National Development Plan 2007 - 2013

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

STRIVE
Report Series No.76

BOGLAND: Sustainable Management of Peatlands in Ireland

PROTOCOL DOCUMENT

STRIVE

Environmental Protection Agency Programme

2007-2013

SSTI Strategy for Science, Technology and Innovation

Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Heritage and Local Government.

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The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

EPA STRIVE Programme 2007–2013

BOGLAND: Sustainable Management of Peatlands in Ireland

PROTOCOL DOCUMENT

Synthesis Report and End of Project Report available for download at http//erc.epa.ie/safer/reports

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DISCLAIMER

The EPA STRIVE Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

EPA STRIVE PROGRAMME 2007–2013

Published by the Environmental Protection Agency, Ireland

ISBN: 978-1-84095-404-3

Price: Free 08/11/300

ACKNOWLEDGEMENTS

This report is published as part of the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme 2007–2013. The programme is financed by the Irish Government under the National Development Plan 2007–2013. It is administered on behalf of the Department of the Environment, Community and Local Government by the Environmental Protection Agency which has the statutory function of co-ordinating and promoting environmental research.

The achievement of the main goals of this large-scale research programme was made possible by the commitment and hard work of numerous people from many organisations. As well as the people who actively carried out research within the BOGLAND Project (see list overleaf), the authors would like to thank everybody who helped in any way with fieldwork, administration or research work. The encouragement, advice and wisdom of the members of the project Steering Committee are gratefully acknowledged: Dr Shane Colgan, Tadhg O'Mahony, Nicola Foley and Dr Frank McGovern (Environmental Protection Agency), Dr Caitriona Douglas and Dr Jim Ryan (National Parks and Wildlife Service), Prof. Hans Joosten (Greifswald University, Germany), Mr Gerry McNally (Bord na Móna), Prof. Harri Vasander (Helsinki University, Finland), and Dr Richard Weyl and Bob Davidson (Environment and Heritage Service, Northern Ireland). The authors also wish to thank Dr George Smiley and Dr Jim Collins (University College Dublin) and the late Dr Bob Hammond for early contributions to a workshop on peat and peatland definitions. Thanks are also due to Mr Phillip O'Brien (National University of Ireland Galway/Environmental Protection Agency), Dr Kevin Black (Forest Environmental Research and Services (FERS) Ltd), Dr Ken Byrne (University of Limerick), Dr Brian Tobin (University College Dublin), Dr Eugene Hendrick (COFORD), Dr Mick Keane (Coillte), Dr Aileen O'Sullivan (Coillte) and Dermot Tiernan (Coillte) who contributed to a workshop on Forested Peatlands. Finally, the authors would like to thank unnamed thousands of individuals throughout Ireland who selflessly participated in the socio-economic research studies by answering surveys or joining focus groups.

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1 Introduction

Peatlands have been part of the Irish landscape since the last Ice Age and, together with a remnant of primeval forests, they form our oldest natural heritage. They are the country's last great area of wilderness, hovering between land and water, providing unusual habitats for its unique and specialist flora and fauna. Peatlands cover a large area of the land surface (20%), occurring as raised bogs, blanket bogs or fens and forming cultural landscape icons in many parts of the country (e.g. Connemara, Ox Mountains, Slieve Bloom). They have accumulated peat over millennia, creating an important economic raw material on which the livelihoods of certain rural populations have critically depended. This accumulated peat mass makes peatlands a fascinating historical archive of past environmental and cultural change. More importantly, in the context of climate change issues, peatlands store very large amounts of carbon that are released to the atmosphere should the peatland degrade, for instance through peat exploitation. Peatlands are the most space-effective carbon stores of all terrestrial ecosystems (Dise, 2009). Over centuries, they slowly remove and store more carbon than they produce and therefore they exert a net cooling effect on the global climate (Frolking et al., 2006). Once degraded, this process is reversed. Along with many other benefits provided by peatlands, these ecosystem services have generally remained unnoticed, being largely invisible to the naked eye. This has resulted in a lack of appreciation of the need for cautious management.

