

Ireland's Environment

2004



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Foreword

This third EPA state of the environment report assesses and reports on the quality of our surface waters, air and natural resources and the impact of the main economic sectors on these valuable assets. We aim to show the public what has been achieved since the last state of the environment report in 2000, what needs to be done and what our future priorities are to protect these important assets.

There have been positive signals for the environment in recent years: a modest improvement in emissions of greenhouse gases and of some acidifying gases, and progress on the extent of rivers affected by eutrophication. Over a longer period we have seen a significant reduction in serious pollution of rivers and in urban air pollution by lead from petrol and smoke from coal. Irish people are becoming more aware of and concerned with environmental issues and more willing to act in environmentally friendly ways. Examples include the success of the plastic bag levy and the increased rates of recycling of municipal waste.

Despite the positive signals, much more progress is needed on issues such as eutrophication, waste, and greenhouse gas emissions - issues that were highlighted in the last state of the environment report. Further progress is needed too on the protection of natural resources and on ameliorating the impact of transport on the urban environment - which were also highlighted in the last report. What is now needed is to make the protection of the environment and the conservation of our natural resources central considerations in the plans, programmes and actions of all economic sectors. This is the process of integrating the environment into sectoral decision making and it is receiving increased support internationally.

There has been considerable investment through the National Development Plan into much needed environmental infrastructure and environmental research and such investment is beginning to pay dividends. In recent years too, we have seen the publication of the National Biodiversity Plan, National Climate Change Strategy and National Spatial Strategy. The challenge now is to ensure that the objectives and targets of these plans become part of day-to-day decision making. A continuation of the positive signals depends critically on the objectives of the various strategies and plans being realised in a timely manner.

The EPA through the implementation of its recently launched strategic framework action plan, intends to pursue with renewed vigour the work of establishing and maintaining high environmental standards in Ireland. The framework includes the establishment of the Office of Environmental Enforcement, which will provide coordination for the various agencies involved in the enforcement of some 200 environmental laws now in force. It is my intention that the Office will take all necessary measures to support better implementation of environmental legislation by the relevant public bodies.

We always welcome your views on our publications and it would be appreciated if you could provide us with feedback; a response form is included at the back of this publication. Finally, a report of this nature would not be possible without the information provided through the dedication and expertise of the many people involved both directly and indirectly. I should like to express my appreciation and thanks to all concerned.

Mary Kelly

Director General

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Summary

Introduction

This third state of the environment report by the Environmental Protection Agency brings together the most recent information on the quality of Ireland's environment. It assesses the factors that affect the environment and discusses protection policies, both national and international.

The past decade has seen unprecedented economic development; GDP per person has increased from well below the EU average to near the top of the range. The population has also grown strongly, especially in Dublin and surrounding counties. Industry and services now account for the bulk of GDP. While the potential pressures on the environment are growing, the means to combat them are keeping pace through a widening range of laws and policies.

At international level, there have been developments in relation to controlling greenhouse and acidifying gas emissions and to the protection of air and water quality. At national level, the statutory controls on industrial activity and waste management have been strengthened, while policies have been devised to counter the regionally unbalanced nature of development. Irish people now seem more aware of and concerned with environmental issues than they were a decade ago, and show an increased willingness to act in a manner that benefits the environment.

Air Quality

A suite of new EU Directives setting out

a fundamentally new approach to the monitoring, assessment and management of air quality has been adopted in recent years. The Directives incorporate stringent new standards for a wide range of pollutants, several of which are covered for the first time. The EPA is the competent authority for implementing these Directives. It is already implementing a detailed new air quality monitoring programme and ensuring that the public has access to more up-to-date information on ambient air quality, including real-time data.

Owing to the success of pollution control related to stationary sources, emissions from road traffic are now the primary threat to the quality of air in Ireland. The pollutants of most concern in this regard are nitrogen dioxide (NO₂) and fine particulate matter, expressed as PM₁₀. Monitoring by local authorities and the EPA indicates that compliance with the stringent new PM₁₀ and NO₂ standards may present problems in some urban areas subject to heavy traffic. The EPA will advise local authorities of areas where measures are needed to ensure compliance with the standards from 2005 and 2010 for PM₁₀ and NO₂ respectively. The introduction of such measures, in the form of air quality management plans or short-term traffic restrictions, would be a major new challenge for local authorities in Ireland.

Water Quality

There is a need for improved protection of surface waters and groundwaters, especially in the context of the Water

Framework Directive's target of good quality for all waters by 2015. Municipal sewage and diffuse agricultural sources are the main causes of eutrophication in Ireland.

It is estimated that 70 per cent of the total river channel surveyed in 1998–2000 (13,200 kilometres) was in a satisfactory condition, 17 per cent was slightly polluted, 12 per cent was moderately polluted and 1 per cent was seriously polluted. This represented a slight improvement compared to the previous two periods (1991–1994 and 1995–1997), which had shown increasing slight and moderate pollution. More recent data indicate that the proportion of seriously polluted channel has fallen further, to 0.5 per cent.

The position regarding lakes is considerably better than for rivers, with 85 per cent of those surveyed in 1998–2000 showing a satisfactory condition; however, serious eutrophication problems are again reported in many of the larger lakes. Lough Sheelin, for example, which was once a major wild brown trout fishery, continues to be polluted by land-spread animal manure from the intensive pig-rearing industry, as it has been for more than 35 years. In Counties Cavan and Monaghan in particular, many lakes are in an unsatisfactory condition due to historically poor control of animal manure.

Deficiencies in livestock waste management and the poor siting of on-site wastewater treatment systems, such as septic tanks, have also led to

some groundwaters having an unacceptably high level of contamination. In 2001–2002, 25 per cent of groundwater samples tested showed faecal contamination, while 23 per cent of samples had nitrate levels in excess of the EU guideline value.

