

Summary and Conclusions

The indicators in this report represent the first comprehensive collation of data on Northern Ireland's environment and provide a baseline to guide future measurement and assessment of change. We acknowledge that gaps remain and ongoing work is necessary to ensure that the information accurately reflects the state of our environment and enables the development of appropriate measures to protect and enhance its quality. A summary of the key challenges for each of the areas in this report follows.



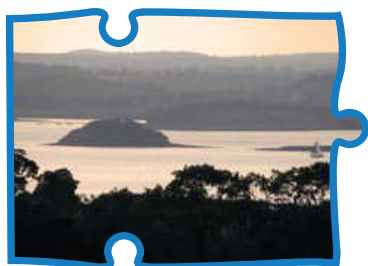
Air

Air quality has improved significantly over the past decade but the continued dependency on fossil fuels means that pollutant emission levels remain high compared to some other European countries. Increased uptake of natural gas and alternative energy sources would further reduce concentrations of pollutants arising from combustion in Northern Ireland.

Road transport is a major and growing pressure in Northern Ireland, affecting local air quality and greenhouse gas emissions. Measures to control emissions from road transport may be outstripped by rapid increase in car ownership and road congestion.

There is no conclusive evidence that Northern Ireland greenhouse gas emissions are declining, and this presents a major challenge in our burgeoning economy. There is a need to take account of future climate in the long term planning for services, environmental protection, construction and business in Northern Ireland. We need to reduce greenhouse gas emissions and adapt to the adverse impacts of climate change already happening.

The UK Government commitment to introduce a Climate Change Bill will further develop mechanisms to address this issue in Northern Ireland.



Water

Chemical water quality in our rivers has shown minor improvement in recent years, from a position of relatively poor quality, primarily through better compliance of discharges. Biological quality is deteriorating, however, and levels of nutrients in particular are high in rivers, lakes, estuaries and occasionally groundwaters. Our coastal waters are generally of good quality as required to protect our health.

Nutrient enrichment, or eutrophication, is the greatest threat to the state of our waters and their biodiversity. Diffuse pollution from run off from agricultural land is a significant factor, as are discharges from towns and cities. Positive steps to address this issue include controls on the use of agricultural fertilisers and investment to meet more stringent discharge controls.

The Water Framework Directive provides a welcome opportunity to assess the effectiveness of current water management activity in Northern Ireland. Effective implementation of the Directive poses a major challenge given the current state of our water environment. There is a significant need to develop new measures to address outstanding risks and achieve the goal of good ecological quality. Future indicators will give a comprehensive picture of both the quality and quantity of water in the environment.

The predicted impacts of climate change provide a future challenge for the management of our water resources, ecosystems, and factors which influence the severity and impact of flooding.

Land and Landscape Management

The state of the land and landscape responds slowly to management change, and long-term monitoring is required.

The management of soils, and in particular phosphorus levels, makes a significant contribution to nutrient enrichment of our water environment. A wider recognition of the importance of soils in the environment as a whole is key to understanding environmental interactions between air, land, and water.

The increase in sustainable land management, promoted through agri-environment schemes and forestry standards, will have benefits for habitats, biodiversity, archaeology and landscape, and will reduce pollution of the air and water environments. Native and ancient woodlands are relatively scarce in Northern Ireland. These will require sensitive management to maximise biodiversity and landscape benefits.

Agricultural intensification and loss of land to development are recognised as threats to habitats, heritage and landscape. Impacts may also arise from the increase in energy crops, affecting the distribution and composition of woodlands in future.

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

Biodiversity

Whilst indicators are at an early stage of development and monitoring, available baseline information on indicators suggests that the coverage and condition of our designated sites needs to be improved significantly.

The key pressures affecting our air, water and land environments will all in combination impact on biodiversity. These include loss of land to development, agricultural and other changes in land use, and pollution from emissions, especially nutrients, all of which are affecting the status of many of our most valuable and vulnerable habitats and species.

Climate change is likely to exacerbate many of the pressures already affecting our flora and fauna.

