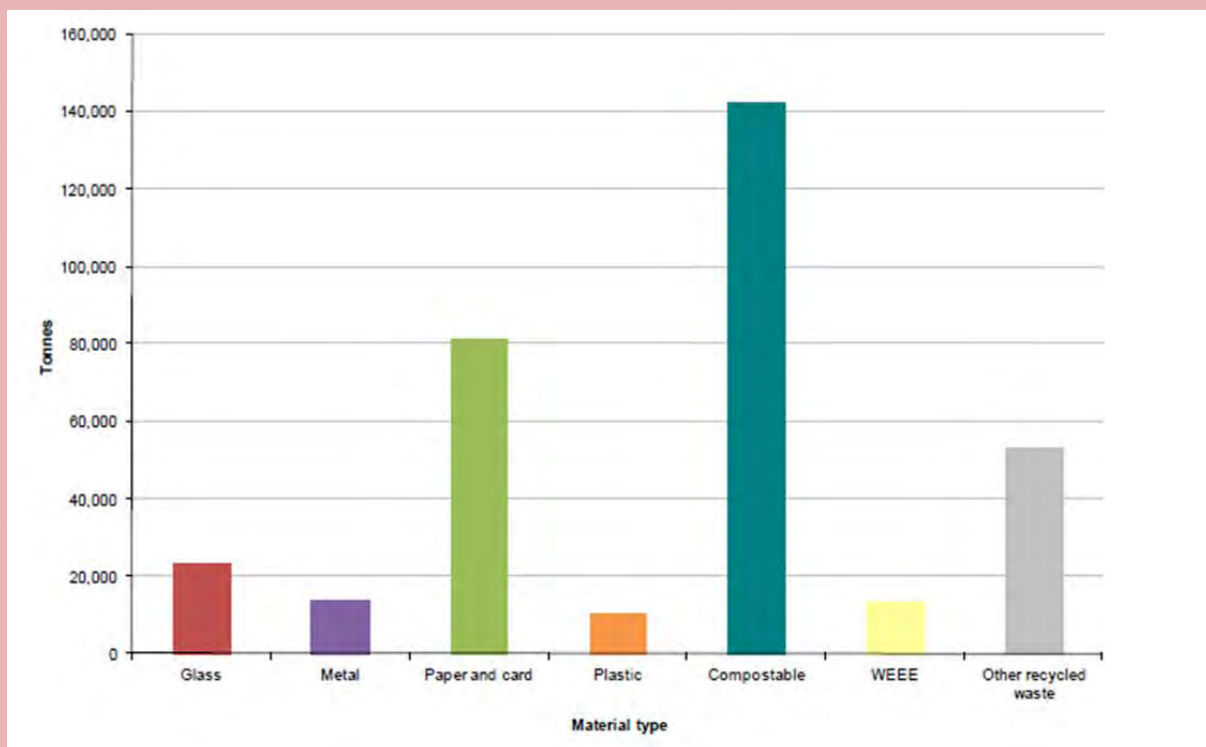
The amount of material which is recycled or composted broken down by material type will inform the most effective interventions to increase recycling. The Department is in the process of developing policy and legislation to introduce a target to recycle 60% of local authority collected municipal waste by 2020.

#### Data

In 2011/12, compostable waste accounted for the largest proportion of LAC municipal waste material collected for recycling at 43%, compared to 42% in 2010/11.

Paper and card was the next most abundant material type collected, at 23% of the total, with glass at 7%, then metal and plastic each accounting for 4%, and WEEE (waste electrical & electronic equipment) at 3%. Other waste accounted for 17%.

Figure WR3: LAC municipal waste material types collected for recycling (2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

## 10 Waste and Resources

### Indicator WR4: LAC Municipal Waste Landfilled

#### LAC municipal waste landfilled, 2004/05 - 2011/12

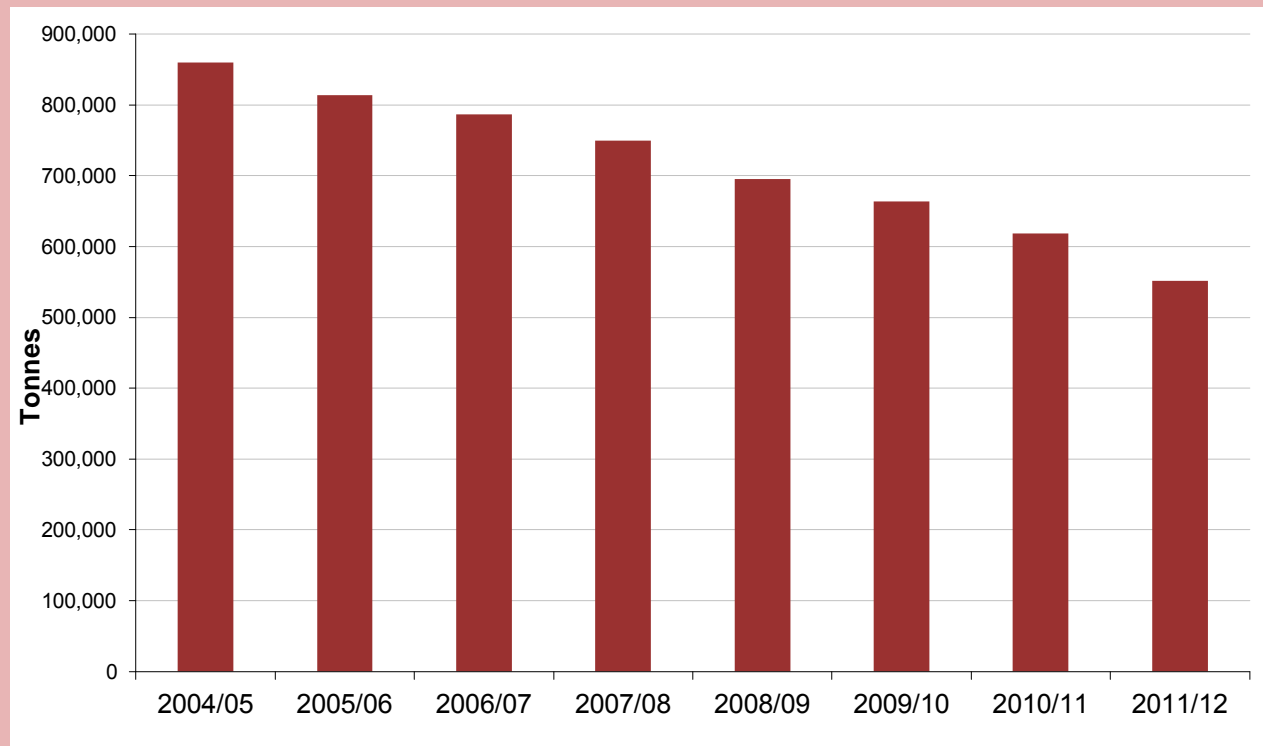
A key objective of the Landfill Directive is to reduce the amount of biodegradable waste going to landfill and improve the environmental performance of landfills.

#### Data

In 2011/12, 551,472 tonnes of LACMW were sent for landfill, a decrease of 10.8% on the amount landfilled in 2010/11, and a decrease of 35.8% on the 2004/05 level.

The proportion of LACMW landfilled has decreased from 81.8% in 2004/05 to 58.1% in 2011/12, with a steady decrease year on year.

Figure WR4: LAC municipal waste landfilled (2004/05 - 2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

## 10 Waste and Resources

### Indicator WR5: Household Waste

#### Household waste collected per household per year, 2004/05 – 2011/12

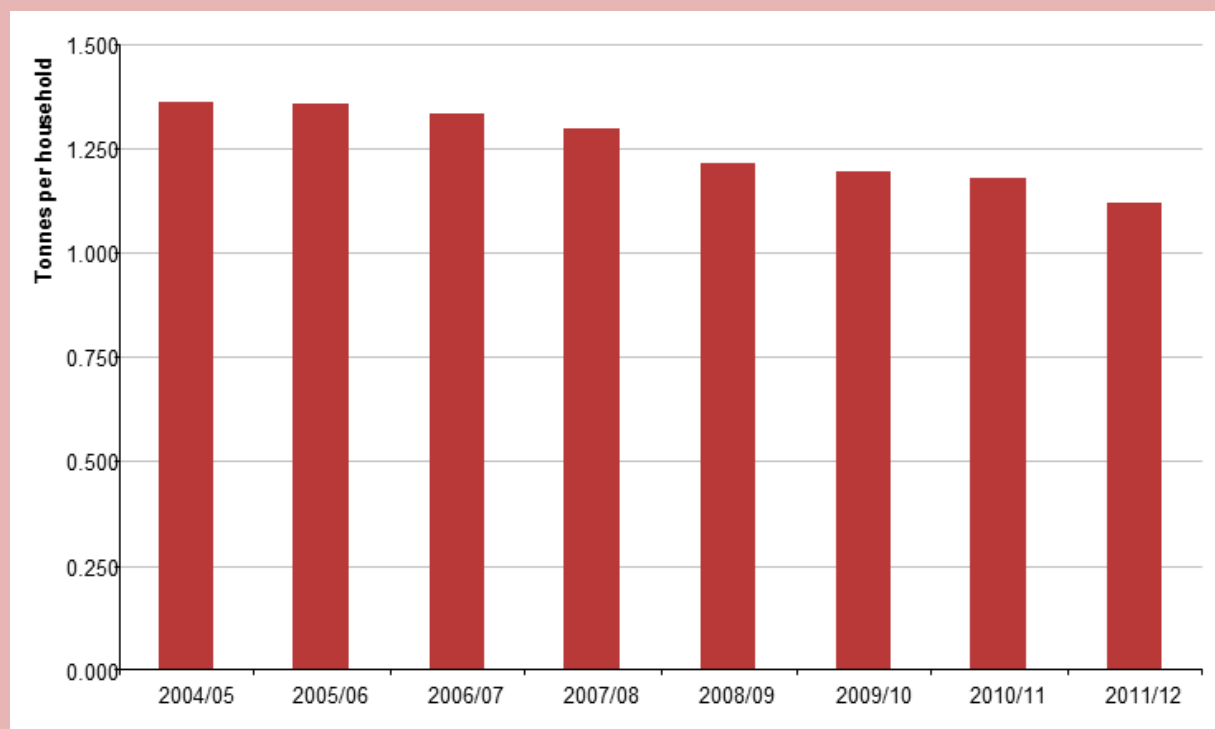
Household waste is one element of LAC municipal waste collected, and is recorded using the WasteDataFlow system as the amount of waste collected by the district council's regular household, kerbside, civic amenity and bring site collections.

#### Data

Household waste accounted for 87.9% of all LAC municipal waste collected in Northern Ireland in 2011/12, compared to 88.3% in 2010/11.

In 2011/12 a total of 834,149 tonnes of household waste was collected, a decrease of 4.1% on the amount collected in 2010/11. Since 2004/05, total household waste arisings in Northern Ireland have fallen by 9.2%. 1.120 tonnes of household waste were collected per household, a 17.7% decrease on the 2004/05 figure of 1.361 tonnes.

Figure WR5: Household waste collected per household per year (2004/05 – 2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

### Indicator WR6: Household Waste Recycled or Composted

#### Household waste sent for recycling (including composting), 2004/05 – 2011/12

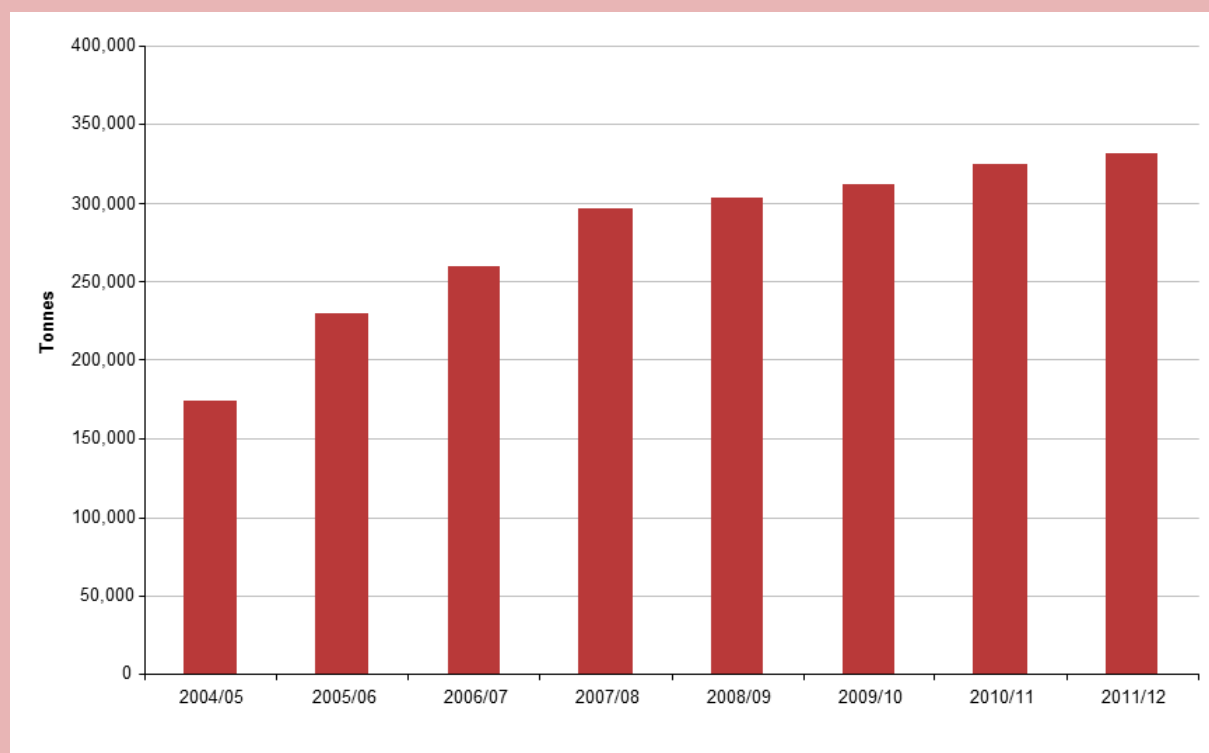
The EU Waste Framework Directive statutory target requires member states to recycle 50% of household waste by 2020. Recycling and composting is based on materials collected for recycling and composting at the kerbside, civic amenity sites, bring sites and those collected by a third party, such as charities/voluntary groups.