Estuarine and Coastal Waters

There are diverse pressures on the estuarine and coastal environment as a result of human activities, leading to impaired quality in some respects. While general water quality in most estuaries and bays is high, some areas within tidal waters have experienced serious deoxygenation, notably a section of the Lee Estuary/Inner Cork Harbour and the estuary of the Castletown River in Dundalk. Surveys indicate that extreme eutrophication is confined mainly to the Broadmeadow Estuary, Co. Dublin, though other water bodies, notably the estuaries of the major rivers of the east and south of the country, have also been classified as eutrophic.

The use of organotins in anti-fouling paints has continued in Ireland, particularly in the vicinity of ports and shipping areas. A new EU Regulation has banned application on vessels from 2003 and prohibits any further use in EU waters as of 2008.

The British Nuclear Fuels reprocessing plant at Sellafield remains the largest single cause of exposure to artificial radionuclides. Doses resulting from operational discharges are low, and on the basis of current scientific understanding, do not pose a significant health risk at this time. However, the potential risk of contamination which might occur as a result of accidents remains a cause for concern.

Irish fish continue to be free of contamination by polluting substances; levels of polychlorinated biphenyls (PCBs) and dioxins in wild and farmed salmon, and in food preparations, were well within current EU limits. Stricter monitoring controls on shellfish production areas are now in place.

The quality of bathing waters and shellfish waters is generally very good, though the continuing problem of naturally occurring harmful algal blooms constitutes a significant threat to the Irish shellfish industry. Coastal litter remains a significant problem, though there is evidence that the 2002 levy on plastic bags has contributed to a reduction in their occurrence on beaches.

The Terrestrial Environment

The land of Ireland is continuously subject to change. A 1990 database of land cover for Ireland (CORINE) was updated in 2000. During this period, there was an increase in artificial surfaces from 1.5 per cent of total land cover to 1.9 per cent, caused by urban sprawl and improvements in infrastructure and sports facilities. An area of over 1,000 km² changed from peatbog to a forest category. The landscape is predominantly rural and has been altered by both natural and human-induced factors over the centuries.

The rural environment, including quiet, natural places for relaxation, is an increasingly important location for recreation and tourism. In different areas it has experienced depopulation, urbanisation, suburbanisation, industrial development and afforestation. The National Spatial Strategy brings the potential for balanced and sustainable growth if

implemented with due regard for the environment.

Litter continues to be one of the most visible environmental problems although, as noted above, the 15 cent levy on plastic bags is a positive development and is expected to remove over one billion bags from circulation each year.

Natural Heritage and Biodiversity

Ireland's natural heritage of species and habitats, while not as diverse as in other European countries, is deemed to be of such importance that 25 species and 60 habitats are recognised by the EU as being in need of special protection. Some other native flora and fauna and their habitats are also under threat from a variety of factors including agricultural practices, forestry, peat extraction, eutrophication of waters, climate change, alien species, land clearance and development.

Assessment of Ireland's biodiversity is inhibited by the continuing lack of a biological records centre to provide baseline and up-to-date information on the distribution and abundance of species. In the meantime, the challenge for the conservation authorities is to prepare action plans for the Irish species and habitats of European importance. A National Biodiversity Plan and a National Heritage Plan were published in 2002.

Agriculture and Forestry

Agricultural practices have shaped the Irish countryside in a harmonious way for generations, but in recent years the intensification of farming practices has resulted in a dramatic increase in impacts on the environment. In

particular, excessive use of nutrients – in many cases well beyond agronomic needs – has caused widespread water pollution. Although phosphorus use has declined markedly in the past decade, Irish farms still apply a significant surplus each year. Further reductions are required in order to bring about a sustainable balance.

As noted above, contamination of surface water and groundwater is a major issue. Overgrazing on hillsides remains a problem in Western counties. A wide range of measures aimed at controlling farm pollution is in place; ongoing farm pollution surveys are also an essential element of a successful control strategy.

Although forest cover has increased to approximately 10 per cent of the land area, Ireland is still one of the least afforested Member States of the EU. The undoubted benefits of forests need to be balanced against potentially adverse impacts, including visual intrusion, impacts on watercourses through acidification and siltation, and impacts on sites of archaeological or scientific interest. The implementation of sustainable forest management is being supported by a suite of environmental and forestry practice guidelines.

Industry, Services and Energy Generation

Energy conversion efficiency has been improving as high-efficiency units replace older generating plant and existing facilities are optimised. The residential sector shows the least eco-efficiency. Currently, Ireland is critically and increasingly dependent on imported non-renewable fossil fuels, especially oil.

Measures to control energy use and environmental impacts include

Integrated Pollution Control licensing, the Cleaner Greener Production Programme, the European Eco-labelling scheme, the Environmentally Superior Products scheme, the National Climate Change Strategy, and EU Directives. Sustainable Energy Ireland, Enterprise Ireland and the Environmental Protection Agency do considerable work in this regard.

Production of renewable energy in Ireland is increasing. Greater use of indigenous, clean sources of energy would provide investment opportunities and employment, often in rural areas.

Low real prices for energy are a disincentive to using it efficiently and responsibly. Given the urgency of the climate change and other transboundary impacts of energy production and usage, it is necessary to encourage a widespread profound change in attitudes and behaviours in Ireland in relation to energy use, particularly in relation to carbon-based, non-renewable fuels.

Transport

Ireland's economic prosperity during the 1990s resulted in a huge increase in the number of vehicles on the roads. Inadequacies in public transport systems and in the national road network now threaten regional development and Ireland's cost-competitiveness, and are contributing to decreased labour mobility and high house price inflation. Also, road traffic is one of the most important sources of air pollution. Greenhouse gas emissions are increasing rapidly; decoupling further growth in such emissions from growth in transport is a key challenge.

There were 339 fatalities on Irish roads in 2003. The total cost of road accidents

is estimated at €750 million annually. Other adverse effects of our dependence on road travel are noise, ecological damage and habitat fragmentation.

So far, there has been little progress towards the objective of bringing about a substantial shift to public transport. A policy of urban containment, involving high-density residential development, mixed land uses and good public transport, is crucial to curbing the trend of increasing hinterland-to-city travel. The successful implementation of the National Spatial Strategy will largely depend on the provision of transport links to a standard that will enable gateways and regional hubs to compete with Dublin for industrial, commercial and social development.