The Northern Ireland Biodiversity Strategy provides the focus for ongoing work in partnership to protect and enhance our biodiversity.





Built Heritage

Overall recording of built heritage has shown improvement in recent years with the identification of many new heritage sites and listing of important buildings for protection.

Positive steps have been taken to reduce the number of listed buildings most at risk from dereliction or neglect with some success. However a significant number remain. The condition of scheduled monuments is assessed regularly. These records will enable future assessment of changes over time.

Potential threats to built heritage include current site and property values, driven by growth in prosperity and demand, and the resultant development pressures. As development pressures increase, a better understanding of how best to reuse and regenerate buildings, should be promoted. In the countryside, the contribution of heritage in the rural landscape may be at risk from changes in land management and tourism activities.

Development of indicators and systematic monitoring will improve reporting on the condition of our built heritage in the future. Our built heritage represents a fragile resource, which when damaged and lost, is irreplaceable.

Waste and Resources



In recent years there has been an improvement in how we manage our waste. Waste recycling and recovery rates have increased, waste management and landfill facilities are better regulated and controlled, and new waste management infrastructure has been established.

The main challenges for waste management are the continuing increase in the amount of waste produced due to economic and population growth and the need to comply with the increasingly strict limits imposed by the Landfill Directive. The need to address waste prevention therefore remains a high priority, with further development of recycling and recovery infrastructure.

The Northern Ireland Waste Management Strategy provides the framework for developing a number of new measures and legal instruments for waste prevention and resource management to complement those that are already in place.



Conclusions

This report provides an opportunity to take stock of how well our environment is doing, and what poses the greatest threats to its future quality.

We have not looked back into the past, but if we did, we would see that there have been significant improvements in controlling the industrial pollution of air and water. Increasing environmental legislation has led to reduced levels of pollution and less environmental damage. Our biodiversity and built heritage is better protected through the identification and scheduling of important sites and structures. Recent controls and incentives to manage land in a more sustainable way, especially agricultural land, are expected to provide demonstrable benefits to the wider environment in future.

The overall picture of the current state is complex. On the positive side, air quality has improved substantially, water quality is benefiting from improvements in effluent controls, and levels of waste recycling are on the increase. However, the quality of our biodiversity is under increasing pressure. Loss of natural habitats is affecting our wildlife and landscape, and the condition of our built heritage, where known, continues to suffer from neglect.

We face significant challenges to reduce emissions of greenhouse gases, to enhance our water environment to meet European standards, and to protect our natural and built heritage. The information in this report reinforces our current understanding of the pressures facing our environment, and identifies the following main threats:

Climate change

We are all aware of the global impact of climate change, and these effects will also be seen in Northern Ireland. Our contribution to greenhouse gas emissions has not yet shown significant downward trend. There is a need to adapt our management of the environment now to take account of the predicted changes to our climate.

Socio-economic growth

Socio - economic growth is a welcome benefit of increased political stability. This is visible through housing and development pressures leading to loss of landscape character and biodiversity, and loss of valuable historic and cultural heritage. To reap the full benefits of this increased prosperity, we must all find a more sustainable way of living, by reusing and regenerating urban areas, and taking full account of the environmental consequences of our actions.

Rural land use

Rural land use has shaped our countryside for many centuries. Increases in agricultural production, especially livestock and dairy farming, have led to nutrient enrichment of soil and water, impacting on biodiversity. More sustainable land use practices, offering wider enhancement of valuable habitats, species and archaeology, are welcomed.

Our ability to effectively address these issues will be central to the environmental legacy we leave for future generations in Northern Ireland. State of the Environment monitoring will play a key role in that process.