#### Data

In 2011/12 331,334 tonnes of household waste were sent for recycling or composting, an increase of 2.0% on the amount sent for recycling or composting in 2010/11, and an increase of 91.0% on the 2004/05 level.

The proportion of household waste sent for recycling or composting has increased from 18.9% in 2004/05 to 39.7% in 2011/12.

Figure WR6: Household waste sent for recycling (including composting) (2004/05 – 2011/12)



Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

## 10 Waste and Resources

### Indicator WR7: Household Waste Landfilled

#### Household waste landfilled, 2004/05 - 2011/12

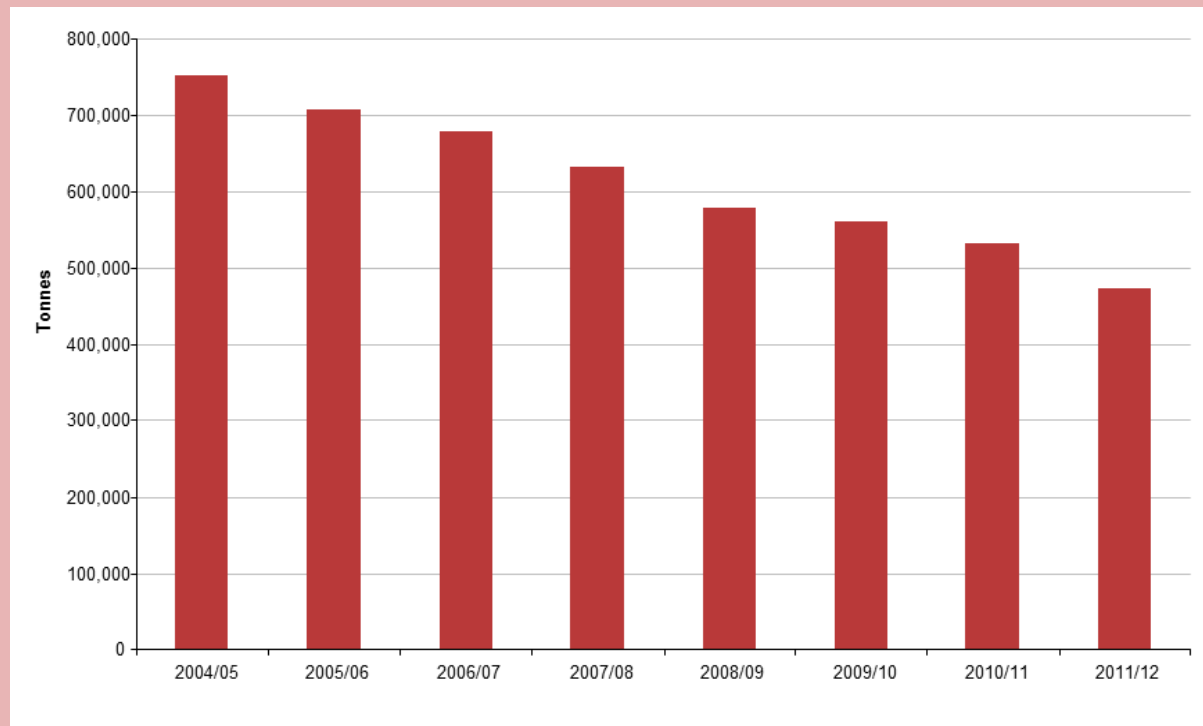
Waste planning policy aims to reduce the amount of household waste going to landfill and the total number of landfill sites.

#### Data

In 2011/12 473,353 tonnes of household waste were sent to landfill, a decrease of 10.9% on the amount landfilled in 2010/11, and a decrease of 37.0% on the 2004/05 level.

The proportion of household waste landfilled has decreased from 81.8% in 2004/05 to 56.7% in 2011/12.

Figure WR7: Household waste landfilled (2004/05 - 2011/12)



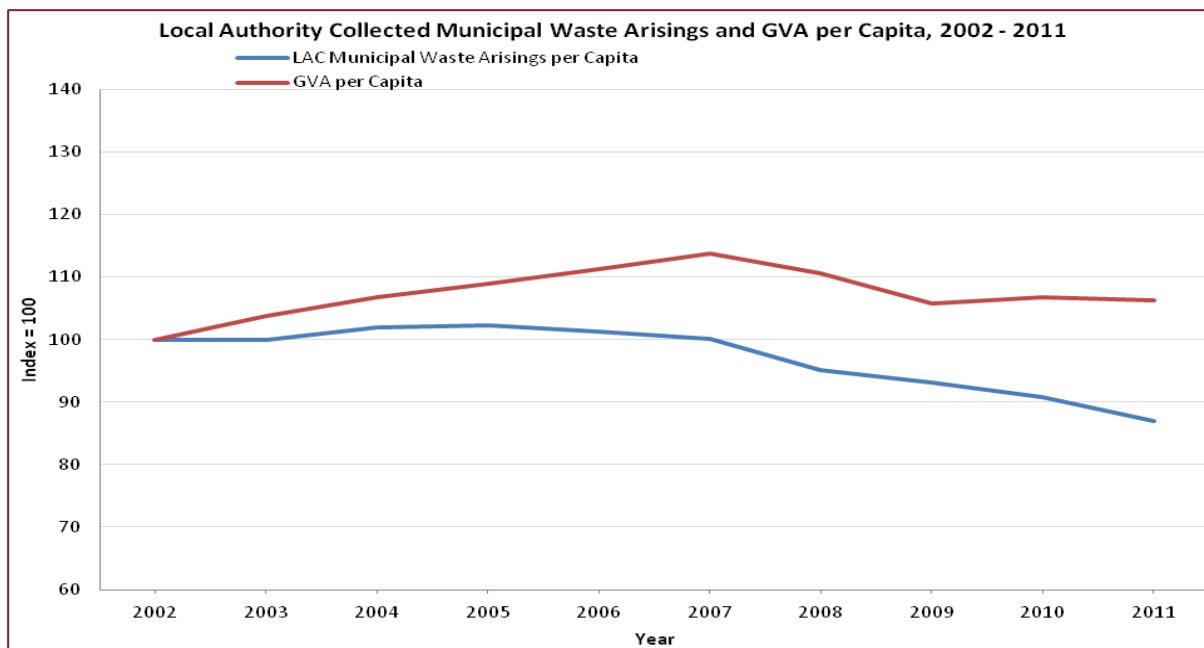
Source: Northern Ireland LAC Municipal Waste Management Statistics, DOE

### Commentary

**Indicators WR1 to WR4: Local Authority Collected Municipal Waste** The data shows a decrease in the amount of LAC Municipal Waste Arisings, particularly over the last few years.

The stabilisation of waste generation was one of the key aims of the [2006 Waste Management Strategy](#). Figure WR8 shows that LACMW arisings per capita have decreased by over 13% since 2002. There was an overall increase in arisings per capita of 2% between 2002 and 2005/06, since when this has fallen by more than 15%. Over the same period GVA per capita, corrected for inflation, has increased marginally. This suggests potential decoupling of the relationship between economic growth and waste generation at certain points during the period, however, a longer more consistent time series is required before definitive conclusions can be drawn.

Figure WR8: LAC Municipal Waste Arisings and GVA per Capita (2002 – 2011)



Source: NIEA and Analytical Services Branch, DoE

Both compostable and paper and card waste streams are 100% biodegradable. Compostable waste was the most common type of municipal waste to be sent for recycling in 2011/12. There was significant increase in the amount of LAC municipal waste sent for recycling and composting but the rate of increase has reduced in recent years.

**Indicators WR5 to WR7: Household Waste** There has been a slow but steady decrease in the amount of household waste collected per household per year from 2004 to 2012. The amount of household waste sent for recycling and composting has increased each year from 2004 to 2012 but the rate of increase has slowed in recent years. The amount of household waste landfilled each year has decreased steadily and significantly between 2004 and 2012.



### Conclusion and Key Challenges

There has been a significant reduction in the amount of collected municipal waste going to landfill and steady increases in the amount recycled and composted since 2000. However government, businesses and householders still face particular challenges in reducing resource consumption and waste generation. For example, the [UK Climate Change Act 2008](#) sets targets for the UK to reduce its greenhouse emissions from 1990 levels by 20% by 2020 and by 80% of 1990 levels by 2050 see **Chapter 4**. This is likely to see further development in biomass fuel and anaerobic digestion installations in managing waste to meet government targets for renewable heat/energy.

Effective, measurable waste prevention will be key to our success in becoming resource efficient. The [Waste Framework Directive](#) introduces the principle of life cycle thinking, which requires us to take account of the overall impacts (environmental, economic and social) that a product or service will have throughout its lifetime, from “cradle to grave”. Producer responsibility obligations incentivise manufacturers and producers to adopt waste prevention and a life cycle approach and these obligations extend to a range of materials.



There are still significant gains to be made through applying this overall approach to, for example, the **construction sector**, where designing out waste and designing new buildings should be done in such a way so as to facilitate deconstruction and reuse of materials at the end of a building's life. This can reduce the need for future raw materials extraction and mitigate the carbon impact of construction.

The existing waste indicators do not address waste from **commercial and industrial** sectors, or hazardous waste arisings. To improve our understanding of these wastes and inform future policy development, work has commenced to assess the suitability of existing regulatory data held by NIEA and reporting of waste data records by waste operators.

#### Natural World Products' (NWP) Bio-Waste Facility, Belfast

NWP's bio-waste facility is located in the former Glenside Quarry in Belfast on a 13.7 acre site, making it the largest of its kind in Ireland. Each year a total of 60,000 tonnes of bio-waste, such as food and garden waste collected from households is being recycled into compost at the facility.



This compost can then be sold in garden centres or used as top soil at golf courses. The 7.5 acre Colin Glen Allotment site in West Belfast uses the NWP's compost to enable green-fingered enthusiasts to grow their own fruit and vegetables in one of 50 newly established allotment plots.

## 10 Waste and Resources

### Responses

The [Roadmap to a Resource Efficient Europe](#) places emphasis on innovative approaches to reducing inputs, minimising waste and optimising production processes, management and business methods to deliver resource efficiency. The new [Waste Management Strategy](#), published in 2013, goes beyond compliance by introducing further targets and policies which are aimed at delivering resource efficiency in Northern Ireland.

The strategy recognises two challenges to this: firstly, tackling illegal activity in the waste sector and secondly, ensuring that Northern Ireland has sufficient waste management infrastructure to meet its EU Landfill diversion obligations. Successful resolution of these issues is central to the creation of a new, more easily regulated and monitored waste sector and better indicators for waste flows in future.

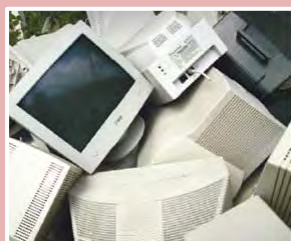
A number of government interventions have been established or planned under the Strategy (see box). The [Rethink Waste](#) communications campaign, launched in March 2010, seeks to make a cultural shift towards waste prevention and resource management. Effective behavioural change and reinforcing the messages on waste prevention, reuse and recycling will ultimately result in cost savings for businesses and householders.

#### Government interventions: Waste Management Strategy



**Carrier Bag Levy** The single use carrier bag levy of 5 pence per bag, introduced in April 2013, applies to carrier bags made from plastic, paper and other natural materials. It aims to cut carbon dioxide emissions, air and water pollution associated with unnecessary bag production, transportation and disposal. It will also reduce litter in public spaces. Prior to the introduction of the levy, 230 million carrier bags were sent to landfill in Northern Ireland each year.

**Landfill restriction on separately collected food waste** [The environmental, economic and practical impacts of landfill bans or restrictions \(WRAP updated 2012\)](#) assessed the feasibility of introducing landfill bans on a number of waste materials. This has led to proposals for obligations on district councils to provide for the separate collection of food waste from households and a ban on the landfilling of separately collected food waste.



#### Increased recycling targets for Producer Responsibility initiatives

Higher recycling targets have been introduced for aluminium, plastic and steel for the period 2013-2017. Meeting these and other material specific targets will equate to an overall packaging recycling rate of 72.7% and recovery rate of 79% by 2017.