Peatlands and Irish people have been closely connected by a long history of cultural and economic development. In the distant past, peat landscapes were both feared and respected as wilderness areas and often linked to traditional culture, rituals and worship (Feehan et al., 2008). In modern times, peatlands have commonly been treated as wastelands that are of no use unless they are drained or excavated. Irish peatlands have been afforested, cut over by domestic cutting, cut away by industrial peat extraction, eroded by overgrazing and agricultural reclamation, damaged by infrastructural developments and invaded by non-native species. To add to this destructive scene, climate change is likely to threaten further the survival of these ecosystems (Jones et al., 2006). In 1979, around 56% of the original area of Irish bogs was deemed still 'unmodified' by man. However, all Irish peatlands to date have been affected by peat cutting, grazing or fire to one extent or another. In a recent assessment (Malone and O'Connell, 2009), it was estimated that only 10% of the original raised bog and 28% of the original blanket peatland resource are now in a good enough condition to be considered as representative peatland habitats, suitable for conservation site designation, i.e. of conservation value.

At the dawn of the 21st century, the dilemmas facing the peatland resource have been heightened with only few 'near-intact' or 'natural' peatlands remaining in the Irish landscape, which are likely to be further damaged, be it directly by humans or by global changes. These are challenging times for Irish peatlands and therefore questions have to be asked:

- What will be the contribution of Irish peatlands to the next generations?
- How should peatlands be managed and utilised to ensure that this natural heritage is not lost – indeed that it should be enhanced?

2 The BOGLAND Project

This nationwide integrated study, informally known as the 'BOGLAND Project' was funded as a 4-year 'sustainable development' project by the Environmental Protection Agency (EPA) research programme. Its overall objective was to develop guidance in the development of strategies for the sustainable future management of peatlands in Ireland. To this effect, the report aimed to provide a synthesis of knowledge on this key natural resource, the important functions and roles that peatland ecosystems perform, their various utilisations and how attitudes and policies affect them.

2.1 Structure, Main Objectives and Components of the Research

The overall aims of the project were addressed by:

- Characterising Irish peatlands – their physical and ecological characteristics and their trends;
- Evaluating the goods and services they provide (ecosystem services);
- Assessing the vulnerability of their functions; and
- Understanding their socio-cultural and economic attributes.

Policy recommendations for sustainable management options were then presented – within the current policy context – with the aim of delivering healthy ecosystems and taking into account their socio-economic and cultural services (Fig. 2.1).

As a multidisciplinary research study, the BOGLAND project sought to collate available information and attempted to fill information gaps that exist on Irish peatlands by asking broad questions:

- What is this resource called 'peatlands' characterised by?
- What are its benefits and values (e.g. ecological, socio-cultural and economic)?
- What are the current pressures and threats to this resource and concerns for its future?
- What are the current policies and do they give rise to tensions?