Fisheries and Aquaculture

Ireland's maritime and freshwater resources are vital to the economy, the environment and recreation. There is concern that 25 out of 56 commercially targeted marine fish stocks in Irish waters are overexploited and in decline. The reform of the Common Fisheries Policy may provide a more effective management system to aid the recovery of the most vulnerable stocks. The European Commission has begun to restrict catches of some deepwater species by imposing total allowable catches.

The suggested link between sea lice on salmon farms and the decline in wild sea trout populations in the west of Ireland is a serious issue. Efforts such as the initiation of sea lice monitoring have seen a downward trend in sea lice levels, and some recovery in individual sea trout fisheries.

A number of native inland fish stocks (e.g. salmon, trout and Arctic char) are

affected by habitat degradation caused by eutrophication; factors such as drainage, acidification of headwaters and fishing pressures also impact on these stocks. Populations of non-native coarse fish appear to be thriving in many lakes and rivers; roach, in particular, continues to expand its range. River rehabilitation and protection programmes have succeeded in increasing stocks of salmon and trout, and should be encouraged.

Household and Tourism Sectors

The demand for new houses continues to rise; Ireland now has one of the highest owner occupancy rates in Europe. The growth in the household sector has placed a significant demand on resources such as land, energy and water – this sector became the second largest consumer of energy in Ireland in 2002. In line with the rest of Europe, household waste production is also on the increase, with every household of three persons in Ireland producing, on average, one tonne of waste per annum.

Tourism is an important source of investment and employment in Ireland, particularly in rural regions. Although the intensity of tourism activity in Ireland is low by some international standards, the impact of tourism needs to be closely monitored as it has both direct and indirect impacts on the environment. The sector interacts closely with other policy areas – transport, energy, environment, regional planning, business and trade – and there is a need to coordinate and integrate policies. All stakeholders in the tourism sector, at national, regional and local levels, have a part to play in preserving environmental quality. The challenge now lies in moving sustainable tourism into practical implementation.

Eutrophication

Eutrophication results from an excess of key growth-limiting nutrients such as phosphate and nitrate entering surface waters. Diffuse agricultural and municipal sewage sources are the main causes of eutrophication in Ireland. It remains the single most important problem affecting surface waters in Ireland. Almost 30 per cent of our rivers remain affected by this form of pollution. Seven per cent of the area of lake waters assessed (15 per cent of the lakes monitored) was unsatisfactory in terms of trophic status. Ten estuarine and coastal waters have also been classified as eutrophic, and sections of a further three waters have been classified as potentially eutrophic.

Large-scale investment is taking place through the National Development Plan (NDP) 2000–2006 to improve the quality of urban wastewater treatment discharges, and further investment in the installation of nutrient removal from point sources will be required. With improved levels of sewage treatment and with industrial point sources subjected to tight controls, it is likely that relative proportion of eutrophication caused by agriculture will increase if measures are not implemented to achieve further improvements in this sector also. Research is pointing to key recommendations including: the implementation of nutrient management plans on all farms, reducing soil phosphorus levels generally, preventing the spreading of slurry and fertiliser in riparian areas, proper management of farmyards, and adequate slurry storage.

Waste and Material Flows

As noted above, waste generation and

resource use are increasing in Ireland in tandem with increasing consumption of goods and services. Tackling the root causes and environmental impact of these trends is increasingly important for society; it is equally important to consider waste generation and resource use together. With most raw materials being imported into Ireland, the environmental impact in the country of origin may not always be recognised here. Additionally, virtually all products and materials themselves sooner or later become waste, necessitating appropriate management for recycling or disposal. As these recycling and disposal activities can themselves have environmental impacts, the best environmental option overall is to prevent or reduce waste where at all possible. In Ireland, notwithstanding an increasingly professionalised and licensed waste sector, significant instances of illegal dumping of waste have been detected. With an infrastructural deficit in waste recovery or disposal capacity, Ireland exports much of its hazardous waste and some non-hazardous waste.

Implementing waste prevention and integrated product policies in increasingly competitive and globalised free-market economies is an ongoing challenge for regulators. The EU Sixth Environment Action Programme has the overarching objective of breaking the link between economic growth and resource use to move to more sustainable economic activity based on renewable energy and resources. National policy needs to be defined and implemented in a manner that fosters increased resource productivity.

Climate Change and Greenhouse Gases

Climate stability is fundamental to

social stability and sustainable development. The United Nations Intergovernmental Panel on Climate Change has identified the build-up of atmospheric greenhouse gases such as carbon dioxide as threatening global climate stability. This is considered to be the most serious environmental issue of this century.

International action to prevent dangerous anthropogenic interference with the climate system through the UN Framework Convention on Climate Change, and its Kyoto Protocol, is strongly supported by Ireland and the EU. However, Ireland must act urgently to reduce greenhouse gas emissions if its Kyoto Protocol target, i.e. to limit increases in greenhouse gas emissions to 13 per cent above 1990 levels, is to be met by the 2008–2012 commitment period.

Recent rapid economic development means that national greenhouse gas emissions during 2002 were 29 per cent higher than 1990 levels. Flexible mechanisms in the Kyoto Protocol, such as emissions trading, can reduce the costs of meeting targets but urgent implementation of further measures is required.

Future emissions reductions targets will be significantly greater and more challenging. These targets will be based on developing increased scientific understanding of climate change and improved management of environmental and other resources. Adaptation to unavoidable climate change during the first half of this century will be required, which may entail significant costs including expected costs of weather-related damage. To meet these complex challenges, Ireland must actively participate in international scientific, technical and socio-economic efforts, discussions and negotiations, and must

define and develop further national actions.

Acidifying Gases

For the first time ever, legally binding limits have been placed on national emissions of the major substances that contribute to the problems of acidification, eutrophication and ground-level ozone in Europe. The limits are laid down for sulphur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃) and volatile organic compounds (VOCs) in the EU National Emissions Ceiling Directive, and are to be achieved by 2010. For Ireland, compliance with the ceilings represents a major new challenge given that ammonia and VOCs have not previously been subject to abatement strategies, and progress on reducing total emissions of SO₂ and NO_x has been slow.