## 10 Waste and Resources

### ANNEX Waste Legislation and Policy Drivers

EC Directives	Description
<a href="#">The EU Landfill Directive (Council Directive 99/31/EC on the landfill of waste)</a>	Aims to prevent or reduce as far as possible the negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills and setting targets for the reduction of biodegradable municipal waste going to landfill.
<a href="#">EU Regulation on Shipments of Waste 1013/2006</a>	Establishes procedures and control regimes for shipping waste depending on its origin, destination and route, and the type of waste and treatment that will be applied.
UK Legislation & Policy	Description
<a href="#">Waste Electrical and Electronic Equipment Regulations 2006</a>	Aims to reduce the amount of WEEE sent to landfill. Requires producers of electrical and electronic equipment to register and cover the costs of collecting, treating, recovering and disposing of equipment when it reaches the end of its life.
Local Legislation	Description
<a href="#">Landfill (Amendment) Regulations (Northern Ireland) 2011 SR 101</a>	This legislation amends the Landfill Regulations (Northern Ireland) 2003 to ensure that the closure and after care provisions apply to all landfill sites in Northern Ireland which closed after 16 July 2001.
<a href="#">The Landfill Allowances Scheme (Northern Ireland) Regulations 2004 SR 416 (as amended)</a>	These Regulations limit the amount of biodegradable local authority collected municipal waste that can be land filled in Northern Ireland between 2004 – 2020 and how each year's allowances may be transferred between Councils.
<a href="#">The Waste Batteries and Accumulators (Treatment and Disposal) Regulations (Northern Ireland) 2009 SR159</a>	These Regulations also amend 2003/496 (above) to prevent the disposal of waste automotive and industrial batteries in landfill.
<a href="#">Animal By-Product (Enforcement) Regulation Northern Ireland 2011 SR 124</a>	Details the enforcement authorities, processes and procedures under the Animal By-Products Regulations.
<a href="#">Controlled Waste Regulations (Northern Ireland) 2002 SR 248</a>	Defines household, industrial and commercial waste, for waste management licensing purposes.
<a href="#">Waste (Northern Ireland) Regulations 2011 SR 127</a>	This requires businesses to apply the waste management hierarchy; introduces a two-tier system for waste carrier, broker and dealer registration, and; establishes waste prevention programmes and amends other legislation.
<a href="#">Control of Asbestos Regulations (Northern Ireland) 2012 SR 179</a>	This bans the import, supply and new use of asbestos and requires employers to assess risks and limit employees' exposure.
<a href="#">Waste and Contaminated Land (Amendment) Act (Northern Ireland) 2011</a>	This gives the DOE and district Councils similar investigative, enforcement and clean up powers to deal with illegally dumped waste. This changes the legislative framework for management of land that has been contaminated.

## 10 Waste and Resources

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<a href="#">Single Use Carrier Bags Charge Regulations (NI) 2013</a>	From the 8 April 2013 all sellers of goods in Northern Ireland must charge their customers at least 5 pence for each single use carrier bag supplied new so as to enable goods purchased to be taken away or delivered. Some bags are exempt from this requirement to charge.
<a href="#">EU Emissions Trading System (EU ETS)</a>	Large emitters of carbon dioxide, including the power sector, must monitor and report annually their carbon dioxide emissions.



A vibrant economy which can transform our society is the number one priority for the Northern Ireland Executive. Securing our vision for the economy depends on a healthy, high quality environment which makes best use of our finite natural resources. Managing our resources more efficiently will enhance competitiveness and reduce business costs.

This chapter looks at the drivers and pressures in our economy and how investment in our environment and heritage to meet these challenges will provide new opportunities for growth.

### Key Messages

- The environment and economy are interdependent. A well managed and protected environment underpins prosperity and creates new opportunities for growth.
- Focusing effort on resource efficiency will deliver sustainable growth by developing green technology, reducing costs to business and minimising impacts on our finite natural resources.
- Northern Ireland's environment provides a powerful foundation for generating prosperity.
- Innovation is a key to harnessing the opportunities and overcoming the threats to benefit the environment, economy and society.

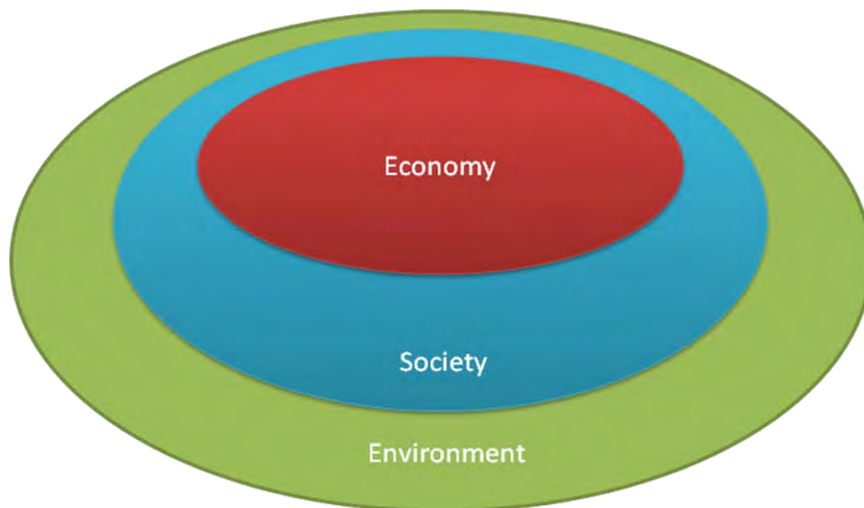
## 11 Environment and Economy

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### Introduction

Our environment is one of our greatest assets. It is essential for maintaining and enhancing the quality of life of current and future generations and for providing a sense of place and history for us all.

Economic development and growth is the first priority of the Northern Ireland Executive. However, our economy and our society are completely dependent on the environment. A healthy, high quality environment is a major driving force for prosperity and well-being and requires us to strike the right balance between economic performance, thriving urban and rural communities and protection of our environment.



Putting an economic valuation on our environment is difficult but a 2007 report on the [Environmental Economy of Northern Ireland](#) estimated that it generates Gross Value Added of £573 million and supports 32,749 jobs. The [UK National Ecosystems Assessment](#) revealed that those elements of nature that produce value to people, known as natural capital, are worth billions of pounds to the UK economy. The report also highlights the value of nature to human health and wellbeing but notes that many of the ecosystems that make up our natural capital are degraded. Concerted action is required to reverse this degradation and secure enhanced economic, social and human health benefits.

A 2012 report on the [economic value of Northern Ireland's historic environment](#) concluded that it generates £522 million annually and creates 10,000 jobs. The report went on to highlight that there is a tremendous opportunity to generate a lot more income and many more jobs in a way that continues to cherish and protect our built heritage.

## 11 Environment and Economy

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Our economy is impacted by a wide range of environmental issues including:

- Management and use of resources
- Generation and disposal of waste
- Agricultural practices
- Transport infrastructure and emissions
- Climate change
- Energy generation and use
- Environmental regulation

In each of these areas there is opportunity to generate prosperity and create jobs while at the same time protecting and enhancing our environment.



### Harnessing the natural environment

Constructed wetlands provide a water purification ecosystem service that can avoid the need for expensive water treatment facilities.

### Economic Drivers

Economy is a top priority for the Northern Ireland Executive. The current [Programme for Government](#) makes a commitment to growing a sustainable economy that recognises the importance of a protected environment. The [Investment Strategy for Northern Ireland](#) identifies environment as one of 7 priority areas for investment. Tourism in particular is highlighted as one of our most important growth areas and a high quality and accessible environment is central to success in this area. A recent research report from the [Heritage Lottery Fund](#) concluded that heritage-based tourism is worth £26.4 billion to the UK economy.

The [Northern Ireland Economic Strategy](#) identifies protecting and enhancing the environment as a key measure for business growth. It recognises the economic value of developing world class capabilities in 'green' areas such as sustainable energy and environmental technology. Developing a green economy in Northern Ireland is also an important element of the Programme for Government Priority 1 – *Growing a Sustainable Economy and Investing in the Future*.

## 11 Environment and Economy

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The [Northern Ireland Sustainable Development Strategy 'Everyone's Involved'](#) published in 2010 confirms that, at all levels of government and society, we must ensure that all of our actions take account of their economic, social, and environmental consequences. The strategy acknowledges that none of us can avoid the implications of non-sustainable lifestyles. It sets out principles and strategic objectives to ensure socially responsible economic development while protecting our resource base and the environment for future generations.

At UK level the Government's Natural Environment White Paper [The Natural Choice](#) aims to create *"a green economy, in which economic growth and the health of our natural resources sustain each other, and markets, business and Government better reflect the value of nature"*. The Department of Business, Innovation and Skills [UK Sector Analysis](#) identified *"increasing demand for environmental products, processes and standards"* as one of the four main drivers for growth over the next decade.

The European Union's ten year growth strategy, [Europe 2020](#) includes a priority on sustainable growth: promoting a more resource efficient, greener and more competitive economy. This priority is developed in the [Resource-Efficient Europe](#) flagship initiative that recognises that increasing resource efficiency will be key to securing growth and jobs for Europe. A number of European funding programmes are in place and under development that provide support to environmental projects linked to jobs and growth. The [Eco-Innovation programme](#) for example provides support funding to businesses that demonstrate green job creation and growth.

Climate change is recognised as a key economic and environmental driver. The Stern review of the economics of climate change assessed a wide range of evidence on the impacts of climate change and on the economic costs. It concluded that the benefits of strong and early action far outweigh the economic costs of not acting. The evidence shows that ignoring climate change will eventually damage economic growth.

The United Nations Environment Programme defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. Practically speaking, a green economy is one whose growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services.

In an effort to re-balance the economy and encourage business growth the Northern Ireland Economic Strategy includes a target to *'encourage and develop the green economy and develop the sustainable energy sector'*. The sustainable energy technology sector in particular has been identified as an area with major growth potential.



## 11 Environment and Economy

Continuing the transition to a green economy is a key element of the UK Government's [Plan for Growth](#). This transition will deliver a range of benefits including:

- Helping businesses take advantage of new global markets for environmental goods and services that are predicted to grow to £4 trillion by 2015
- Reduced costs through increased resource and energy efficiency
- Helping businesses manage risks such as those from fluctuating fuel prices
- Increasing resilience including to the impacts of climate change

A CBI report in 2012 estimated that green growth contributed at least a third of all the growth in the British economy in the previous two years. The UK's green business sector continued to grow in real terms in 2010/11, accounting for a £122 billion share of a £3.3 trillion global market and resulting in close to one million jobs. The Government has set out its ambition to increase the UK share by increasing investment in low carbon technologies.

A range of policy tools is being used to support the development of the UK green economy. These include financial incentive schemes such as the Green Deal and the Green Investment Bank, national initiatives such as the first Climate Change Risk Assessment and National Adaptation Plan and commitment to European and global obligations such as the EU Emissions Trading Scheme. Support from the Green Investment Bank for example has been identified as a significant factor in delivering annual growth of 40% in the UK anaerobic digestion sector where energy is extracted from organic material.



### Anaerobic Digestion (AD)

AD is a natural process where plant and animal materials are broken down by micro-organisms in the absence of air. The AD process begins when biomass is put inside a sealed tank or digester. Naturally occurring micro-organisms digest the biomass, which releases a methane-rich gas called biogas that can be used to generate renewable heat and power;

this helps cut fossil fuel use and reduce greenhouse gas emissions. The remaining material called digestate is rich in nutrients, so it can be used as a fertiliser.

Many forms of biomass are suitable for AD including food waste, slurry and manure, as well as crops and crop residues. An increasing number of AD plants are being built in the UK to generate clean renewable energy with several plants currently operating in Northern Ireland. AD is also used to treat the waste produced in homes, farms, supermarkets and industries across the UK. This helps divert waste from landfill.

The transition to a green economy will require concerted action involving Government and businesses working together. It will present opportunities for businesses to identify and exploit new opportunities in the rapidly developing market for green goods and services. In addition it will enable reductions in costs through efficiency savings and will deliver substantial environmental benefits.

### Resource Efficiency

Our natural environment provides business, industry and society with the resources that are fundamental to supporting and developing our economy and quality of life. These resources include raw materials such as fuels and minerals but also include food, water, air and ecosystems. It is widely recognised that current levels of natural resource use are unsustainable and represent a barrier to economic growth (OECD 2011). A report published by the World Wildlife Fund in 2010 indicated that globally people are using 50% more natural resources than the planet can provide. Increasing global population and associated resource demand coupled with increasing aspiration and expectation in emerging economies will further add to this pressure.

The Europe 2020 strategy identifies improved resource efficiency as key to delivering its sustainable growth priority. The Resource Efficient Europe flagship initiative aims to progress this priority by:

- decoupling economic growth from the use of resources;
- supporting the shift to a low carbon economy;
- increasing the use of renewable energy sources;
- modernising the transport sector; and
- promoting energy efficiency.

Building on the Europe 2020 strategy and the Resource Efficient Europe flagship initiative the European Commission [Roadmap to a Resource Efficient Europe](#) outlines how to achieve the resource efficient growth which is essential for future wellbeing and prosperity. The roadmap outlines how we can transform Europe's economy into a sustainable one by 2050 and proposes ways to increase resource productivity and decouple economic growth from resource use and its environmental impact. The UK sees improved resource efficiency as critical to greening the economy and creating new opportunities for green economic growth.