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 a and a variety of other pigments, giving the organisms a range of characteristic colours.
Alien Species (also known as introduced 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 ₃)	A colourless, corrosive, pungent-smelling, gaseous pollutant, formed mainly by the decomposition of organic material.
Annual Mean	The average over the year.
Atmospheric Nitrogen	The gaseous form of nitrogen found in the atmosphere, which is primarily in inert form.
B	
Biochemical	Chemical reactions in living organisms.
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.
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	
Contaminated Land	Land which has been contaminated by past or present industrial use.
Carbon Dioxide (CO ₂)	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 metric measure used to compare emissions of different greenhouse gases based on their global warming potential (GWP).
Carbon Monoxide (CO)	A colourless, odourless and tasteless gas which is highly toxic to humans.
Cashels	Stone-walled ring forts; essentially the same as Rathes except that they are surrounded by drystone walls rather than earthen embankments.

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.
Climate Change	A change in global climate which is attributed directly or indirectly to human activity that alters the composition of the atmosphere by releasing greenhouse gases, 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 .
Critical Load	A quantitative estimate of exposure to one or more pollutants below which, according to present knowledge, significant harmful effects on sensitive elements of the environment do not occur.
Cyprinid	A freshwater fish of the family Cyprinidae which includes carp and minnow.
D	
Deposition	The processes by which chemical constituents move from the atmosphere to the Earth's surface; these processes include precipitation (wet deposition such as rain or cloud fog) as well as particle and gas deposition (dry deposition).
Demesne	An estate or part of an estate occupied and controlled by, and worked for the exclusive use of, the owner.
Denitrification	A process occurring naturally in soil, where bacteria breakdown nitrates and nitrites to nitrogen gas.
Diffuse Pollution	Pollution arising from a number of sources spread across an area or catchment.
Discharge Standards	Criteria applied to emissions to water.
E	
Ecological Footprint	Measures human demand on nature.
Ecosystem	A natural unit consisting of all plants, animals and micro-organisms in an area which function together with the non living environmental factors.
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.
Esker	A serpentine ridge of gravelly and sandy drift, believed to have been formed by streams in or under glacial ice.
European Union (EU)	A super national and intergovernmental body comprising twenty-seven European countries.
Eutrophication	The enrichment by nutrients, especially compounds of nitrogen and/or phosphorus, causing an increase in the growth of algae and plants that produces an undesirable disturbance to the natural balance of the 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.
Fossil Fuels	Organic deposits found in the upper layer of the Earth's crust which are formed from the fossilized remains of dead animals and plants and are used as fuels. Examples include coal, oil and natural gas.
G	
Geodiversity	The variety of minerals, rocks, fossils, soils, landforms and geological processes that constitute the topography, landscape and underlying structure of the Earth.
Glacial Moraines	An accumulation of boulders, stones, or other debris carried and deposited by a glacier.
Global Hectare	A measurement defining an area of global average productivity.
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 Ecological Potential	The status a heavily modified water body must reach under the Water Framework Directive, the components of which are chemical and ecological quality.
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 Gases	Components of the atmosphere which contribute to the greenhouse effect 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.