Fundamental changes, entailing substantial costs in some cases, are needed in key sectors of the economy if Ireland is to reduce emissions of the four substances to their respective ceilings. Proposals for the control of SO₂ and NO_x emissions have been put forward in respect of large combustion plants. Following the publication of the 2003 discussion document, Ireland needs to produce a national strategy for the attainment of the national emissions ceilings. The integration of environmental issues into economic and social development in implementing the coordinated emission control strategies necessary to meet these targets will be a key element of the pursuit of sustainable development in the coming years.

The Environment and Human Health

The level of environmental public health

protection in this country is high, especially since the threat from infectious diseases has largely diminished due to successful immunisation programmes and improved diet, housing and general living conditions. Ireland's temperate climate is a contributory factor in reducing risks to public health, especially in terms of infectious diseases and sun exposure. Considerable investment has been made in improving drinking water quality, especially in the larger supply schemes, although unacceptably high microbiological levels are continually being found in many of the smaller private rural schemes.

Radon levels are high in some areas and remediation work in some schools has been undertaken. Persons living in these areas are advised to have radon levels checked by the Radiological Protection Institute of Ireland.

Since the toxicological response of children to many substances is proportionately much greater than that of adults, children's health should be a particular priority in considering issues of environmental health.

Protection of Natural Resources

Recent policy measures to protect natural resources include the publication of the National Biodiversity Plan and the National Heritage Plan. A systematic and detailed study would be required in order to assess the degree of effectiveness of such initiatives; however, from the information available, it appears that policies and measures have only partially succeeded in protecting Ireland's natural resources.

Problems identified in the last state of the environment report included deficiencies in:

- coastal zone policy;
- natural heritage protection and management;
- protection of water quality from eutrophication;
- waste management/resource use;
- urban development and transport management;
- marine resource protection;
- response to climate change.

Some of these shortfalls remain: for example, little progress has been made in coastal zone protection in the past four years. The lack of a National Biological Records Centre militates against tracking changes in species and habitats over time and the identification of areas in need of conservation.

Significant progress in submitting sites of European importance for designation has been recorded since 2000, and the process of achieving full compliance for the Natura network – the cornerstone of EU nature conservation policy – could be completed by the deadline of end of 2004. It is proposed that an overarching strategy for policy in agriculture, fisheries, forestry and tourism is required in order to sustain our natural resources.

Chemicals and Genetically Modified Organisms

Developments in the chemical and pharmaceutical industry in the recent past have brought great benefits in terms of living standards and human and animal health, but the manufacture, use and dispersal of chemicals have also created risks to humans and the natural environment. Persistent organic pollutants (POPs) and heavy metals merit particular attention because of their persistence and tendency to bioaccumulate. New

initiatives such as the United Nations Stockholm POPs convention and the proposed EU chemical policy, REACH, attempt to address the shortcomings of existing policy approaches.

Results of dioxin monitoring have consistently shown uniformly low levels in the Irish environment compared with those measured in other European countries. The effect on wildlife of endocrine disrupting substances is well established, but the impact on humans is more obscure. While the concentrations of these substances are generally very low, their high biological activity is of concern. In recent years the development of genetically modified organisms has represented a new risk to the environment, which is subject to strict regulation.

Future Agenda

As a result of preparing this third EPA state of the environment report, five overall environmental priorities are identified. The five comprise of three specific thematic challenges and two general challenges for environmental protection.

The three specific challenges are:

- meeting international commitments on air emissions (greenhouse gases and acidifying gases);
- eutrophication prevention and control; and
- waste management.

The two general environmental protection challenges are:

- better integration of environmental and natural resource considerations into the policies, plans and actions of economic sectors; and
- improving the enforcement of environmental legislation.

In Conclusion

Although under increasing pressure, Ireland's environment remains of generally good quality and represents one of our most essential assets. Awareness and vigilance are needed if this asset is to be protected, and where necessary enhanced, for the benefit and enjoyment of present and future generations.

Acronyms/Abbreviations

AFS	Convention on the Control of Harmful Anti-fouling Systems on Ships	DTO	Dublin Transportation Office
AOT ₄₀	Accumulation over a Threshold of 40 ppb	EDC	Endocrine Disrupting Chemical
BAT	Best Available Techniques	EEA	European Environment Agency
BIM	Bord Iascaigh Mhara	EEC	European Economic Community
BMW	Border, Midland and West (Region)	EIA	Environmental Impact Assessment
BOD	Biochemical Oxygen Demand	EIS	Environmental Impact Statement
BOHAB	Biological Oceanography of Harmful Algal Blooms (study)	EMAS	Eco-Management and Audit Scheme
Bq	Becquerel	EMS	Environmental Management System; European Marine Strategy
CAP	Common Agricultural Policy	EPA	Environmental Protection Agency
CEC	Council of the European Communities	EPER	European Pollution Emissions Register
CFB	Central Fisheries Board	ERTDI	Environmental Research Technological Development Innovation
CFP	Common Fisheries Policy	ESRI	Economic and Social Research Institute
CHP	Combined Heat and Power	ETS	Environmental Tobacco Smoke
CLAMS	Coordinated Local Aquaculture Management System	EU	European Union
CLC	CORINE Land Cover Project	FMU	Forest Management Unit
CO	Carbon Monoxide	FSAI	Food Safety Authority of Ireland
CO ₂	Carbon Dioxide	FSC	Forest Stewardship Council
CORINE	Coordination of Information on the Environment	GCOS	Global Climate Observing System
CSO	Central Statistics Office	GDA	Greater Dublin Area
DAF	Department of Agriculture and Food	GDP	Gross Domestic Product
DAFRD	Department of Agriculture, Food and Rural Development	GHG	Greenhouse Gas
DAHGI	Department of Arts, Heritage, Gaeltacht and the Islands	GIS	Geographical Information System
DART	Dublin Area Rapid Transit	GMM	Genetically Modified Micro-organism
DCMNR	Department of Communications, Marine and Natural Resources	GMO	Genetically Modified Organism
DEHLG	Department of the Environment, Heritage and Local Government	GSI	Geological Survey of Ireland
DELG	Department of the Environment and Local Government	GWP	Global Warming Potential
DES	Department of Education and Science	HAB	Harmful Algal Bloom
DIT	Dublin Institute of Technology	IBAL	Irish Businesses Against Litter
DMC	Direct Materials Consumption	IBEC	Irish Business and Employers Confederation
DMI	Direct Materials Input	ICES	International Council for the Exploration of the Seas
DMP	Direct Materials Productivity	ICZM	Integrated Coastal Zone Management
DO	Dissolved Oxygen	IFFPG	Irish Farm Films Producers Group
DSP	Diarrhetic Shellfish Poisoning	IFS	Indicative Forest Strategy
		IMPRZ	Irish Marine Pollution Responsibility Zone
		INAB	Irish National Accreditation Board
		IPC	Integrated Pollution Control
		IPCC	Intergovernmental Panel on Climate Change; Irish Peatland Conservation Council
		IPPC	Integrated Pollution Prevention and Control