Advances in resource efficiency will promote economic development through stimulating technological innovation in the developing green technology sector and through reducing business costs. Substantial environmental benefits will also accrue through reducing greenhouse gas emissions and protecting ecosystems and biodiversity. In addition boosting resource efficiency will improve security of supply of food, raw materials and energy.

### Waste

Each year across the European Union we throw away 2.7 billion tonnes of waste. On average only 40% of our solid waste is recycled or re-used, the rest going to landfill or incineration. Waste prevention and re-use activities offer a significant opportunity to enhance our environment while at the same time boosting economic development through improving resource efficiency, reducing disposal costs, opening up new markets and creating jobs. An [EU-wide study \(BIOIS 2011\)](#) found that full compliance with EU waste legislation would increase turnover in the waste management and recycling sector by €42 billion each year and create over 400,000 new jobs.

The Waste Management Strategy for Northern Ireland - Delivering Resource Efficiency sets the policy framework for the management of waste. This reflects obligations contained in the EU Waste Framework Directive (2008/98/EC) that include measures on waste prevention, recovery and re-use. See **Chapter 10**.

The Roadmap to a Resource Efficient Europe includes an aim that waste should be managed as a resource to be fed back into the economy as a raw material. This will contribute to the development of a 'circular economy' with residual waste eliminated or reduced as far as possible. The roadmap recognises that much higher priority will need to be given to re-use and recycling and this will require a combination of policies.

Making more efficient use of material and natural resources and facilitating increased re-use and recycling is expected to have a favourable impact on the NI economy and help to promote and support 'green jobs'. It is estimated that a circular economy where the UK increasingly re-uses and recycles the resources it already has, could help generate 50,000 new jobs with £10 billion investment, boosting GDP by £3 billion.

### Energy

In Northern Ireland we depend on imported fossil fuels for most of our energy needs. The importance of moving from this situation to a more sustainable and secure system is recognised in the [Strategic Energy Framework for Northern Ireland](#) (2010). The framework also recognises that without reliable and affordable energy, economies and communities will cease to function.

Energy generation and use can have a range of negative environmental impacts including emission of greenhouse gases, water and air pollution, habitat fragmentation and biodiversity disturbance. See **Chapters 4 to 9**. By improving energy efficiency and increasing generation of energy from 'clean' sources we can reduce these impacts while at the same time enhancing security of energy supply.

Energy policy in Northern Ireland is driven largely by Europe and this is reflected in the Strategic Energy Framework. A range of initiatives and policies are also in place to promote renewable energy and energy efficiency in Northern Ireland. These include a renewable heat incentive scheme, the Northern Ireland renewables obligation, the warm homes grant

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scheme, the public sector energy plan and the 'Plugged in Places' electric vehicle scheme (see **Chapter 3**).

Northern Ireland has potentially abundant renewable energy resources including through marine and wind and a challenging target to achieve 40% of our energy consumption from renewable sources has been agreed. However we also have the highest fuel poverty levels in the UK raising tensions between renewable energy generation and consumer affordability.

Some areas in Northern Ireland have been identified as potential sources of shale gas that could be exploited as a new regional energy resource bringing economic development, jobs and reducing reliance on imported fuels. The process used to extract the gas from underground rock, known as hydraulic fracturing or 'fracking' for short, has however raised some concerns on possible environmental impacts (see **Chapter 7**).

### Climate Change

Predicted increases in annual rainfall and average temperatures have the potential to disrupt business, agriculture, services and our daily lives. An increased risk of flooding and coastal erosion will put pressure on drainage, sewage, road and rail infrastructure, water resources and habitats. Increased temperature, increased pollution and poorer air quality may bring discomfort to the vulnerable and threaten species of animals and plants, including crops.

Climate Northern Ireland (Climate NI) is a partnership group established to raise awareness and an understanding of climate change issues across a range of sectors, in order to prepare for the effects of climate change. The current focus of the group is on building adaptive capacity by stimulating, supporting and promoting action on adaptation. By preparing for and adapting to the unavoidable consequences of climate change we will minimise negative social, environmental and economic impacts. We will also be well placed to exploit potential benefits such as opportunities to grow new crops. See **Chapter 4**.

### Built Heritage

Our built heritage is recognised as an asset that contributes to economic prosperity and social wellbeing. It is a key element of our developing tourism sector and is also an important driver for regeneration across Northern Ireland.

A number of new and innovative built heritage projects were initiated in 2013 with the support of the Northern Ireland Executive. These include major initiatives at Dunluce and Carrickfergus castles. They aim to invest in the potential of our built heritage and develop heritage assets while maintaining a high level of protection and conservation.

### Natural Capital

Natural capital can be defined as those elements of nature that produce value (directly and indirectly) to people. It includes all of our natural resources such as rivers, land, forests, oceans, minerals, fish stocks and bees. Value is provided through essential ecosystem services and products such as water for industry and society, materials such as timber, fertile

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land, clean air and pollinating insects required to grow crops. Damage to our natural resources can lead to major environmental and economic consequences. For example, it has been estimated that invasive alien species such as Japanese knotweed and Zebra mussels cost the Northern Ireland economy £46.5 million per year. A Northern Ireland strategy to address the problem was launched in May 2013.

The Natural Capital Committee, an independent advisory body to Government, reported in 2013 that *'Natural capital underpins all other types of capital and is the foundation on which our economy, society and prosperity is built'*. Regional policy on natural capital is currently being developed and will be guided by national and European initiatives.



### Agriculture and Food

The agri-food sector includes agriculture, horticulture and food and drinks processing and is Northern Ireland's largest indigenous industry. It is our biggest manufacturing industry, our largest single employer and is also a major exporter. Figures collated in 2010 indicated that the sector employs approximately 100,000 people and generates sales of £4.4 billion.

The sector has significant potential for growth as recognised in the Executive Programme for Government and the Economic Strategy and a seven year strategic action plan to support growth was published in April 2013. [Going for Growth](#) recognises the growing and increasingly affluent global population and associated increasing demand for high quality food products. It sets out to:

- Grow sales by 60% to £7bn
- Grow employment by 15% to 115,000
- Grow sales outside Northern Ireland by 75% to £4.5bn
- Grow by 60% to £1bn the total added value of products and services from local companies.



Agri-food activity can have negative impact on our environment through for example the release of greenhouse gases and ammonia, loss of natural habitat, water pollution and use of pesticides. The Going for Growth strategy recognises the importance of a sustainable and profitable agri-food sector and confirms that proposals for growth should be implemented in a way that delivers the shared goals of environmental and commercial sustainability.

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In Northern Ireland the potential negative impacts of the agri-food sector are controlled through a range of regulations and controls originating mainly from Europe. These include the Nitrates Directive, the Habitats Directive, the Groundwater Directive, the Water Framework Directive and the Northern Ireland Greenhouse Gas Emissions Reduction Action Plan (2011). See **Chapters 4 and 7**.

Funding to protect and conserve the rural environment is also available through European initiatives such as the Common Agricultural Policy (CAP) and the European Agriculture Fund for Rural Development. Negotiations on the next EU financing period from 2014 to 2020 are ongoing and the UK Government is aiming to secure additional support for the environment from these initiatives.

At UK level innovative schemes are being trialled that compensate farmers to protect and conserve the rural environment. These include biodiversity offsetting and conservation compensation schemes that enable farmers and others to receive payments to carry out specific activities that benefit the environment.

### Innovation

Innovation can be broadly described as the process of turning knowledge into valuable products and services that can include an economic return. Environmental innovation reduces the cost of meeting necessary environmental targets and makes possible new policies to meet future needs at the same time as creating wealth and jobs. Innovation is a key element in the transition to a low-carbon future and the [UK Innovation and Research Strategy for Growth](#) identified the potential for the UK to become a world leader in this area.

A regional innovation strategy for Northern Ireland was launched in 2003 and a new strategy is being developed by the Department of Enterprise, Trade and Investment in 2013. The strategy will focus on high value added cross sectoral opportunities based on Key Enabling Technologies (KET's). Development of these technologies will enable promotion of innovation other key sectors including tourism. A Smart Specialisation approach to economic development is also being developed that will help to target support for research and innovation.

The Northern Ireland Science Industry Panel is known as MATRIX. It was established in 2007 to provide forward-focused advice on the future policies necessary for Northern Ireland to ensure economic growth and wealth creation through greater commercial exploitation of its science and technology capabilities. MATRIX has generated a number of reports advising on innovation in key areas including sustainable energy and agri-food.

Innovative environmental projects and initiatives continue to progress in Northern Ireland and one example is the recently established Competence Centre for Advanced Sustainable Energy at Queen's University that will help to position Northern Ireland as an international renewable energy zone.

### First-time Willows Technology for Northern Ireland

An innovative new project has been agreed to trial the use of willows as a natural vegetative filter to clean wastewater from a site in Dungannon. This is a commercial pilot project and is the first of its kind in Northern Ireland. The scheme will involve testing the use of willows as a natural filter (biofiltration) system to clean wastewater from Drumkee Wastewater Treatment Works, Dungannon. If successful, this natural willow technology could provide NI Water with a robust, reliable solution for the cleaning and treatment of wastewater in other rural areas. It could also provide significant benefits in terms of reducing capital expenditure, carbon footprint and environmental sustainability. Northern Ireland is a leading region within the British Isles in terms of researching, trialling and proving the concept of this technology.

[Innovation Union](#) is one of the seven flagship initiatives announced in the Europe 2020 Strategy for Growth. The initiative is an integrated innovation strategy built around 34 specific commitments that aim to ensure that ideas are translated into new goods and services that create growth and jobs. It states that innovation is the only answer to tackling growing societal challenges like climate change, energy supply, scarcity of resources and the impact of demographic changes. The strategy also confirms that Europe includes some of the most innovative states in the world but must do much better if we are to remain globally competitive.

The strategy includes a commitment to publish an Eco-Innovation Action Plan (EcoAP) focusing on the specific bottlenecks, challenges and opportunities for achieving environmental objectives through innovation. The plan was launched in 2011 and focuses on developing stronger and broader eco-innovation actions across and beyond Europe.

### Transport

Transportation has a major impact on our quality of life, our environment and on the economy. It is a major driver for economic development and it sits at the heart of a modern society. Communities and businesses depend on an effective transportation network to move people and goods quickly and reliably.

Direct investment in our transport infrastructure is also an investment in our wider economy. Funds are directed to services, goods and raw materials procured from regional and national sources where possible and jobs are supported at all levels in the supply chain including road and quarry workers, engineers and contractors.

Vehicles and transport infrastructure can however cause environmental damage in a range of ways including through emissions to air, water pollution, loss of natural habitat and damage to buildings. Road traffic is the fastest growing source of greenhouse gases in Northern Ireland and accounts for 26% of our emissions. To meet the Executive's carbon reduction targets, greenhouse gas emissions from transport will have to be reduced. Ultimately, reducing emissions and realising more sustainable transport arrangements will

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require significant changes in travel behaviour and difficult decisions as to how we prioritise and maximise the use of finite road space.

The importance of transportation to economic and social development and health is acknowledged in the current Northern Ireland Executive Programme for Government. This includes commitments to improve our road network, promote sustainable modes of travel and facilitate more school children in walking or cycling to school. The Northern Ireland Regional Development Strategy 2035 states that to remain competitive in the global market it is important to continue to promote transport which balances the needs of our environment, society and economy. The focus is on managing the use of road and rail space and how we can use our network in a better, smarter way.

Decisions on transportation investment in Northern Ireland are currently based on the Regional Transportation Strategy 2002 – 2012. This confirms the need to develop an integrated transport system which meets our economic and social needs, but which does not threaten the health of our environment. A new approach to regional transportation [Ensuring a Sustainable Transport Future](#) has been developed and will replace the existing strategy from 2015. This will complement the Regional Development Strategy and aims to achieve the transportation vision: *“to have a modern, sustainable, safe transportation system which benefits society, the economy and the environment and which actively contributes to social inclusion and everyone’s quality of life”*.

The new approach will be objective-led and will link strategic transportation interventions to the Executive’s objectives for Northern Ireland, based on qualitative and quantitative evidence.

To prevent and reverse environmental degradation and to protect human health, Government uses a range of interventions including education, incentivisation, awareness raising and regulation. The way in which environmental regulation is delivered can have a significant impact on businesses’ operating environments.

The DOE’s Regulatory Reform programme will contribute significantly to economic development and sustainable growth by reducing regulatory burdens and creating a less constricted business environment for innovation and entrepreneurship. It will protect compliant businesses by enabling fair competition and promoting a level playing field and provide business with the confidence to invest, grow and create new jobs.

The environment is fundamental to the economy, providing both direct and indirect inputs to economic activity and acting as a sink to absorb the by-products of production and consumption. The relationship between economic growth and environment is complex but it is clear that, unless we transform our economies to be resource-efficient and low-carbon in the coming years, the increasing global population will put immense strain on natural resources and will continue to damage our already degraded environment. Consequently, failure to decouple economic growth from its negative environmental impacts will make that growth unsustainable.



### Key Challenges and Opportunities

A key challenge is to move away from the historic linear economic model where we extract, produce, use and throw away, to a circular economy model with minimal use of materials and maximum re-use and re-cycling. Zero waste is the ultimate goal of this approach and it delivers major benefits for both environment and economy.

Proposed growth in the agri-food sector should provide a major boost to our economy but must be delivered in an environmentally sustainable way to avoid loss of essential natural capital. Threats to our natural capital through development and unsustainable use of natural resources must also be addressed. This will require a better and wider understanding of the value of nature and its integration into policy development and decision making.