H	
Habitat	Place where an organism (e.g. human, animal, plant, micro-organism) or population of organisms live, 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.
Household waste	Waste collected by District Councils from households.
Hydrofluorocarbon (HFC)	Compounds found in the air composed of carbon, hydrogen and fluorine which contribute to global warming.
I	
Impoundment	Any dam, reservoir, weir or any structure which creates a barrier across a watercourse. If a structure raises the natural water level of an existing loch, 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. The resulting information is therefore synthesised.
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.
Inorganic	Not composed of organic matter.
Invasive Species	Non-native species that adversely affect the habitats they invade.
K	
kt NH ₃	Kilotonnes of Ammonia.
Kyoto Protocol	An international treaty designed to limit global greenhouse gas emissions; negotiated in December 1997, it commits industrialized nations to making substantial reductions in their emissions of greenhouse gases by 2012.
L	
Land Cover	The physical state of the land such as the quantity and type of surface vegetation, water and earth materials.
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.
M	
mg/l	Milligrammes per litre.
Mt CO ₂ Equivalent	Mega tonnes of carbon dioxide equivalent.
Macroinvertebrates	Aquatic invertebrates, such as shrimps, that are large enough to be visible to the naked eye.
Macrophyte	An aquatic plant large enough to be visible to the naked eye.
Mandatory	Obligatory.
Mean Trophic Ranking (MTR)	Macrophyte based system of assessing water quality.
Megalithic	Prehistoric time period characterised by the use of very large stones in various prehistoric architectures or monumental styles, notably in western Europe during the second millennium BC.
Methane (CH ₄)	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.
Mineral Fertilisers	Naturally occurring, inorganic compounds given to plants to promote growth.
Mitigate	To moderate (a quality or condition) in force or intensity; alleviate.
Morphological	Relating to the geological structure.
Municipal Waste	Household waste and any other waste under the control of (i.e. collected by) District Councils or agents acting on their behalf.
N	
Niche	The position or function of an organism in a community of plants and animals.
Nitrous Oxide (N ₂ 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.
Nutrient Budget	The balance of nutrients coming into a system with those leaving.
O	
Objectives	Policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedences, within a specified timescale.
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, toxic gas. Close to the earth's surface ground-level ozone is produced photochemically from hydrocarbons, NO _x and sunlight, and is a major component of smog. In the stratosphere, it protects the earth from harmful ultraviolet radiation.
P	
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	Relating to the science of physical geography.
PM ₁₀	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. PM ₁₀ also reduces visibility.
PM _{2.5}	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. PM _{2.5} 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.
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.
Podzols	A soil that develops in temperate to cold moist climates under coniferous or heath vegetation; an organic mat over a grey leached layer.
Precursors	A compound that participates in a chemical reaction that produces another compound.
Putrescible Waste	Solid waste that contains organic matter capable of being decomposed by microorganisms and of such a character and proportion as to cause obnoxious odors and to be capable of attracting or providing food for birds or other animals.
Q	
Quantitative	Estimable according to quantity.
R	
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.

Raths	A kind of ancient fortification found in the island of Ireland; in the form of ring forts surrounded by an earthen embankments.
Recycling	Using waste materials in manufacturing other products of an identical or similar nature.
Renewable Energy	Energy derived from a resource that can be exploited without depletion because it is constantly replenished, e.g. solar radiation and wind.
Reuse	Use of waste material again without any structural changes made to materials.
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.
S	
Salmonid	A fish of the family Salmonidae including salmon and trout.
Semi-natural Habitat	A habitat that has been altered by human actions, but which retains significant native elements.
Sewage Discharges	Effluent which results from the treatment of sewage at a Waste Water Treatment Works.
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.
Stalagmite	A deposit, usually of calcium carbonate, more or less resembling an inverted stalactite, formed on the floor of a cave or the like by the dripping of percolating calcareous water.
Stalactite	A deposit, usually of calcium carbonate, shaped like an icicle, hanging from the roof of a cave or the like, and formed by the dripping of percolating calcareous water.
Stratosphere	The portion of the atmosphere that is 10 to 25 miles above the earth's surface.
Sulphur Dioxide (SO ₂)	A pungent, colourless, gaseous pollutant formed primarily by the combustion of fossil fuels, especially coal and oil.
Sulphur Hexafluoride (SF ₆)	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.
V	
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 precursors of ground level ozone and smog.

W	
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.
Waterbody	Any significant accumulation of water.
Water Framework Directive	EC 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 the deterioration of them; promote sustainable water use; reduce discharges, emissions and losses of priority substances; and contribute to reducing the effects of floods and droughts.
OTHERS	
$\mu\text{g}/\text{m}^3$	Microgrammes per cubic metre.
$\mu\text{mol}/\text{l}$	Micromoles per litre