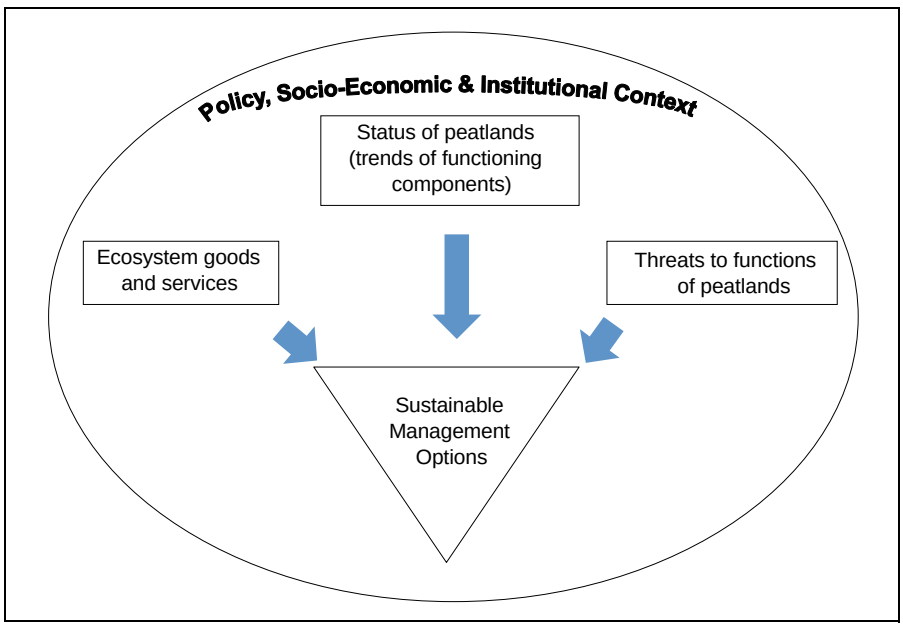

Figure 2.1. Main research dimensions to develop a protocol for the sustainable management of peatlands.

3 BOGLAND Findings

The research work was conducted in four sub-projects, 20 work packages (see Annex 1), with the core research work focusing on three areas:

1. Biodiversity;
2. Characterisation of the physical peatland resource and its use; and
3. Socio-cultural, economic aspects and institutional policy.

The BOGLAND project helped to detect changes and trends in the quantity and quality of the peatland resource by producing baseline data against which to assess policy and management options. Thus, the project helped to bridge the gap between scientific priorities and the real world of management. It has brought together diverse knowledge on peatland features, functions and services from different sources, through a multidisciplinary task force. The key management aspects were based on 'integration across disciplines' and 'consultation of all parties'. A particular strength of the project was the collaboration of representatives from government, non-government and scientific bodies, as well as other stakeholders.

3.1 Integrating Biodiversity Protection and Sustainable Management of Irish Peatlands

This section focused on building on existing data regarding the biodiversity of peatlands and their associated abiotic environment (soil and water). New surveys of birds (Bracken et al., 2008), aquatic and terrestrial invertebrates, as well as vegetation and micro-organisms comprise critical information against which the effectiveness of future management practices of peatlands can be measured. This research demonstrated that peatlands support few but unusual and rare species with exceptional adaptation. As species new to Ireland were discovered (Hannigan et al., 2009) and indeed one new to science, it is clear that the contribution of Irish peatlands to biodiversity is not yet fully understood. Meanwhile, biodiversity indicators developed in this project, such as protected species but also habitat heterogeneity, can inform whether a peatland site is:

(a) Suffering from degradation;

(b) Healthy; or

(c) In the process of recovery.

These indicators should be used for future assessment of all the peatlands, starting with state-owned sites, in order to draw up individual restoration and management plans that will maximise their natural functions, not least their unique biodiversity.

3.2 Characteristics, Disturbances and Management of Irish Peatlands

In this section, a new map has been generated showing that peat soils cover 20.6% of the national land area (Connolly and Holden, 2009) and contain more than 75% of the national soil organic carbon (SOC). Estimating the carbon stock of Irish peatlands is critical and therefore a peat depth inference model was developed to improve this estimate for a blanket bog region in Ireland (Holden and Connolly, 2011).

It was also revealed that near-intact peatlands over the whole country may actively sequester, on average, 57,402 t C/year. However, damaged peatlands are a persistent source of carbon dioxide (CO_2) and, at the national level, Irish peatlands are a large net source of carbon, estimated currently at around 2.64 Mt C/year (Wilson et al., 2011). In view of these findings, it is clear that carbon dynamics should be a key driver of policies for peatland management. Active and remedial management options, such as avoiding drainage (conserving) and re-wetting (full restoration or paludiculture) may be effective ways to maintain the carbon storage of peatlands and to recreate conditions whereby the peatland may actively sequester carbon in the future.