Climate change presents a very serious threat to both environment and economy. We must take action at all levels to minimise greenhouse gas emissions and we must prepare government, business and society and build resilience to the unavoidable impacts. Potential opportunities arising from climate change must also be identified and exploited. Implementing sustainable transport is an important element in reducing emissions and supporting wider economic development.

Great opportunities exist to grow the green economy in Northern Ireland including through developing and applying new technologies and processes and growing the tourism sector. An innovative and forward-looking approach will be necessary to fully realise these opportunities.

Effective environmental policy and targeted incentivisation is necessary to ensure that the Northern Ireland economy achieves long term, sustainable growth. Concerted and co-ordinated effort from all sectors in government, business and society will however be required to secure delivery of the best outcomes for the region.





Our environment around us underpins every aspect of our lives and can have a profound impact on our health and well-being. We depend on it to produce our food, regulate our water and climate, enhance our leisure time and provide a sense of identity.

This chapter focuses on the impact our interactions with our local environment can have on the quality of our lives, health and well-being.

### Key Messages

- Environmental protection and health protection are inextricably linked. Local and community activities play a vital role in delivering improvements in our surroundings and creating well being.
- In recent years there has been a policy shift from addressing single environmental pollution issues towards overall ecosystem resilience.
- Air and water quality pose little overall risk to public health in Northern Ireland. Risks from exposure to radioactivity are also very low provided that precautions are taken in homes in areas where high naturally occurring radon levels have been identified. Whilst much less is known about the health impacts of hazardous chemicals, legislation has been introduced in recent years to ensure the supply and use of chemicals is regulated.
- Noise is an emerging environment and health issue, together with effects of climate change, depletion of stratospheric ozone, loss of biodiversity, and land degradation.

### Introduction

Environment is widely recognised as a major determinant of health and is estimated to account for almost [20% of all deaths in the World Health Organisation \(WHO\) European Region](#). The best-known health impacts are related to ambient air pollution, poor water quality and insufficient sanitation. Much less is known about the health impacts of hazardous chemicals. Noise is an emerging environment and health issue. Climate change, depletion of stratospheric ozone, loss of biodiversity, and land degradation can also affect human health.

### Environment and Health European Policy Context

It has been recognised for many decades by European policy makers that human health and well-being are intimately linked to environmental quality. In recognition of this it is a cornerstone of the European Commission's [7<sup>th</sup> Environment Action Programme](#) and the promotion of good health an integral part of [Europe 2020](#), the EU's 10-year economic-growth strategy. Four pieces of legislation provide the foundation of the EU's approach:

- [Water Framework Directive](#),
- Regulation concerning the [Registration, Evaluation and Authorisation and Restriction of Chemicals \(REACH\)](#),
- [Directive on ambient air quality and cleaner air for Europe](#), and
- [Thematic Strategy on the Sustainable Use of Pesticides](#).

[Health 2020](#) is a new European health policy framework which was adopted in 2012 by the WHO Regional Committee. It aims to support action across government and society to improve significantly the health and well-being of populations, reduce health inequities and ensure sustainable people-centred health systems.

Interactions between the environment and human health are highly complex and difficult to assess. To help address this, the European Commission [7<sup>th</sup> Framework Programme for Research and Technological Development 2007 – 2013 \(FP7\)](#) encourages research to assess the relationship between environment and health and to influence environmental policy decisions.

A recent report on '[Environment and human health](#)' published in May 2013 by the [European Environment Agency \(EEA\)](#) and the European Commission's [Joint Research Centre \(JRC\)](#), outlines a number of environmental issues with a direct influence on people's health and well-being. While pollutants, noise and other forms of environmental degradation can be harmful, the report underlines the large benefits of access to natural environments for physical and mental wellbeing.

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### Environmental Determinants of Health

The [World Health Organization \(WHO\)](#) separates the **environmental determinants of health** into nine key areas. These are Air Quality; Climate Change; Health Impact Assessment (HIA); Housing & Health; Noise; Occupational Health; Transport & Health; Urban Health; and Water & Sanitation.

Aspects of these have already been discussed in the **Air, Climate, Water and Environment and Economy** chapters of this report. This section focuses on areas relating to health not already considered.

### Climate Change and Sustainable Food Production

The effects of climate change can be seen across the globe, therefore it is becoming ever more important to adopt and use more sustainable food harvesting methods, to prevent food shortages. The Northern Ireland [Going for Growth Strategy](#) which aims to increase turnover related to food production in Northern Ireland by 60% by 2020, will not only boost the Northern Ireland economy if achieved, but will ensure long term food security for our growing population.

Food production in Northern Ireland may actually be helped by the onset of a changing climate. Going for Growth notes “*yield modelling identifies overall benefits for some aspects of agriculture production in higher latitudes such as Northern Ireland*”. However, potential changes in rainfall patterns could affect crop production due to impacts on soil quality as a result of flooding, pests, diseases and plant toxin contamination.

Locally [Belfast Healthy Cities](#) support the work of the [UK Sustainable Food Network](#). This is a partnership project, led by the [Soil Association](#) which brings together public, private and third sector organisations that believe in the power of food as a vehicle for driving positive change. They are committed to promoting sustainable food for the benefit of people and the planet. The Network aims to help people and places to share challenges, explore practical solutions and develop best practice in all aspects of sustainable food.



#### **Belfast Healthy Cities**

Belfast Healthy Cities is a citywide partnership working to improve health equity and wellbeing for people living and working in Belfast.

The focus is on improving social living conditions and prosperity in a healthy way, through intersectoral collaboration and a health in all policies approach. Belfast is also a leading member of the [World Health Organization \(WHO\) European Healthy Cities Network](#) and [UK Healthy Cities Network](#) with a strong track record of meeting its goals and objectives.

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Community allotments and the growing of home produce have become more popular in recent years. Council initiatives have been implemented to encourage members of the public to grow their own fruit and vegetables. The [National Allotment Society](#) run a campaign on a yearly basis to increase public awareness of allotments and the benefits to human health and well-being. The campaign is also designed to help wildlife on allotments.



### Allotments

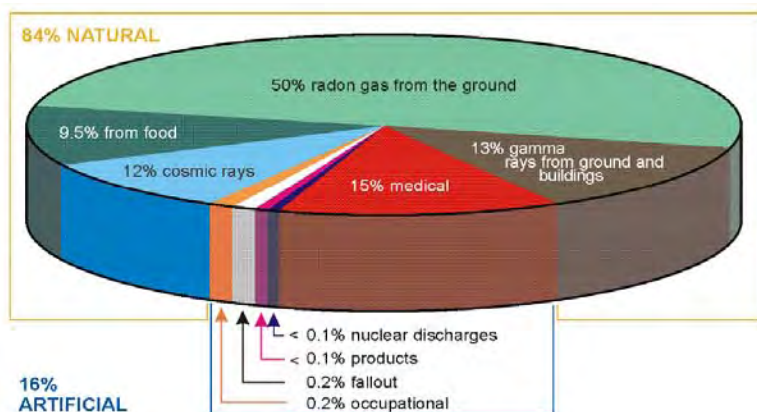
To celebrate National Allotments Week the [Ards allotments](#) site in Newtownards held an Allotment Open Day during allotments week to showcase to the public the benefits of keeping an allotment. These included increased space and time spent outdoors, socialising with friends and the pleasure of growing and eating produce they had grown themselves.

### Housing and Health - Radon

We can regulate what goes in to our air, water and food. However, it is more difficult to regulate naturally occurring phenomena, such as exposure to natural radioactivity. One form of this is radon gas, formed as a result of the decay of uranium, which occurs in varying amounts in rocks throughout Northern Ireland. It has its greatest concentrations in the south and west of the province, and also small isolated areas in the north east.

Outdoors, the risk to health is negligible, but if radon builds up in homes and buildings it may lead to an increased risk of lung cancer. As a result, radon is the single biggest source of public radiation exposure in the UK and is estimated to cause 30 deaths per year in Northern Ireland. The average radiation exposure from radon sources is shown in Figure EH1.

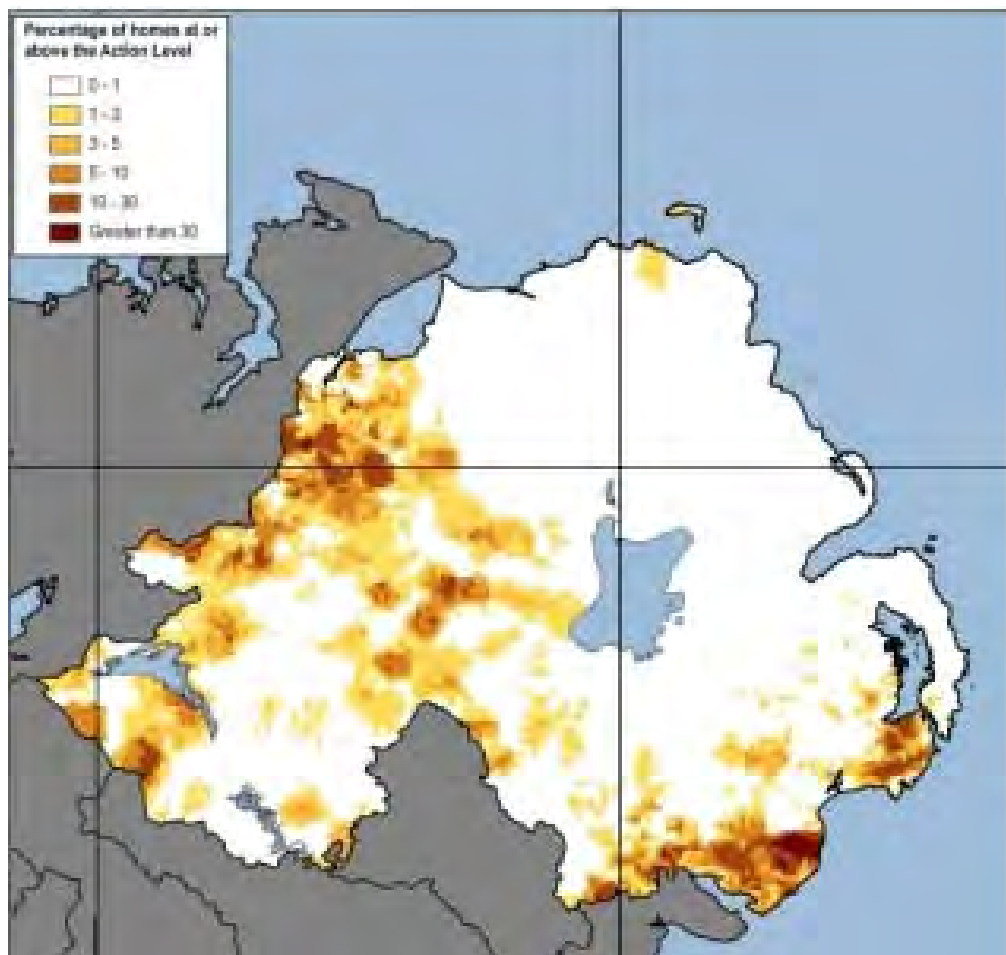
**Figure EH1: Average radiation exposure to Northern Ireland population from all sources**



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The government have recommended an action level for radon in homes in the UK. This level is 200 becquerels per cubic metre. Above this level it is recommended that householders take action to reduce their radon levels. The report on [Radon in Dwellings in Northern Ireland](#) released in 2009 contains maps based on radon results from over 23,000 homes (see Figure EH2). It highlights that 1,200 homes in Northern Ireland have been identified above the Government Action Level for radon. The most effective method of reducing Radon levels in homes is through the use of a radon sump. Air is drawn to the sump using a fan and is then expelled to the outside. In new homes, a radon barrier fitted during construction can be effective at preventing radon infiltration into the building.

**Figure EH2: Overall map of Radon Affected Areas in Northern Ireland**



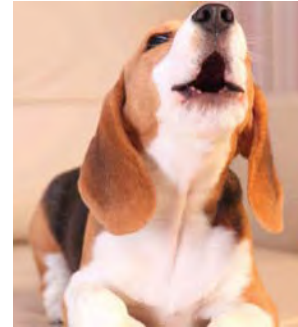
Source: [Radon in Dwellings in Northern Ireland: 2009 Review and Atlas](#) - Reproduced from [OSNI](#)

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### Noise

Noise pollution affects local environmental quality and can seriously affect people's quality of life. It can cause general nuisance and measurable health effects, such as hearing loss, sleep disturbance, aggressive behaviour and stress. The main sources of noise include domestic activities, commerce and leisure, noise in the street, industrial activities, construction and transport.

Noise from certain industrial activities is controlled through the permitting system set out in the [Pollution Prevention and Control \(Industrial Emissions\) Regulations \(Northern Ireland\) 2012](#). Noise from other industrial processes are subjected to the statutory nuisance regime which is enforced by district councils. District Councils are also empowered to deal with the vast majority of noise pollution in Northern Ireland through the [Clean Neighbourhoods and Environment Act \(Northern Ireland\) 2011](#) which gives the councils the power to deal with noise from premises, including land, which they consider amounts to a statutory nuisance.