IRCG	Irish Coast Guard	ppb	parts per billion
ISO	International Standards Organisation	ppm	parts per million
JAMP	(OSPAR) Joint Assessment and Monitoring Programme	PPP	Public Private Partnership
MCL	Maximum Contaminant Level	PRI	Producer Responsibility Initiative
MFA	Material Flows Accounting	QBC	Quality Bus Corridor
MFSU	Manufacture, Formulation, Supply and Use	RBD	River Basin District
MRTDIM	Marine Research, Technology, Development and Innovation Measure	RCM	Regional Climate Model
MSSC	Molluscan Shellfish Safety Committee	REPS	Rural Environment Protection Scheme
MTOE	Million Tonnes of Oil Equivalent	RPII	Radiological Protection Institute of Ireland
NCCS	National Climate Change Strategy	SAC	Special Area of Conservation
NDP	National Development Plan	SAR	Search and Rescue
NECD	National Emission Ceilings Directive	SCR	Selective Catalytic Reduction
NGO	Non-Governmental Organisation	SEA	Strategic Environmental Assessment
NHA	Natural Heritage Area	SEI	Sustainable Energy Ireland
NMP	Nutrient Management Planning	SFM	Sustainable Forest Management
N ₂ O	Nitrous Oxide	SMEs	Small and Medium-sized Enterprises
NO ₂	Nitrogen Dioxide	TAC	Total Allowable Catch
NO _x	Nitrogen Oxides	TAR	Third Assessment Report (of IPCC)
NPWS	National Parks and Wildlife Service	TBT	Tributyltin
NSS	National Spatial Strategy	TOE	Tonnes of Oil Equivalent
NRA	National Roads Authority	TPER	Total Primary Energy Requirement
NUIG	National University of Ireland Galway	TPRG	Tourism Policy Review Group
NWPP	National Waste Prevention Programme	UCC	University College Cork
OCP	Organochlorine Pesticide	UCD	University College Dublin
OECD	Organisation for Economic Cooperation and Development	UNEP	United Nations Environment Programme
OSPAR	Convention (Oslo and Paris Commission) for the Protection of the Marine Environment of the North-East Atlantic	UNFCCC	United Nations Framework Convention on Climate Change
P	Phosphorus	US EPA	United States Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon	UV	Ultraviolet
PCB	Polychlorinated Biphenyl	VAT	Value-Added Tax
PCDD	Polychlorinated Dibenzo-Para-Dioxin	VOC	Volatile Organic Compound
PCDF	Polychlorinated Dibenzofuran	VRT	Vehicle Registration Tax
PE	Population Equivalent	WCP	World Climate Programme
Pg	Picogram	WDTP	Western Development Tourism Programme
PM _{2.5} , PM ₁₀	Particulate matter measuring less than 2.5 µm and 10 µm in diameter	WFD	Water Framework Directive
POP	Persistent Organic Pollutant	WHO	World Health Organisation
		WMO	World Meteorological Organisation
		WPA	Water Pollution Act
		WWTP	Wastewater Treatment Plant

Glossary

98-percentile

The value of a ranked distribution above (or below) which 98 per cent of values in the distribution lie, depending on application.

Acid Sensitive

Surface water and soils that due chiefly to their low calcium concentration, have little or no resistance to acid inputs.

Acidification

Continuing loss of capacity to neutralise acid inputs indicated by declining alkalinity and increasing hydrogen ion concentration (i.e., the decrease in pH of water or soil resulting from increases in acidic anion inputs such as sulphate).

Aerosols

Airborne solids or liquids, with a typical size between 0.01 and 10 µm. Aerosols may be of either natural or anthropogenic origin. Aerosols may influence climate in two ways directly through scattering and absorbing radiation, and indirectly through acting as condensation nuclei for cloud formation or modifying the optical properties and lifetime of clouds.

Afforestation

Establishment of a new forest by planting of non-forested land.

Alert Threshold

The concentration of a pollutant, notified to the public, beyond which there is a risk to human health from brief exposure.

Algae

Simple aquatic plants that may be attached or free floating (planktonic) and occur as single cells, colonies, branched and unbranched filaments.

Algal Bloom

Dense growth of planktonic algae or most commonly Cyanobacteria (blue-green bacteria formerly classified as algae) in nutrient enriched lakes causing discoloration of the water.

Ammonia (NH₃)

A simple form of nitrogen primarily originating in waste discharges. It can be toxic to fish under certain circumstances and is a source of nitrogen for plants and algae.

Amphibian

Vertebrates, including frogs, with an aquatic larval stage followed by a terrestrial adult stage.

Anthropogenic

Produced as a result of human activities.

Aquaculture

The farming of aquatic species such as fish and shellfish under controlled conditions.

Aquifer

A rock unit that will yield water in a usable quantity to a well or spring. A geological formation through which water can percolate, sometimes very slowly for long distances.

Atmospheric Deposition

Pollution from the atmosphere associated with dry deposition in the form of dust, wet deposition in the form of rain and snow, or as a result of vapour exchanges.