This investigation into peatland utilisation showed that past and current management of peatlands in Ireland

have not been sustainable. Disturbances in the form of industrial and domestic peat extraction, private afforestation, overgrazing, wind farms and recreational activities have had, and continue to have, major impacts on the hydrology and ecology of these habitats (Renou-Wilson and Farrell, 2009; Regan and Johnson 2010). In recent years, several peat failures on blanket bogs were associated with wind-farm developments and this has questioned the ability of the Environmental Impact Assessment (EIA) process to fully assess the likely environmental impacts. Peat strength is a complex attribute of peatlands and varies at each site and thus requires a stability assessment to be carried out as part of the EIA. New guidance for such an EIA should include the utilisation of the new UCD-DSS[1] technique (Direct Simple Shear Apparatus) which has been developed within the BOGLAND project (Boylan and Long, 2009). It is a simple shear device using image analysis techniques (e.g. Particle Image Velocimetry) that allow the testing of peat soils at low effective stresses representative of the in-situ condition.

From our analysis of policies affecting peatlands and interviews with stakeholders, it could be concluded that the majority of peatlands have been damaged because of legislative inertia and lack of enforcement.

3.3 Peatlands, People and Policies

The management of the Irish peatland resource is a complex task comprising large areas of various habitats exhibiting a range of status (from near intact to very degraded), involving a mixture of stakeholders, and which are affected by many different (sometime contradicting) policies. In order to achieve sustainable management of peatlands, ecosystem services or functions should underpin policy. This was demonstrated in Section 4 of the Synthesis Report, where an economic analysis has revealed that peatlands are public goods that deliver benefits of great economic and social value (primarily in relation to carbon storage, biodiversity, amenity and landscape). However, these are often ignored by the general public and can sometimes work in conflicting directions. While there is a lack of public awareness regarding certain functions of peatlands (e.g. the contribution of peat extraction to increased carbon dioxide emissions in the atmosphere and related current climate change), people's attitudes to peatlands are changing. The results of this survey indicated general public support for:

- The protection of peatlands;
- The transformation of industrial cutaways into uses that encourage wildlife and green energy production; and
- A willingness to pay for the establishment of a dedicated National Peatland Park. However, people still attach a social value to the domestic cutting of peat and do not always recognise a contradiction with peatland preservation (Bullock and Collier, 2011). This study has identified considerable ambiguity and lack of understanding as to the significance of the peatland resource, and in particular its role in the provision of ecosystem services. It is time to open the debate and actively involve the public, especially the local communities in drawing up future management options for peatlands, and in particular industrial cutaway peatlands (Collier and Scott, 2008).

3.4 Summary

The BOGLAND project has demonstrated the compelling evidence of the importance of Ireland's peatland resource as:

- A major carbon store;
- The negative potential of degraded peatlands to augment the greenhouse effect;
- The positive role of natural and restored peatlands to actively sequester carbon from the atmosphere;
- The role of peatlands in watershed management;
- Their contribution to biodiversity; and
- Their essential attributes that confer on them a cultural and informative function.

In conclusion, managing peatlands sustainably so that they can deliver all these benefits will require a mixture of economic instruments, regulation and institutional design. But most of all, it requires immediate actions.