The Clean Neighbourhoods and Environment Act (Northern Ireland) 2011 also extended the range of premises against which a council can take action under the [Noise Act 1996](#) as well as extending the Noise Act 1996 to all district councils in Northern Ireland from April 2012. The Noise Act 1996 provides additional powers to deal with noise at night from domestic premises. The powers include issuing warnings and fixed penalty notices and in certain circumstances seizing noise making equipment.



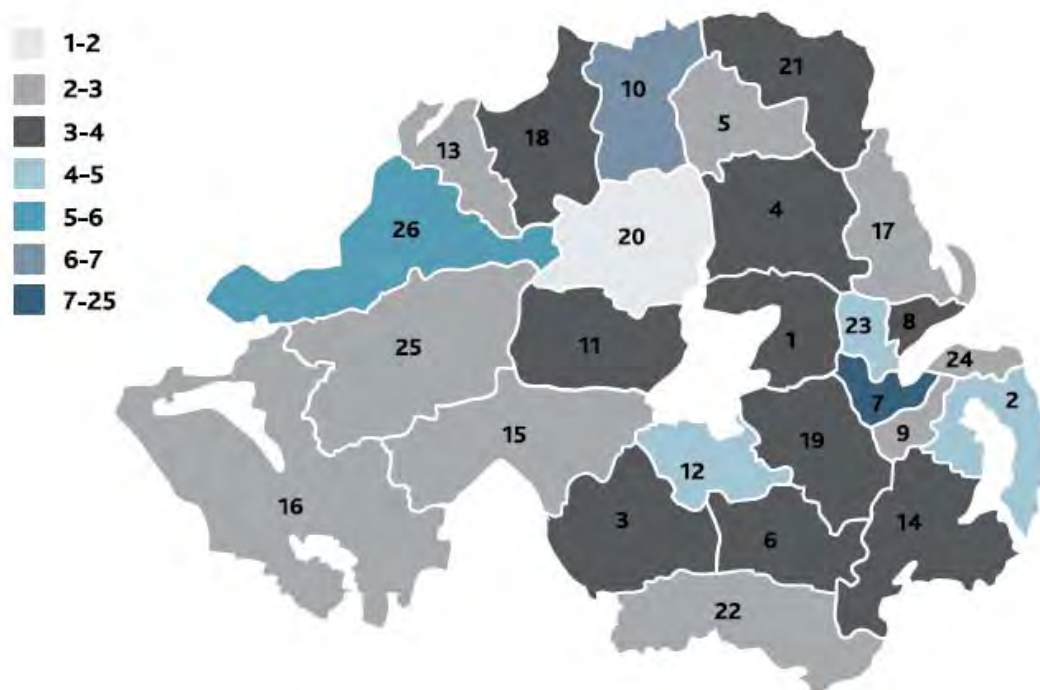
An analysis of noise complaints received by all 26 councils during the period from 1 April 2012 to 31 March 2013 records that 12,142 complaints were made to councils about noise. Northern Ireland has experienced a reduction of less than 1% in the total number of noise complaints received compared to previous year 2011/2012. Figure EH3 shows the noise complaints per 1000 of the population in 2012/13 received by individual council areas.

The [European Environmental Noise Directive](#) requires the production of strategic noise maps for sources of noise from transport, major industrial sites and agglomerations (urban areas).



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Figure EH3: Noise Complaints Per 1000 Population 2012-13



Source: [Noise Complaint Statistics for Northern Ireland 2012/13](#)

1. Antrim	10. Coleraine	19. Lisburn
2. Ards	11. Cookstown	20. Magherafelt
3. Armagh	12. Craigavon	21. Moyle
4. Ballymena	13. Derry	22. Newry & Mourne
5. Ballymoney	14. Down	23. Newtownabbey
6. Banbridge	15. Dungannon	24. North Down
7. Belfast	16. Fermanagh	25. Omagh
8. Carrickfergus	17. Larne	26. Strabane
9. Castlereagh	18. Limavady	

### Occupational Health

Much research has been carried out in recent years to assess the link between rural life and mental health. Life for rural dwellers can be a very positive experience and their levels of good health and well-being can be higher than for many living in urban areas. However, at the same time some people living in rural or remote areas can become subject to social exclusion, and can lack access to services such as, health care and adequate housing. This exclusion can also impact mental health and well-being (source [Health Matters Annual Report of the Chief Medical Officer for Northern Ireland 2011/12](#)).

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Those living in rural areas or in isolation are less likely to seek help for problems than their urban-living counterparts. Rural dwellers such as those involved in the agricultural sector can experience financial burdens resulting from poor harvests, market fluctuations, and livestock disease, to name but a few. These strains can cause worry and ultimately stress, (source: [Understanding rural mental health problems](#) by Tim Relf, February 2012). Suicide rates in farmers are among the highest in any occupational group with approximately one farmer a week committing suicide. In comparison, almost 300 people in the Provence took their own lives in 2011 and 59 died due to road traffic accidents.

### Transport and Health

A great deal of research has been carried out on the topic of transport and health, much of which has been centred around children, in particular their journey to school each day. The [Children's Environment and Health Action Plan \(CEHAP\)](#) produced in 2007 focuses on the impact the environment can have on children's health and well-being and sets its ideas out into Regional Priority Goals. One of the Regional Priority Goals was designed, "To prevent and substantially reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure and supportive human settlements for all children".

The CEHAP document also mentions road safety in children's journey to school and how School Travel Plans can be implemented to ensure children are kept safe. Northern Ireland has adopted this stance and has developed School Travel Plans in conjunction with [Sustrans](#). These school Travel Plans focus on children's journey to school and try to encourage more active living through walking or cycling to school, which in turn helps to lower vehicle emissions especially around school gates. It is also hoped that the current DOE road safety campaign *Share the Road to Zero* will help ensure the safety of our children on Northern Ireland's roads.



Another CEHAP Regional Priority Goal was intended to "prevent and reduce respiratory disease due to outdoor and indoor air pollution ...to ensure that children and adolescents can live in an environment with clean air". An organisation that has tried to do this in Northern Ireland is [Eco-Schools](#), which has developed the '[Travel Challenge](#)' in conjunction with [Translink](#). This scheme attempts to reduce traffic and pollution at school gates by encouraging pupils and parents to adopt sustainable modes of transport such as car sharing or public transport. Another similar initiative also carried out in Northern Ireland is the [Travelwise NI 'Walk to School Week / Month'](#) which in partnership with Northern Ireland Government aims to encourage children to walk to school.

### Urban Health

Green space and the use of it in an urban setting for physical activity is an important factor in relation to individuals' health and well-being. This can help in combating obesity for those who may not have access to the countryside for exercise purposes, and can also reduce social exclusion among neighbourhoods.

Belfast Healthy Cities in their "[Good for Regeneration, Good for Health, Good for Belfast: Indicators to monitor urban development](#)" report state that green infrastructure is advantageous to the built environment by helping to improve air quality and reduce the urban heat island effect. The report also suggests that enhancement of air quality can help ease respiratory conditions, and that small green areas close to people's homes are ideal locations to carry out community activities, which in turn can increase physical activity and overall wellbeing.



Green infrastructure also plays a role in leisure and recreation in that it is free to use. This can help lower-wage individuals to have access to physical activity at no, where otherwise (such as at indoor gyms) it is charged.

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### Chemicals Regulation

Much has been achieved through regulation and other actions to reduce or eliminate direct and indirect human exposure to harmful substances in the environment. Consequent improvements in human health have delivered economic benefits through reduced health service costs and a more productive work force. However, environmental risks remain and are primarily attributed to urban air and water pollution.

Environmental contamination whether natural or man-made can have a profound impact on our health and well-being. Many forms of chemicals exist in our environment and are controlled by a number of regulations. One of these regulations is the [Registration, Evaluation, Authorisation and restriction of Chemicals \(REACH \(EC\) 1907/2006\)](#).

#### Chemicals

REACH is a European Union regulation which came into force on 1 June 2007, and affects the supply and use of chemicals and substances. The REACH Regulation aims to:

- provide a high level of protection for human health and the environment;
- make manufacturers and importers responsible for managing risks;
- allow the free movement of substances on the EU market;
- enhance the competitiveness of the EU chemicals industry;
- promote alternative methods for the assessment of hazards.



The REACH Regulation applies to any business that manufactures, imports, distributes, sells or uses chemical substances. Manufacturers and importers of substances in quantities of 1 tonne or more per year must register them by 1 June 2018. In Northern Ireland the [Health and Safety Executive \(HSENI\)](#) is the competent authority. NIEA also has a role in carrying out campaigns to determine compliance with REACH restrictions and increase business awareness of REACH.

### Sustainable and Healthy Living

The lifestyle choices we make whether it be smoking or taking regular exercise can have a profound effect on our physical and mental health. Within Northern Ireland there are numerous initiatives currently under way which actively encourage outdoor activity.

#### Partnership Initiatives to Encourage Outdoor Activity

The use of green space for community activities is evident through the community allotments and gardens initiative which is currently being carried out in various district council areas. This has helped to encourage people to consider their environment and become more involved in healthy eating through growing their own produce.



## 12 Environment and Health

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Projects that enhance use of green space are encouraged and supported through government and charitable partnerships such as the [Northern Ireland Environment Link Challenge Fund](#). In 2013, seven projects which contain garden, orchard and allotment elements were funded. Projects are carried out by a range of organisations. Some are voluntary such as, the students from St Colms High School, Draperstown who developed a Biodiversity Trail with an outdoor classroom for use by their own school, local primary schools and the local community. Others are carried out by organisations, such as [Groundwork Northern Ireland \(GWNI\)](#).

Reports commissioned by the [RSPB](#) also underline the strong links between good physical health, good mental health and the natural environment. Increasing access to a high quality natural environment can play a vital role in:

- Increasing physical activity and reducing obesity
- Reducing stress, depression and anxiety
- Reducing risk of up to 20 diseases and disorders including heart disease, diabetes and certain cancers

Being obese or overweight costs the UK £2.5 billion a year and the NHS spent £6.5 billion on mental health in 2002/03. Health and wellbeing improvements derived from a clean and high quality environment can therefore deliver major economic benefits.

### Volunteering

Volunteering can provide many benefits to our health and well-being, not only can it provide access to the outdoor environment thus increasing physical activity, but it can also help to promote social inclusion, especially in urban areas. These are the areas most likely to contain a mixture of ethnic or religious groups who do not communicate, or have difficulty in communicating with each other, where social exclusion can develop.

The [Department of Social Development \(DSD\)](#) produced a [Volunteering Strategy](#) in 2012 which referred to an estimate that over 280,000 people regularly give time to formal volunteering in Northern Ireland. Volunteering influences how the [Northern Ireland Executive's Programme for Government](#) is transferred across a range of policy areas such as community cohesion, sport, education, criminal justice, health and urban and rural development.



### Conservation Volunteers Northern Ireland



The [Conservation Volunteers Northern Ireland \(TCV\)](#) is a cross-community volunteering group based in Belfast. TCV specialise in environmental volunteering that involves conservation work and community development in interface communities and areas of deprivation. TCV are currently implementing a **“Willow for Shade”** project funded by the New Opportunities Fund Cancer Programme.

The project arose through the growing concern over the rising number of malignant melanoma cases in Northern Ireland. Here we have a 10% higher chance of developing skin cancer than anywhere else in the UK. The main aims were to supply places for children to play outside school buildings and create shaded areas, thus reducing cases of skin cancer in school children. Twenty four schools from disadvantaged wards within the Eastern Health and Social Services Board were identified to take part in the project. (Source: TCV NI)

### Mental Health

Research published in 2007 by the RSPB called [‘Natural Thinking’](#) has shown that connecting with our natural environment can have a positive effect on our mental health. One organisation in Northern Ireland which has attempted to promote physical activity in an outdoor setting is [SportNI](#). It launched a Mental Health and Well-being in Sport pilot programme in June 2013 to encourage breakdown of barriers within sport regarding mental health. The programme involves 25 sports clubs throughout Northern Ireland in the areas of rugby, gaelic games, soccer, golf and boxing. The clubs will also receive a Mental Health and Well-being in Sport Toolkit, including booklets, posters and training equipment.

### Using Innovation to Develop Healthy Living

Many innovative programmes to encourage healthy living have been developed in Northern Ireland. An example is the Active Living Programme in conjunction with Belfast Healthy Cities and Belfast City Council, which with funding from the Big Lottery aimed to encourage people of all ages to participate in physical activity and get out into their surrounding environments. This programme was organised into set weeks focusing on various types of physical activity such as walking, cycling and swimming.

The concept of the “Green Gym”, first developed at a UK level in England in the 1990s, is relatively new to Northern Ireland and [“Green Gym”](#) initiatives have recently been rolled out across a range of Council areas. The biodiversity and fitness trail at [Carnfunock Country Park, Lame](#) was created in 2011 by [Larne Borough Council](#) in partnership with NIEA, to encourage outdoor activity and thus increase fitness levels.

## Biodiversity and Fitness Trail at Carnfunnock Country Park, Larne

**Biodiversity Trail / Fitness Trail**

**Biodiversity Trail**  
What is Biodiversity?  
Put simply, biodiversity is the variety of life around us. It is all living things from trees to toadstools, from birds to butterflies, from the common place to the greatly endangered. It is the multitude of all living things on earth, including us, the places where they live and relationships that occur

between them. It is important that we appreciate our biodiversity and conserve it, as many species and their habitats are becoming extinct.  
**Why have a Biodiversity Trail?**  
This circular route extends just over 1,000 metres around agricultural land and is accessible for wheelchair users and families with young children in buggies. Along the route, you will see a number of unique habitats, which have been specially created to enhance the park's diversity and encourage wildlife. In particular, there is a giant bird table and a bog garden along with tree, shrub and wildflower areas. Look out for various plants, animals, birds, insects and even fungi, which make up our native biodiversity.