Attenuation

The reduction in magnitude/intensity/concentration of a substance dispersed in a gaseous or liquid medium.

Benthic Organism (benthos)

An organism that lives on or near the bottom of a river, lake or ocean.

Bioaccumulative Substance

A substance that builds up in tissue of living organisms as a result of direct exposure to polluted water, air or soil, or through consumption of contaminated food.

Biochemical Oxygen Demand (BOD)

A measure of the potential oxygen consumption of decaying organic matter in water. It is a widely used measure of organic pollution in rivers and in effluents discharged to water.

Biodiversity

Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Biomass

The weight of biological matter. Standing crop is the amount of biomass (e.g. algae) in a waterbody.

Biota

The flora and fauna of an area.

Biotoxins

Substances produced by certain organisms that are toxic or otherwise injurious to other organisms.

Black Smoke

The fraction of total suspended particulates in air determined from the blackness measurement of the stain produced by passing the air through standard filter paper.

Blanket Bog

An area, often very extensive, of acid peatland, found in constantly wet climates, characteristic of broad flat upland areas, which develops where drainage is impeded and the soil is acid.

Bonamiasis

A disease that affects native oysters (*Ostrea edulis*) caused by infection by the parasite *Bonamia ostreae*.

Calcareous Grassland

Grassland occurring on well-drained, lime-rich soils that are dominated by a suite of calcicole (lime-loving) grass and broadleaved herbaceous plants.

Calcicole Plants

Plants which grow best on calcareous soils.

Callows

Areas of fen peat periodically inundated by floodwater.

Carbon Dioxide (CO₂)

A naturally occurring gas which is also a by-product of burning fossil fuels and biomass, land-use changes and industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1.

Carbon Sequestration

The uptake of carbon containing substances, in particular carbon dioxide.

Carcinogen

A substance that causes or is believed to cause cancer in humans.

Catchment Area

The area from which a major river system or lake derives its water (i.e., the area drained by a river system).

Cetacean

A marine mammal belonging to the taxonomic order *Cetacea*, which includes all whales, dolphins and porpoises.

CFCs (Chlorofluorocarbons)

A range of compounds of chlorine, fluorine and carbon implicated mainly in the destruction of stratospheric ozone but also in enhancing the greenhouse effect.

Chemotherapeutics

Specific chemicals such as antibiotics that are used to treat disease.

Chloroform

Trichloromethane (CHCl₃) which may be produced as a by-product of the chlorination of water supplies especially when organic matter is present in the water being chlorinated.

Chlorophyll

The green pigment found in algae and higher plants which is involved in photosynthesis.

Coral Reef

A Reef formed by the growth of coral which is the hard calcareous substance secreted by marine animals (polyps) for support and habitation.

Cryptosporidium

A coccidian protozoan parasite that infects vertebrates such as sheep and cattle. It can infect humans and is a particularly dangerous parasite when its oocysts enter public water supply systems due to, for example, cattle slurry contamination.

Decibel (dB)

The unit of measurement of sound intensity.

Deforestation

The removal of trees in an area.

Demersal Fish

Fish such as cod, whiting, plaice, haddock, skates and rays, that spend most of their time swimming near the seabed. It usually refers to the adult stage of the species.

Diffuse Source Pollution

Pollution that arises from diffuse areas in a catchment such as fields adjacent to a river or stream during heavy rainfall when surface runoff occurs.

Dioxins

A collective name given to a group of 75 closely related chemical compounds known as polychlorinated dibenzodioxins (PCDDs). Dioxins can form during combustion of organic materials containing chlorine, as undesirable by-products during chemical manufacture and bleaching operations.

Dissolved Oxygen (DO)

A measure of the concentration of oxygen in a liquid, such as water or wastewater, usually expressed in mg/l or per cent saturation.

Dolomitisation

The process by which an original calcium carbonate rock is converted into a double calcium-magnesium carbonate rock.

Drumlin

A low hill of glacial boulder clay, considered to have been fashioned beneath an ice-sheet.

Ecclesiastical Remains

Remains of, or relating to, the Christian Church or its clergy.

Eco-Efficiency

Aims at breaking the link (decoupling) between economic growth, environmental degradation and use of natural resources. Indicators of eco-efficiency represent the use of nature in society and the economy.

Ecology

The study of the relationship among organisms and between those organisms and their non-living environment.

Ecosystem

A community of interdependent organisms together with the environment they inhabit and with which they interact, and which is distinct from adjacent communities and environments.

Eco-Audit

A generic term that includes several procedures in use at present, such as Environment Proofing, Green Accounting and at company level, Environmental Management Systems such as ISO 14001 or EMAS.

Eco-Tourism

Eco-tourism is responsible travel to fragile, pristine and usually protected areas that strives to be low impact and (usually) small scale. It helps educate the traveller, provides funds for conservation, directly benefits the economic development and political empowerment of local communities and fosters respect for different cultures and human rights.

Effluent

Liquid wastes.

Endocrine Disrupting Chemical

A chemical that disrupts the endocrine system and the organs that respond to hormonal signals.

Environmental Assessment

The preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making.

Erosion

Wearing away of earth or rock by the effects of rain, wind, sea or rivers or by the action of toxic substances.

Eutrophic

Greek for well nourished. Applied to waterbodies with high nutrient concentrations leading to large algal standing crops.

Eutrophication

The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.

Evapotranspiration

The combined processes of evaporation and transpiration. It can be defined as the sum of water used by vegetation and water lost by evaporation.

Faecal Coliforms

Harmless bacteria which serve as indicators of the presence of human and animal faeces in waters.

Fauna

Animals.

Fen

An area of waterlogged peat which, unlike bog, is alkaline or only slightly acid.

Fiscal Instrument

A financial tool or mechanism by which certain practices may be encouraged, e.g. via incentives or discouraged via levies or taxes or controlled via regulation. The purpose is to influence economic behaviour to follow an ecologically benign path.

Flora

Plants.

Flue-Gas Desulphurisation

The removal of sulphur from the flue gases in combustion activities.