1. University College Dublin's direct simple shear technique.

4 Current Situation and Main Issues

4.1 The State of Irish Peatlands in 2010

- Ireland remains one of the heartlands of blanket bogs in the world but is barely holding on to its unique raised bogs.
- While new species are still being discovered in bogs and fens across the country, it can be assumed that the contribution of Irish peatlands to biodiversity is not yet fully understood.
- Peat soils cover 20.6% of the national land area and contain more than 75% of the total SOC in Ireland but this asset is under great pressure.
- Natural peatlands act as a long-term carbon store and play an important role in the regulation of the global climate by actively removing carbon from the atmosphere, but this important function is reversed (i.e. there is a net release of carbon) when the peatland is damaged.
- All Irish peatlands (raised bogs, blanket bogs and fens) have been impacted by natural and anthropogenic disturbances over the course of their history. Peat soils now occur under different land uses – forest, grassland, agricultural crops – as well as a range of degraded peatland ecosystems, from industrial cutaway bogs to overgrazed blanket bogs, and a very small area of active peatland (near intact).
- While being a significant resource, the degradation of peat soils witnessed in the 20th century has left a disproportionately small amount of near-intact peatlands and a much reduced mire area or active peatland where peat formation is ongoing. Of the 15% of the peat soils extent that are currently protected, less than three-quarters are in near-intact condition and of that a smaller proportion is active (Table 4.1).
- The area of active raised bog has decreased by over 35% between 1995 and 2005. It is estimated that between 2% and 4% of this active area continues to be lost every year since then. While turf cutting continues, it is reasonable to expect that the area of active bog will continue to decrease (this decline will in fact continue for several decades after cutting and drainage ceases).

Table 4.1. Distribution of Irish bogs (ha) in 2010 (sources from the National Parks and Wildlife Service (NPWS), Coillte and Bord na Móna).

Category	Total area (Hammond, 1981)	Protected peatlands	Protected near intact	Unprotected, of conservation value	NPWS ownership	Coillte ownership	Bord na Móna ownership
Raised	237,190	35,000	21,519 [2]	28,481[3]	7,000	31,725[5]	5,302[7]
Blanket	765,890	182,063	143,248	34,536[4]	34,339	188,334[6]	7,383
Industrial cutaway	82,080[1]	–	–	–	–	12,450	74,193
Total	**1,085,160**	**203,582**	**164,767**	**63,017**	**41,339**	**232,509**	**86,878**

[1]Includes 74,110 ha of industrial cutaway raised bog and 7,970 ha of industrial cutaway blanket bog.
[2]Includes 1,945 ha of active bog (supporting a significant area of vegetation that is normally peat forming) (NPWS, 2007).
[3]Total area of uncut high bog (50,000 ha) minus area of protected uncut high bog (21,519 ha) (NPWS, 2007).
[4]Total area of blanket bog of conservation value (Malone and O'Connell, 2009) minus protected areas.
[5]Includes 570 ha of restored bogs.
[6]Includes 2,000 ha of restored bogs.
[7]Mostly hydrologically damaged but includes some restored areas. Bord na Móna sold nearly 7,000 ha of raised bogs of conservation value to the NPWS.

- The boundaries of most protected peatlands are hydrologically deficient and do not allow adequate hydrological management of the designated sites. Therefore, their restoration in terms of increasing the active area (that is fully functioning) is jeopardised.
- Since the 1950s, there has been a sharp decline in the area of Irish peatlands of conservation importance which has arisen as a result of human exploitation of the resource.
- The last century saw:
    - The introduction of mechanised turf extraction schemes (both industrial and domestic);
    - Afforestation schemes;
    - Intensification of agriculture through the Common Agriculture Policy (CAP); and
    - Land reclamation through drainage schemes, all of which contributed to the dramatic decline in natural peatlands.
- The biggest disturbances of Irish peatlands in the 21st century are: industrial and domestic peat extraction, private afforestation (afforestation of western peatlands by Coillte has been suspended), wind-farm and associated infrastructural developments, recreation activities, invasive species and climate change.
- More than a third of Irish bogs (excluding fens) are state owned (Table 4.1).
- Being degraded to various degrees, the vast majority of Irish peatlands are critically at risk of future disturbances such as climate change. Predicted changes are likely to affect low Atlantic blanket bogs in the west of Ireland the least while the areas showing greatest changes in precipitation and temperature are the areas containing basin peat in the Midlands.