**TREES**  
Native Trees: Alder, Ash, Crab Apple, Scots Pine, Rowan, Wyth Elm, Field Maple, Silver and Downy Birch, Sessile Oak, Willow, Bird and Wild Cherry.  
Naturalised Trees: Beech, Sycamore, Common Oak, Austrian Pine and Horse Chestnut.

**INVERTEBRATES**  
Butterflies, Moths, Spiders, Millipedes, Centipedes, Snails, Flies, Bees, Wasps, Ants, Woodlice, Dragonflies, Crane Flies, Slugs, Worms and Beetles.

**WILDFLOWERS**  
Yellow Flag, Ox-eye Daisy, Marsh Marigold, Snowdrop, Red Poppy, Stinking Iris, Buttercups, Primrose, Cuckooflower and Vetches.

**BIRDS**  
Year Long Residents: Blackbird, Finches, Robin, Wrens, Goldcrest, Thrushes, Blue Tit, Magpies.  
Summer Visitors: Chiff Chaff, Swallow, Warblers.  
Winter Visitors: Brambling, Fieldfare.

**MAMMALS**  
Badger, Bats, Hedgehog, Red Fox, Stoat, Pygmy Shrew, Wood Mice, Wild Rabbits and Grey Squirrels.  
*Most mammals are nocturnal or sensitive to noise so you are unlikely to actually see them!*

**SHRUBS**  
Blackthorn, Bramble, Butterfly Bush, Dog Rose, Sweet Briar Rose, Dogwood, Guelder Rose, Hawthorn, Hazel, Holly, Elder, Cherry Laurel and Field Rose.

**Key to Map Symbols**  
Information Sign  
Parking

**Key to Fitness Trail**  
Station 1: Double Air Walker Lat Pull Station  
Station 2: Double Sit-up Board Seated Leg Press  
Station 3: Elliptical Cross Trainer  
Station 4: Air Skier Seated Chest Press

**Fitness Trail**  
This dedicated fitness trail offers various stations of outdoor gym equipment. (See fitness trail stations outlined below.) The trail is perfect for beginners and more athletic visitors alike, interested in exercising and promoting good health. Suggested training programmes are available from the Visitor Centre or can be downloaded online. Persons using the trail should first ensure that they are physically fit to undertake exercise. Use of the equipment is at your own risk and instructions for use are attached.

The use of GIS (Geographic Information Systems) can also provide an innovative method of mapping and recording health and ways of improving health in a population. Belfast Healthy Cities in conjunction with [Queens University Belfast](#) and other partners have created the Queen's University Belfast Research Project: [Knowledge Exchange, Spatial Analysis and Healthy Urban Environments](#). The project involved the setting up of a Real Walkable Network using GIS to create a spatial database of pedestrian networks across Belfast and Derry, intended to support public decision-making. The Real Walkable Network database has many potential opportunities including using the database to explore how it can contribute to a project to benchmark the age friendliness of Belfast's built environment.

### Key Challenges and Opportunities

It is clear that our environment provides many benefits to our health and well-being. However, we must treat it with care and respect if we wish to continue receiving the valuable Ecosystem Services it provides, to enable our children and future generations to live as healthily as we do.





## 13 Conclusions and Key Challenges



The publication of the first State of the Environment Report for Northern Ireland in 2008, together with the introduction of annual Northern Ireland Environmental Statistics reports in 2009, means that we now have an extensive set of indicators on the Northern Ireland environment.

As a result we are better able to assess the effectiveness of environmental policies over the longer term and to base decisions on how we manage and protect our environment, on appropriate evidence.

### Key Findings

Overall, the current picture of our environment is variable. On the positive side, air quality continues to improve, water quality has benefitted substantially from improved effluent controls and there has been a steady increase in municipal waste recycling rates. In other areas, such as reversing the decline in our biodiversity and meeting key EU objectives for our water bodies, landscapes, habitats and heritage, significant challenges remain.

### Key Challenges

The main threats identified in the first report, from climate change, land use, and socio-economic growth, continue to create pressures.

The most significant change since 2008 has been the **economic downturn**, with related impacts on housing, development, energy and resource use and on waste production. The recession has reduced pressure in some areas such as greenhouse gas emissions, but intensified the need to respond to new approaches to stimulate growth, use our limited resources more effectively and build resilience for the future.

Significant updates in legislation and policy frameworks reflect the priorities for a building a strong economy and delivering resource efficiency whilst protecting and enhancing our natural environment and built heritage assets.

The impact of increasing population, more households and lifestyle choices on the global environment, in terms of imports, energy use, food and water security should not be ignored. **Living within our limits**, both economic and environmental, locally and globally, is now the main challenge.

## 13 Conclusions and Key Challenges

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The challenge of **sustainable rural land use** remains but it is too soon to judge the impacts of planning policy changes and agri-environment schemes. However, it is clear from new evidence from the marine environment, from biodiversity indicators and the status of our waters that key ecosystems remain under threat. **A fully integrated approach to the management of our land and water environment is needed.**

While climate change is still an issue, both in terms of mitigation and adaptation, new legislation such as the UK Climate Change Act along with renewable energy policies and increasing energy costs are likely to reinforce some positive changes already emerging.

### Response and Opportunities

To address these challenges we need to recognise the full value of the services our environment provides in achieving a healthy economy, prosperity and well-being in all our decision-making.

The key principles underpinning the way forward are already widely recognised:

- Working to achieve **resilient, diverse ecosystems** capable of providing vital services while absorbing pressures and responding to change.
- Valuing and **managing natural resources** to support economic and social prosperity.
- Protecting the quality of life by **reducing pollution, protecting heritage** and promoting **sustainable land use**.

Taking advantage of new opportunities and developing innovative solutions that protect and enhance our environment will not only provide a clean and safe place to live but also make Northern Ireland an attractive place for investment in our key agriculture, food and tourism sectors.

## Appendices

### Glossary

A	
Abstraction	The process of taking water from a natural source.
Acidification	The process of a substance becoming more acidic or decreasing in pH, generally in reference to surface waters and soils.
Acid Rain	Refers to the deposition of acidic components in rain when certain pollutants are emitted into the atmosphere.
Agri-food	Agricultural production and food and drink processing
Agricultural Waste	Farm plastics, manures and slurries produced from agricultural processes.
Algae	General term for a group of photosynthetic organisms (microscopic or very large such as seaweeds), which may have bacteria-like cell structures or ones like all other organisms, containing chlorophyll <i>a</i> and a variety of other pigments, giving the organisms a range of characteristic colours.
Alien Species	A species which is not native to a place or area and has been accidentally or deliberately introduced to the new location by human activity.
Ammonia (NH <sub>3</sub> )	A colourless, corrosive, pungent-smelling, gaseous pollutant, formed mainly by the decomposition of organic material.
Annual Mean	The average over the year.
Aquaculture	The farming of aquatic organisms such as fish, shellfish and plants.
Archaeology	The study of human history and pre-history through the excavation of sites and the analysis of artefacts and other physical remains.
Architecture	The art or practice of designing and constructing buildings.
B	
Biochemical Oxygen Demand (BOD)	A chemical procedure for determining how fast biological organisms use up oxygen in water. It can be used to indicate water quality.
Biodegradable	Capable of being decomposed by bacteria or other living organisms and thereby avoiding pollution.
Biodiversity	The variability among living organisms and the ecological complexes of which they are part.
Borehole	A narrow shaft drilled into the ground for the purposes of water extraction, mineral exploration, geotechnical or environmental investigation.
C	
Conservation Areas	Areas designated for their special architectural or historic interest. The purpose of designation is to protect the special interest identified in an area including its setting.
Contaminated Land	Land which has been contaminated by past or present industrial use.

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Carbon Dioxide (CO <sub>2</sub> )	A naturally occurring gas found in the atmosphere which is the most important greenhouse gas produced by human activities, primarily through the combustion of fossil fuels.
Carbon Equivalent	A measure used to compare emissions of different greenhouse gases based on their global warming potential (GWP).
Carbon footprint	The amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organisation or community.
Carbon Monoxide (CO)	A colourless, odourless and tasteless gas which is highly toxic to humans.
Catalytic Converter	A device used to reduce the toxicity of emissions from an internal combustion engine.
Catchment	Term used to describe an area which is drained by a river.
Circular economy	An economy in which we keep resources in use for as long as possible, extract maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.
Climate Change	A change in global climate which is attributed directly or indirectly to human activity and which is in addition to natural climate variability observed over comparable time periods.
Coliforms	A broad class of bacteria found in our environment, including the faeces of man and other warm-blooded animals.
Colony Forming Units (cfu)	A measure of viable (living) bacterial numbers.
Commercial Waste	Waste arising from premises that are used wholly or mainly for trade, business, sport, recreation or entertainment, excluding household and industrial waste.
Common Agricultural Policy (CAP)	A system of European Union agricultural subsidies and programmes.
Compliance	Adhering to laws, regulations and policies.
Controlled Waste	Household, industrial and commercial waste or any such wastes that require a waste management licence for treatment, transfer or disposal.
<b>D</b>	
Deposition	The accumulation or laying down of matter by a natural process e.g. the laying down of sediments in a river.
Designation	The process of identifying an area and affording it a special status.
Demesne	An estate or part of an estate occupied and controlled by, and worked for the exclusive use of, the owner.
Diffuse Pollution	Pollution arising from a number of sources spread across an area or catchment.
Discharge Consent	Authorisation from an environmental regulator required prior to the discharge of anything other than uncontaminated water to surface waters or ground waters.

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E	
Ecosystem	A natural unit consisting of all plants, animals and micro-organisms in an area which function together with the non living environmental factors.
Ecosystem approach	A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use of ecosystems in an equitable way.
Effluent	A discharge of pollutants into the environment, partially or completely treated or in its natural state; generally used in regard to discharges into waters.
Emission	The direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources into air, water or onto land.
Environmental Quality Standard (EQS)	A regulatory value defining the maximum concentration of a potentially toxic substance which can be allowed in an environmental compartment, usually air or water, over a defined period. It can also be used to establish the allowable minimum concentration for necessary substances such as dissolved oxygen in water.
Erosion	A natural phenomenon consisting of the removal of soil or rocks by water or wind that can be accelerated by human activities.
European Union (EU)	A super national and intergovernmental body comprising twenty-seven European countries.
European Directive	A legislative act of the European Union which requires member states to achieve a particular result without dictating the means of achieving that.
Eutrophication	The enrichment by nutrients, especially compounds of nitrogen and/or phosphorous, causing an increase in the growth of algae and plants that produces an undesirable disturbance to the natural balance of an ecosystem.
Exceedence	An event where something, especially a pollutant, is greater than an environmental standard or permissible concentration or level.
F	
Faecal Coliforms	A subgroup of bacteria of the coliform type that live mainly in the gut of warm-blooded animals.
G	
Global Warming Potential (GWP)	A measure of how much a given gas is estimated to contribute to global warming by comparison to the reference gas, carbon dioxide.
Good Environmental Status	The overall state of the environment that provides ecologically diverse and dynamic ecosystems which are healthy and productive.
Greenfield	Undeveloped land in a city or rural area either used for agriculture, landscape design, or left to naturally evolve.
Greenhouse Effect	A natural warming of the Earth's atmosphere due to the reduction in outgoing solar radiation caused by the presence of greenhouse gases.
Greenhouse	Components of the atmosphere which contribute to the greenhouse effect

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Gases	by absorbing and radiating solar heat.
Groundwater	All water which is below the surface of the ground in the saturated zone and which is in direct contact with the ground or subsoil.
<b>H</b>	
Habitat	Place where an organism (e.g. human, animal, plant, micro-organism) or population lives, characterised by its surroundings, both living and non-living.
Habitats Directive	EC Directive aiming to achieve the conservation of natural habitats and species, as well as the protection and where possible improvement of biodiversity. The main aim is to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements, and create a network of protected areas across the European Union known as "Natura 2000".
Hazardous waste	Waste that contains hazardous properties that may render it harmful to human health or the environment.
Heritage Assets	Buildings, landscapes, buried remains and historic areas of architectural or historic interest. Some have statutory protection as listed buildings or scheduled monuments. Others are included in designated conservation areas, historic parks and gardens, World Heritage Sites, and Areas of Outstanding Natural Beauty.
Heritage Crime	Any offence which harms the value of heritage assets and their settings to this and future generations'.
Household waste	Waste collected by Local Authorities from households.
Hydrofluorocarbon (HFC)	Compounds found in the air composed of carbon, hydrogen and fluorine which contribute to global warming.
Hydrographical	The physical features of the navigable portion of the earth's seas and adjoining coastal areas, with particular reference to their use for the purpose of navigation.
Hydrology	The branch of science concerned with the properties of the earth's water, and especially its movement in relation to land.
<b>I</b>	
Impoundment	Any dam, reservoir, weir or structure which creates a barrier across a watercourse. If a structure raises the natural water level of an existing water body, this also constitutes an impoundment.
Indicator	An observed value representative of a phenomenon to study. In general, indicators quantify information by aggregating different and multiple data.
Indigenous	Originating and living, or occurring naturally in an area or environment.
Industrial Waste	Waste from a factory or from any premises used for, or in connection with: provision of public transport; public supply of gas, water, electricity or sewerage services; provision to the public of postal or communication services.
Infiltration	The process by which water on the ground surface enters the soil.
Inorganic	Not composed of organic matter.