Fouling

In an aquatic context, fouling is the growth of microbial, plant or animal life on the hulls of boats, on piers, platforms and other structures, which leads to increased resistance to water flow and increased susceptibility to corrosion and damage.

Fugitive Emissions

Emissions that occur through leakage, evaporation or other uncontrolled losses.

Geographical Information System (GIS)

A set of integrated techniques for storing, retrieving, transforming and displaying spatially referenced thematic data in map form.

Geomorphology

The study of the form and development of the Earth, and especially of its surface and physical features, and of the relationship between these features and the geological structures beneath.

Green Accounting

Accounting methods which take into consideration positive or negative impacts on the environment and natural resources.

Greenhouse Effect

Enhanced warming of the atmosphere due to the reduction in outgoing solar radiation resulting from increased concentrations of gases, in particular, CO₂.

Greenhouse Gases

Gaseous constituents of the atmosphere that absorb/trap infrared (thermal) radiation which is mainly emitted by the Earth's surface and thereby influence the Earth's temperature.

Groundwater

Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material.

Habitat

The dwelling place of a species or community, providing a particular set of environmental conditions (e.g. forest floor, sea shore).

Haemoglobin

A substance in red blood cells that carries oxygen around the body.

Hazardous Waste

Defined in the Waste Management Act 1996 as any waste which appears on the hazardous waste list or is prescribed as a hazardous waste and which displays one or more of the properties of hazardous waste listed in the Waste Management Act 1996.

HCFCs (Hydrochlorofluorocarbons)

Compounds which have been substituted for CFCs as the latter become phased out by international agreement.

Heath

An area of open uncultivated land, typically an acid soil with characteristic vegetation of heather, gorse and coarse grasses.

Hydrograph

A graph showing variation of stage (depth) or discharge of water in a stream over a period of time.

Hypertrophic

Applied to water bodies which are excessively nourished, extremely productive.

Insoluble

Does not dissolve.

Integrated Pollution Control (IPC)

A system of licensing which covers all emissions to air, water and land, including noise/odour and is intended to minimise the impact on the environment by taking account of pollution that may be transferred from one environmental medium to another. IPC is based on Best Available Technology Not Entailing Excessive Cost (BATNEEC). The implementation of the Integrated Pollution Prevention Control (IPPPC) Directive will replace this system of licensing in an advanced form.

Integrated Pollution Prevention and Control (IPPC)

Council Directive 96/61/EC prescribes IPPC as an EU-wide licensing and enforcement regime for specified activities aimed at preventing/reducing pollution and providing a high level of protection for the environment as a whole. It will supersede IPC licensing in Ireland from 2004 onwards in an enhanced form based on Best Available Techniques (BAT).

Invertebrates

Animals which do not possess a backbone.

Karst

An area of limestone or other highly soluble rock, in which the landforms are of dominantly solutional origin, and in which the drainage is usually underground in solutionally enlarged fissures and conduits.

Karstification

The processes of solution and infiltration by water, mainly chemical but also mechanical, whereby the surface features and subterranean drainage network of a karstland are developed to form a karst topography, including such surface features as dolines, karren, and mogotes and such subsurface features as caves and shafts.

Kyoto Protocol

The 1997 protocol to the Convention on Climate Change under which industrialised countries will reduce their combined greenhouse gas emissions by at least 5 percent compared to 1990 levels by the period 2008-2012.

Leachate

The seepage of liquid through a waste disposal site or spoil heap.

Leaching

The removal of the soluble constituents of a rock, soil or ore (that which is leached being known as the leachate) by the action of percolating waters.

Limit Value

A level fixed on the basis of scientific knowledge, with the aim of avoiding preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained.

Machair

Coastal grassland formed when sand is blown inland over extensive areas.

Macroinvertebrates

Larger invertebrates, e.g. worms, snails and insects.

Macrophytes

Large plants which in water include rooted and floating species.

Maërl

Calcareous red algae.

Margin of Tolerance

The percentage of a limit value by which this value may be exceeded.

Megalithic Tomb

Prehistoric tomb using a large stone.

Mesotrophic

Applied to water bodies which are moderately nourished, moderately productive.

Monoculture

In forestry terms, even-aged, single-species forest crops.

Monofilament Gill Netting

A static net suspended vertically used to capture fish which entangle themselves in the net, usually by the forward part of the body near the gills.

Montreal Protocol

The Montreal Protocol and subsequent amendments set out a programme for the phasing out of the compounds with the greatest ozone-depleting potential, as well as some of their replacements, many of which are also greenhouse gases, by mid to late 1990s. This included such substances as methyl bromide and hydrochlorofluorocarbons (HCFC).

Moor

A tract of open, uncultivated upland, typically covered with heather.

Municipal Waste

Defined in the Waste Management Act 1996 as household waste as well as commercial or other waste which, because of its nature and composition, is similar to household waste.

Mutagen

An agent that changes the hereditary genetic material that is a part of every living cell. Such a mutation is probably an early step in the sequence of events that ultimately leads to the development of cancer.

Nitrate (NO₃)

A salt of nitric acid (HNO₃).

Nitrogen Oxides (NO_x)

A gas which usually includes the two pollutants nitric oxide (NO) and nitrogen dioxide (NO₂) produced by high temperature combustion and some natural processes.

Nutrient

Element or chemical essential for growth, e.g. phosphorus, nitrogen, silica, oxygen and carbon.

Oligotrophic

Applied to water bodies which are poorly nourished, unproductive.

Oocysts

The infective phase in the life cycle of parasites such as *Cryptosporidium*. Mature oocysts are resistant to normal forms of water treatment such as chlorination and thus pose particular dangers in public water supplies.

Organotins

Compounds containing at least one bond between tin and carbon. One of these compounds, Tributyltin, has been used since the 1970s as an antifoulant on ships and marine structures, but there has been increasing concern about its impact on non-target species due to its toxicity and hormone-disrupting effects.

Ozone (O₃)

A secondary pollutant in which the molecule of oxygen consists of three atoms rather than two.