Acronyms and Abbreviations

AFBI	Agri-Food and Biosciences Institute
AONB	Area of Outstanding Natural Beauty
ASSI	Area of Special Scientific Interest
BHARNI	Built Heritage at Risk in Northern Ireland
BOD	Biochemical Oxygen Demand
BAP	Biodiversity Action Plan
CAMSAR	Condition and Management Survey of the Archaeological Resource for Northern Ireland
CAP	Common Agricultural Policy
CEH	Centre for Ecology and Hydrology
CFU	Colony Forming Units
DARD	Department of Agriculture and Rural Development
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
EA	Environment Agency (England and Wales)
EHS	Environment and Heritage Service (Northern Ireland)
EPA	Environmental Protection Agency (Republic of Ireland)
EPER	European Pollution Emission Register
EU	European Union
EC	European Commission
FCB	Fisheries Conservancy Board
FFD	Freshwater Fish Directive
GHG	Greenhouse gases
GQA	General Quality Assessment

GSNI	Geographical Survey of Northern Ireland
GVA	Gross Value Added
GWP	Global Warming Potential
ha	hectare(s)
HFC	Hydrofluorocarbon
MTR	Mean Trophic Ranking
NAEI	National Air Emissions Inventory
NOx	Oxides of nitrogen
OECD	Organisation for Economic Co-operation and Development
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
PAHs	Polycyclic Aromatic Hydrocarbons
PFC	Perfluorocarbon
PPC	Pollution Prevention and Control
RBDs	River Basin Districts
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SLNCI	Site of Local Nature Conservation Importance
SME	Small or Medium sized Enterprise
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SPA	Special Protection Area
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UWWT	Urban Waste Water treatment
VOCs	Volatile Organic Compounds
WFD	Water Framework Directive (2000/60/EC)
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works

Acknowledgements

The Environment and Heritage Service wishes to express its appreciation to the following people and their organisations who contributed to this report.

The EHS/DOENI Project Steering Group, of Wendy McKinley (EHS Project Manager), Pat Corker (Project Director); Ivan Gregg (Planning and Environmental Policy Group); Clifford Henry (Water Management Unit); Richard Weyl (Natural Heritage, Biodiversity); Sandi Howie (Natural Heritage, Countryside and Coast); Brian McKervey (Built Heritage) ; Clare Foley (Built Heritage); Noel Bell (Strategy Unit) and Eileen Curry (Corporate Communications).

Ms Joanne Moran, Consulting Group Manager and the Enviro Consulting Ltd Project team who undertook the initial development of indicators, data collation and drafting of the report.

Dr Liz Fawcett, of Liz Fawcett Consulting for drafting the separate Summary document for this report.

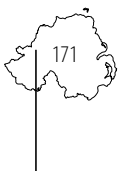
Also we wish to acknowledge the following EHS and DOENI colleagues for their help in providing or facilitating acquisition of information for the report, or providing comments:

Stephen Aston, Caroline Barry, Chris Perry, Fiona Mulholland, David Charlton, Robert Peszel, Sara McGuckin, David Bell, Robert Larmour, Barry McAuley, Ivan Gregg, Stephen Kerr, Colin Nugent, Brendan Forde, Peter Hale, Brenda Walker, Claire Vincent, Ros Stewart, Lynn McFarland, Jake Gibson, Eamon Hagan, Orla Ruddle, John Farren, Tom Adamson, Victoria Crone, Joanne Campbell, David Edwards, Ian Enlander, Martin Bradley, Mark Wright, Marielouise McKenna, Brian Williams, Manus Deery, Ken Neill, Gail Pollock, Helen Murphy, Eugene Kelly, Sean Campbell, Peter McConvey (Geological Survey Northern Ireland)

Special thanks are due to the following who provided additional material and comment for the report

Harry Gracey and Eugene McBride (DARD Countryside Management Branch)
Dr Crawford Jordan (AFBI)
Richard Schaible and Ben Searle (Forest Service)
Stephen Watson (Planning Service)
Pat Aldridge (Rivers Agency)
Patrick Boylan (Loughs Agency)
Paul Willis (AEA Technology plc)
Alain Le Garsmeur (© Images of Strangford Lough)

Designed and published by EHS Design Team; David Walsh, Jacquie Gordon and EHS Design team staff



Our aim is to protect,
conserve and promote
our natural and built
environment for the
benefit of present and
future generations.



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