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Invasive Non-Native Species	Any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live.
Invertebrates	Animals that lack backbones.
<b>K</b>	
kt NH <sub>3</sub>	Kilotonnes of Ammonia.
Kyoto Protocol	An international treaty designed to limit global greenhouse gas emissions; negotiated in December 1997, it committed industrialized nations to making substantial reductions in their emissions of greenhouse gases by 2012.
<b>L</b>	
Land Cover	The physical state of the land such as the quantity and type of surface vegetation, water and soils.
Landfill	Area of land in or on which waste is deposited.
Land Use	The human employment of the land; a change in land use at any location may involve a shift to a different type of use (e.g. from farming to residential) or a change in the intensity of use.
Landscape Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Leachate	Liquid that leaks from waste disposal sites.
Leaching	Process by which water soluble substances are washed out from soil or waste materials.
Listed building	A building officially designated as being of architectural or historic importance and having protection from demolition or major alterations.
<b>M</b>	
mg/l	Milligrammes per litre.
Mt CO <sub>2</sub> Equivalent	Mega (million) tonnes of carbon dioxide equivalent.
Macrophyte	An aquatic plant large enough to be visible to the naked eye.
Mandatory	Obligatory.
Methane (CH <sub>4</sub> )	A colourless, non-poisonous, flammable gas with a high global warming potential. It is the principal component of natural gas and is produced by the anaerobic decomposition of organic matter. Important sources include marshes and landfill sites.
Micron	A micrometre – one millionth of a metre.
Mitigate	To moderate (a quality or condition) in force or intensity; alleviate.
Monuments in state care	Monuments in State Care are protected by virtue of their ownership or guardianship by the state. The State is responsible for all decisions made on the structure.
Morphological	Relating to the geological structure.
Municipal Waste	Household waste and any other waste under the control of (i.e. collected by) Councils or agents acting on their behalf.

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<b>N</b>	
Natural capital	The elements of nature that produce value (directly or indirectly) to people including the living aspects of nature (e.g. fish stocks) as well as the non-living aspects (e.g. minerals and energy resources).
Nitrous Oxide (N <sub>2</sub> O)	A colourless, non-flammable gas which contributes to the greenhouse effect. It is used in medicine as an anaesthetic and is commonly known as “laughing gas”.
Non-native Species	See alien species.
Nutrient	Element or chemical essential for growth.
<b>O</b>	
Organic	Containing carbon compounds.
OSPAR	An international convention for the protection of the marine environment of the north east Atlantic, to which both the UK and Ireland are signatories. The name ‘OSPAR’ is derived from the earlier Oslo and Paris Conventions, which were combined in 1998.
Ozone	A pungent, colourless, naturally occurring but toxic gas. Close to the earth's surface ground-level ozone is produced photochemically from hydrocarbons, NO <sub>x</sub> and sunlight, and is a major component of smog. In the stratosphere, it protects the earth from harmful ultraviolet radiation.
<b>P</b>	
Particulate	Fine particle of solid or liquid suspended in gas.
Perfluorocarbon (PFC)	Gas used in refrigeration units with a high global warming potential.
pH	A unit for measuring hydrogen ion concentrations. A pH of 7 indicates a "neutral" water or solution. At pH lower than 7, a solution is acidic. At pH higher than 7, a solution is alkaline.
Physiographical	Physical geography.
PM10	Particulate Matter less than 10 microns in diameter, such as solid or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles allows them to easily enter the air sacs in the lungs where they may be deposited, resulting in adverse health effects. PM10 also reduces visibility.
PM2.5	Particulate Matter less than 2.5 microns in diameter, generally soot and aerosols. The size of the particles allows them to easily enter the air sacs in the lungs where they may cause adverse health effects. PM2.5 also reduces visibility.
Pollutants	Substances which, when present in the environment under certain conditions, may become injurious to human, animal, plant or microbial life, or to property, or which may interfere with the use and enjoyment of life or property.
Pollution	The introduction of pollutants into the environment.



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Polycyclic Aromatic Hydrocarbons (PAHs)	A group of compounds formed during the incomplete combustion of coal, oil, gas, wood, waste or other organic substances.
Point source pollution	Pollution from a single, identifiable localised source.
Precursors	A compound that participates in a chemical reaction that produces another compound.
Priority habitats and species	Habitats and species that are conservation priorities which are under threat because of their rarity and rate of decline.
<b>R</b>	
Raised Bog	Found in lowland areas, generally below 150m, such as river valleys, lake-basins, and between drumlins; they are known as raised bogs because the bog surface is raised in the middle, like a dome.
Ramsar Convention	The convention on wetlands, named after the Iranian city where it was adopted in 1971.
Recycling	Using waste materials in manufacturing other products of an identical or similar nature.
Resilience	Measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables.
Renewable Energy	Energy derived from a resource that can be exploited without depletion because it is constantly replenished, e.g. solar radiation and wind.
River basin district	A river basin, or several river basins, and the adjacent coastal areas.
Run-off	Portion of rainfall, melted snow or irrigation water that flows across the ground's surface and is eventually returned to streams; run-off can pick up pollutants from air or land and carry them to receiving waters.
<b>S</b>	
Scheduling	Including on a list for legal preservation or protection.
Semi-natural Habitat	A habitat that has been altered by human actions, but which retains significant native elements.
Sequester	To form a stable compound with an ion, atom or molecule so that it is no longer available for reactions.
Sewage Discharges	Effluent which results from the treatment of sewage at a Waste Water Treatment Works.
Siltation	The deposition of finely divided soil and rock particles on the bottom of water bodies.
Smog	A noxious mixture of gases and particles that often appears as a haze in the air.
Soil Quality	The capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, sustain biological productivity, maintain environmental quality, and promote plant and animal health.
Spatial planning	A function to influence the future spatial distribution of activities.

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Statutory	Required, permitted or enacted by statute.
Storm water	Surface water in abnormal quantity resulting from heavy falls of rain or snow.
Sulphur Dioxide (SO <sub>2</sub> )	A pungent, colourless, gas. Released naturally by volcanic activity, large amounts are also produced by the combustion of fossil fuels, especially coal and oil.
Sulphur Hexafluoride (SF <sub>6</sub> )	Gas used in the electrical industry with a high global warming potential.
Sustainable Development	The ability to meet our needs and enjoy a better quality of life without jeopardising the quality of life of future generations.
<b>T</b>	
Topography	The arrangement of the natural and artificial physical features of an area.
Transboundary	Movement across national borders.
Trophic Status	A measure of nutrient levels and associated plant growth in aquatic and marine systems.
<b>U</b>	
Urban Heat Island Effect	Tendency for a city or town to remain warmer than its surroundings. This is caused mostly by the lack of vegetation and soil moisture.
<b>V</b>	
Vernacular	A style of architecture exemplifying the commonest techniques, decorative features, and materials of a particular historical period, region, or group of people.
Volatile Organic Compounds (VOCs)	Family of highly evaporative organic materials used in a variety of industrial applications, such as paints and solvents; VOCs emissions are major pre-cursors of ground level ozone and smog.
<b>W</b>	
Waste	Any substance or object which the holder discards or intends or is required to discard.
Waste Arisings	A measure of the amount of waste generated by a specified sector or activity.
Waste Recovery	Generating value from wastes from a wide variety of activities such as recycling, composting and energy recovery.
Water body	Any significant accumulation of water.
Water Framework Directive	EU Directive aiming to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. Its main aims are to: protect and enhance aquatic ecosystems and prevent their deterioration; promote sustainable water use; reduce discharges, emissions and losses of priority substances; and contribute to reducing the effects of floods and droughts.
<b>OTHERS</b>	
µg/m <sup>3</sup>	Microgrammes per cubic metre
µmol/l	Micromoles per litre

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### Acronyms

<b>A</b>	
AD	Anaerobic Digestion
AFBI	Agri-Food and Biosciences Institute
AONB	Area of Outstanding Natural Beauty
AQS	Air Quality Strategy
ASSI	Area of Special Scientific Interest
<b>B</b>	
BAP	Biodiversity Action Plan
BHARNI	Built Heritage at Risk in Northern Ireland
BOD	Biochemical Oxygen Demand
BTO	British Trust for Ornithology
<b>C</b>	
C&I	Commercial and Industrial
CAMSAR	Condition and Management Survey of the Archaeological Resource for Northern Ireland
CAP	Common Agricultural Policy
CBI	Confederation of British Industry
CCG	Connswater Community Greenway
CCRA	Climate Change Risk Assessment
CEH	Centre for Ecology and Hydrology
CEHAP	Childrens Environment and Health Action Plan
CFCs	Chlorofluorocarbons
CFU	Colony Forming Units
CRC	Carbon Reduction Commitment
<b>D</b>	
DARD	Department of Agriculture and Rural Development
DCAL	Department of Culture Arts and Leisure
DECLG	Department for Environment, Communities and Local Government
Defra	Department for the Environment, Food and Rural Affairs
DETI	Department of Enterprise, Trade and Investment
DIN	Dissolved Inorganic Nitrogen
DOE	Department of the Environment
DPSIR	Driving force, Pressure, State, Impact and Response
DRD	Department for Regional Development
DSD	Department of Social Development
<b>E</b>	
EA	Environment Agency (England and Wales)
EAP	Environment Action Programme

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EC	European Commission
EcoAP	Eco-Innovation Action Plan
EEA	European Environment Agency
EHS	Environment and Heritage Service (Northern Ireland)
ELD	Environmental Liabilities Directive
EPA	Environmental Protection Agency (Ireland)
E-PRTR	European Pollution Release and Transfer Register
EQS	Environmental Quality Standards
ESA	Environmentally Sensitive Areas
EU	European Union
EU ETS	European Union Emissions Trading Scheme
<b>F</b>	
FCB	Fisheries Conservancy Board
FFD	Freshwater Fish Directive
F-gases	Fluorinated greenhouse gases
<b>G</b>	
GDP	Gross Domestic Product
GES	Good Environmental Status
GHG	Greenhouse Gases
GIS	Geographical Information System
GPS	Geographical Positioning System
GQA	General Quality Assessment
GSNI	Geographical Survey of Northern Ireland
GVA	Gross Value Added
GWNI	Groundwork Northern Ireland
GWP	Global Warming Potential
<b>H</b>	
ha	Hectare(s)
HFC	Hydrofluorocarbon
HSENI	Health and Safety Executive Northern Ireland
<b>I</b>	
IED	Industrial Emissions Directive
<b>J</b>	
JNCC	Joint Nature Conservation Committee
JRC	Joint Research Centre
<b>K</b>	
KETs	Key Enabling Technologies
<b>L</b>	
LACMW	Local Authority Collected Municipal Waste
LAQM	Local Air Quality Management

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LBAP	Local Biodiversity Action Plan
LCA	Landscape Character Assessment
LCM	Land Cover Map
LiDAR	Light Detection and Ranging
LUCF	Land Use Change and Forestry
<b>M</b>	
MTR	Mean Trophic Ranking
<b>N</b>	
NAEI	National Air Emissions Inventory
NAP	Nitrates Action Programme
NASCO	North Atlantic Salmon Conservation Organisation
NEA	National Ecosystem Assessment
NGO	Non Governmental Organisation
NHS	National Health Service
NICMS	Northern Ireland Countryside Management Scheme
NICS	Northern Ireland Countryside Survey
NIEA	Northern Ireland Environment Agency
NIEL	Northern Ireland Environment Link
NIESR	Northern Ireland Environment Statistical Report
NITB	Northern Ireland Tourist Board
NOx	Oxides of Nitrogen
NPL	National Physical Laboratory
NWP	Natural World Products
<b>O</b>	
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
OFS	Organic Farming Scheme
OSNI	Ordnance Survey Northern Ireland
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
<b>P</b>	
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PEDU	Performance and Efficiency Delivery Unit
PFC	Perfluorocarbon
PfG	Programme for Government
PIP	Plugged in Places
PM	Particulate Matter
PPC	Pollution Prevention and Control
PPS	Planning Policy Statement

## Appendices

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<b>R</b>	
RBDs	River Basin Districts
RE	Resource Efficiency
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RSPB	Royal Society for the Protection of Birds
<b>S</b>	
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SIMCAT	SIMulation of the Water Quality of CATchments
SLNCI	Site of Local Nature Conservation Importance
SME	Small or Medium Sized Enterprise
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SOE	State of the Environment
SPA	Special Protection Area
SUSTRANS	Sustainable Transport charity
<b>T</b>	
TCUNI	The Conservation Volunteers NI
TOMPs	Toxic Organic Micro-Pollutants
TPO	Tree Preservation Order
<b>U</b>	
UKNEA	United Kingdom National Ecosystems Assessment
UKPRTR	United Kingdom Pollutant Release and Transfer Register
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UWWT	Urban Waste Water Treatment
<b>V</b>	
VOCs	Volatile Organic Compounds
<b>W</b>	
WeBS	Wetland Bird Survey
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WHO	World Health Organisation
WRAP	Waste and Resources Action Programme
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works

## Appendices

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