4.2 Main Obstacles to Sustainable Peatland Management

The main obstacles to the sustainable management of peatlands in Ireland are summarised here:

- A number of government departments, in particular the Department of Communications, Energy and Natural Resources (energy) and the Department of the Environment, Community and Local Government (national parks and wildlife, biodiversity, climate change, water planning), have key policy responsibilities that shape how peatlands are managed. These are often in conflict.
- While a legal and administrative structure exists in Ireland to help decision-making processes (European Union (EU) Directives on environmental issues and land use planning have been ratified), the absence of a national policy relevant to peatlands and inadequate public administration functions (including funding) to administer current legislation (e.g. peat cutting on Special Areas of Conservation (SACs)) are major obstacles to conservation targets.
- Based on our economic analysis, it was concluded that acquisition ought to be a more cost-effective process than the compensation scheme to stop turbary rights holders from cutting turf on protected bogs.
- Poor communication (e.g. contacts with turbary rights owners regarding turf cutting on protected sites are insufficient).
- Lack of public awareness and understanding.
- Poorly planned renewable energy schemes (mistakenly promoting wind farms on upland blanket bogs).
- Unregulated voluntary carbon market.
- Poor prediction of climate change at the regional level.
- Market-driven peat extraction for horticulture.
- Management of the surrounding land area and hydrological catchment often ignores the needs of the peatland site.
- The management of peatland has often been led by single-interest groups that are often insufficiently informed about the wider

consequences of inappropriate actions.

This situation, together with the poor conditions of the majority of Ireland's peatlands, calls for a national framework for their sustainable management, coalescing environmental, social, economic and institutional objectives.

5 Developing a Protocol for the Sustainable Management of Peatlands

5.1 Support Framework and Key Aims of the Protocol

The scientific investigations (e.g. biodiversity assessments, greenhouse gas (GHG) emissions monitoring, mapping and analysis of physical characteristics, socio-economic surveys) carried out within the BOGLAND project revealed the global significance of a national resource and the dilemmas of peatland management, utilisation and conservation. The main part of this report presented the backdrop of the exceptional features of peatlands which includes the provision of benefits traditionally ignored in decision making. In this large-scale analysis, the general and local public, as well as stakeholders, were engaged in peatland discussions. This collation of information provides a comprehensive guidance for the 'sustainable' management of peatlands and needs to be translated into instruments to assist decision making. The BOGLAND project provided a strong scientific and socio-economic evidence base, a prerequisite to advise political decision making (Fig. 5.1). A support framework or *protocol* for the sustainable management of peatlands necessitates the drafting of an action plan (set of recommendations) for managing peatlands and the articulation of a vision for a peatland policy. First, however, key aims need to be presented in the current context together with an analysis of the main existing issues and obstacles to the successful sustainable management of peatlands.

Ultimately, this protocol aims to support the promotion of the sustainable management of peatlands. A system is said to be sustainable if it allows the well-being of future generations to be at least as high as that of the present generation. Well-being, in this definition, comprises a combination of financial (measured by per capita income, employment, etc.), social (measured by education level, life expectancy, health, etc.) and environmental (measured by quality of environmental endowments, including air, water, soil, flora and fauna) criteria. A system can also be defined as sustainable if it is not vulnerable and thus not threatened. The sustainable management of the peatland resource is a highly desirable objective towards which Ireland should aim. However, the Irish landscape is the product of many centuries of human interference and,