Ozone Precursor

A substance which contributes to the formation of ground-level (tropospheric) ozone.

Pathogen

Biologically hazardous organisms such as viruses, bacteria or parasites that may give rise to illness in humans or animals.

Peatbog

Peatland with water table at or near the surface; includes both upland and lowland bogs and a variety of vegetation cover from heath dominated to moor-sedge dominated.

Pelagic Fish

Fish such as herring, mackerel and blue whiting that spend most of their time swimming in the water column as opposed to resting on the seabed. Usually refers to the adult stage of the species.

Pesticide

A general term for any chemical agent which is used in order to kill unwanted plants ('weeds'), animal pests, or disease causing fungi.

pH

The measure of the acidity or alkalinity of a substance.

Phosphate (PO₄)

The commonly occurring form of phosphorus taken up by plants in the aquatic environment and essential for their growth.

Photosynthesis

The process by which all green plants manufacture sugars from water and carbon dioxide (CO₂).

Phytobenthos

Microscopic plants, including diatoms, living on surface layer of bed of streams, rivers, lakes, estuaries or seas.

Phytoplankton

Microscopic small plants which float or swim weakly in fresh or salt water bodies.

Plankton

Organisms suspended in water by currents, the presence of air sacks or by their own swimming movements. Phytoplankton refers to microscopic plants, and zooplankton refers to microscopic animals.

PM₁₀

Particulate Matter measuring less than 10 microns in diameter.

PM_{2.5}

Particulate Matter measuring less than 2.5 microns in diameter.

Point Source Pollution

Pollution that arises from a well defined point typically the end of a discharge pipe but may include farmyard sources.

Polycyclic or Polynuclear Aromatic Hydrocarbons (PAHs)

Complex organic molecules found in soot, tar, vehicle exhausts and combustion products of fuels.

Population Information Threshold

The concentration of a pollutant used to inform the public that levels are increasing and beyond which there is a risk to human health from brief exposure for particularly sensitive sections of the population.

Precipitation

The manner by which water and other matter in the atmosphere reach the earth's surface. Wet precipitation includes rainfall, snow, hail, mist and fog. Dry precipitation describes the deposition of gases, aerosols and particles not dissolved in atmospheric borne water.

Radiative Forcing/Radiative Balance

Radiative forcing is the general term for a change in the net radiant atmospheric energy, expressed in Watts per square metre (Wm⁻²), due to an internal atmospheric change or external changes, e.g. internally due to a change in the concentration of carbon dioxide or externally due a change in the output of the Sun. Such changes are said to change the Radiative balance.

Raised Bog

An area of ombrogenous (i.e. originating as a result of wet climates) acid peatland with a convex profile.

Reforestation

Replanting of forests on lands that have recently been harvested.

Renewable Resource

A resource that can be exploited without depletion because it is constantly replenished, e.g. solar radiation and wind.

Riparian Vegetation

Vegetation growing close to a watercourse, lake, wetland, or spring that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for streambank stability.

Salt Marsh

An area of coastal grassland that is regularly flooded by seawater.

Selective Catalytic Reduction

An emissions abatement technology for nitrogen oxides that involves the injection of ammonia (NH₃) into the flue gas that passes through a catalyst bed in which the ammonia and nitrogen oxides react to form harmless nitrogen and water vapour.

Sewage

Liquid wastes from communities, conveyed in sewers. Sewage may be a mixture of domestic sewage effluents from residential areas and industrial liquid waste.

Sewage Sludge

Semi-solid and solid waste matter removed from sewage at sewage treatment plants.

Sewerage

A network of pipes and associated equipment for the collection and transportation of sewage.

Sludge

The suspended matter in industrial effluent or sewage remaining after partial drying.

Slurry

The animal waste generated in animal housing units that have slatted floors and in which there is no use made of bedding material.

Stream Morphology

The form and pattern of streambeds and stream channels.

Sulphate (SO₄)

A constituent of rain and acid aerosols produced by oxidation of SO₂, in the atmosphere.

Sulphur Dioxide (SO₂)

A colourless gas produced mainly by oxidising the sulphur in fossil fuels through combustion.

Sustainable Development

Defined by the Brundtland Commission (1987) as 'development that meets the needs of the present without compromising the ability of the future generations to meet their own needs'.

Sustainable Tourism

Sustainable tourism development should meet the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems. Sustainable tourism products are products, which are operated in harmony with the local environment, community and cultures, so that these become the permanent beneficiaries not the victims of tourism development.

Tangle Netting

A static net placed on the bottom of the sea, aimed at trapping fish and shellfish that entangle themselves in the net.

Topography

The study of the physical features of a geographical area.

Total Allowable Catch (TAC)

The TAC is the total fish catch allowed to be taken from a resource in a specified period (usually a year), as defined in the management plan. The TAC may be allocated to the stakeholders in the form of quotas as specific quantities or proportions.

Toxic Equivalent (TEQ)

Toxic equivalent is a system of toxicity weighting factors, adopted by the WHO, which allows concentrations of the less toxic compounds to be expressed as an overall equivalent concentration of the most toxic dioxin, 2,3,7,8-TCDD.

Trophic Status

The extent of enrichment of a waterbody as assessed by the nutrient concentrations, amount of planktonic algae and macrophytes, water transparency and oxygen levels. The trophic categories oligotrophic, mesotrophic, eutrophic and hypertrophic are used to describe waters varying from un-enriched to highly enriched.

Turlough

A temporary water body on carboniferous limestone.

Ulcerative Dermal Necrosis Disease

A disease that primarily affects salmonids returning from the sea to freshwater with ulcers near the head. The cause is probably viral but the ulcers are typically infected by bacteria and fungi.

Volatile Organic Compounds (VOCs)

Organic compounds which evaporate readily and contribute to air pollution mainly through the production of secondary pollutants such as ozone.

Waste Arisings

A measure of the amount of waste generated by a specified sector or activity.

Wetland

An area covered permanently, occasionally, or periodically by fresh or salt water (e.g. flooded pasture land, marshland, inland lakes, rivers and their estuaries); also includes bogs.

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Notes