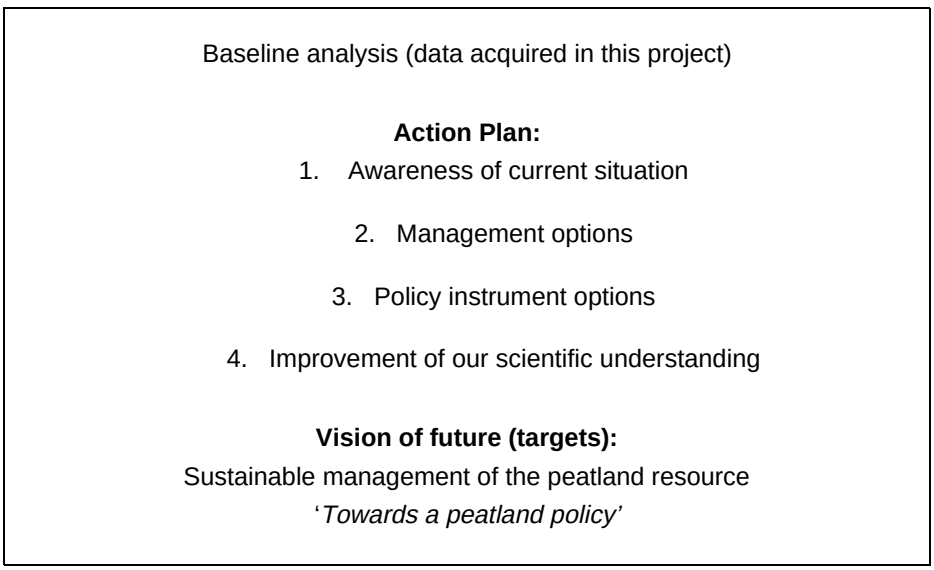

Figure 5.1. Evidence-based policy development for Irish peatlands.

in the case of peatlands, it has been significantly degraded as a result of a wide range of disturbances. The BOGLAND report has found that past and current management of peatlands in Ireland has not been generally sustainable and has had major negative impacts on the ecosystem services that they provide (biodiversity, climate, past knowledge, etc.). Natural peatlands, which are hydrologically and ecologically intact, have become rare and are being further threatened. Past mismanagement has led to the majority of the Irish peatlands being damaged or becoming deteriorated. Conservation management in its traditional form (designation) was also very limited, resulting in a small area of peatland enjoying protection, at least on paper. Indeed, designated areas continue to be damaged (Table 5.1). A protocol for the sustainable management of peatlands should ensure that, while a substantial part is already irreversibly lost, what remains of this natural heritage should be enhanced. In short, any vision of the future must include maintaining and enhancing one of Ireland's last natural ecosystems – *peatlands*. This protocol aims to succeed in achieving such vision that serves the needs of humans and preserves nature.

5.2 Action Plan

The targets set around managing Irish peatlands have changed through time and will continue to change as they integrate future ecological, economic and social conditions. However, overarching targets have been highlighted within this protocol for the sustainable management of peatlands and the preferred means or actions of achieving these targets are presented below, under seven headings:

1. Managing peatlands for biodiversity (MPB);
2. Managing peatlands for carbon, climate and archives (MPC);
3. Managing peatlands for water (MPW);
4. Managing peatlands for other land uses (MPL);
5. Managing state-owned peatlands (MPS);
6. Managing peatlands using socio-economic instruments (MPE); and
7. Managing peatlands for and with the people (MPP).

The responsibility for each action may rely on one or several parties working together for this action plan to be successful. These include: the industry sector (including Bord na Móna, Coillte and other private companies), local and national government and agencies (EPA, NPWS), non-governmental organisation (NGOs) and universities and other bodies engaged in research (e.g. socio-economic). In the 'Actions' outlined below for the sustainable management of peatlands, the following abbreviations are used: IND, Industry sector; GOV, Government and its agencies; RES, Research bodies.

Table 5.1. Management of Irish peatlands through time.

Past	Present	Future 'with the objectives of achieving'
• Conservation of a very small proportion of the peatlands • Conversion of the peatlands to a different state • Fixed, short-term economic uses prevailed and were even subsidised • Long-term economic uses of ecosystem services such as carbon storage and biodiversity function ignored and un-remunerated	• A large natural resource of local, national and international importance but hydrologically and ecologically intact peatlands have become rare (some types even extinct!) • Damaged and deteriorating conditions of the majority of Irish peatlands (bad states of threatened EU priority habitats) • Peatlands are vulnerable as some current uses are not sustainable	• A strategy to manage peatlands sustainably with the means of achieving more desirable outcomes than their continued loss and by regularly adapting measures against future global changes • To utilise the resource as long as sustainability is maintained

5.3 Management of Peatlands for Biodiversity (MPB)

5.3.1 Observations

Peatlands are exceptional natural entities. They are local illustrations of a unique combination of habitats with a unique biodiversity and natural heritage value. Peatlands are a valuable ecosystem from a national, European and global perspective. The last century and particularly the last half-century have been the most destructive for peatlands. It has taken the same amount of time to realise that the degradation of these ecosystems and the disappearance and even extinction of species are not in the interest of human well-being at large, especially not of future generations. The loss of peatlands in Ireland equates to a loss of biodiversity at regional, national and international levels. Therefore, it is vital to reverse the trends, halt further loss of priority habitats and species, and protect the last intact peatlands. The drivers of biodiversity change are projected to either remain constant or even increase in the near future and this represents a major challenge for the protection of peatlands. The sustainable management of peatlands which necessitates a new approach to the protection of natural and degraded ecosystems ought to make a very significant contribution towards Ireland's obligations under the Convention on Biological Diversity (CBD).

5.3.2 Targets

- To maintain the current extent and overall distribution of all blanket bogs, raised bogs and fens currently in favourable conditions (Actions MPB1, 2, 3);
- To improve the status of peatland habitats which were assessed as 'bad' in the latest NPWS assessment (with prioritised target sites and timescale) (Actions MPB2, 3, 4);
- To maintain the number of rare species and rare habitats protected under the Habitats Directive (1992) and the Wildlife (Amendment) Act (2000) and improve their status (Actions MPB1, 2);
- To increase the area of 'Active raised bog' by improving the areas designated as 'Degraded raised bog' (Actions MPB1, 2, 3);
- To increase the range of protected peatland habitats, including fens (Actions MPB1, 4);
- To maintain the network and landscape integrity of peatlands (Actions MPB1, 4);
- To avoid further loss of protected peatlands by removing their threats (Action MPB6);
- To increase the awareness of peatlands and associated biodiversity: maintain, restore and enhance the range, network and integrity of peatland habitats, some of which are unique to Ireland (Actions MPB2, 4, 7, 8);
- To protect and enhance biodiversity at different levels: from landscape to genetic (Actions MPB1, 2, 4);
- To improve our understanding of the variety of peatlands at all levels and associated habitats (Actions MPB2, 4, 5, 8); and
- To develop a conservation strategy as part of the general national peatland strategy (Actions MPB1, 2, 6, 7).

5.3.3 Actions – 1. Management of peatlands for biodiversity (MPB)

		Priority	Remit	Link
MPB1:	All remaining areas of priority habitat peatlands (active and degraded raised bogs and blanket bogs) should be declared as SACs and more peatland sites (including fens) should be designated under adequate legal protection. Attention should be paid to maintaining the integrity of these peatland habitats to ensure the survival of the unique biodiversity that they sustain.	High	GOV	MPB4 MPC10
MPB2:	Designated peatland sites should be appropriately managed and restored to increase the total area of near-intact peatlands. A range of key peatland sites representing all types of peatlands should be identified for positive management to achieve biodiversity targets at different levels: genetic, species, habitat and ecosystem.	High	GOV	MPC2 MPC3

MPB3:	The threats and causes of degradation should be evaluated on all protected peatland sites (included those proposed for designation). The Habitats Directive gives statutory authorities the right to require that all activities on designated peatlands undergo an Appropriate Assessment (AA). While Irish law is in the process of being amended to facilitate the implementation of AA, all activities pertaining to protected peatlands should undergo an AA (including turf cutting).	High	GOV	MPC2
MPB4:	An inventory of the condition of all peatlands (including those not designated) should be developed.	Medium	GOV RES	MPB1 MPC3 MPS2
MPB5:	Wet heaths are often associated with blanket bogs and are listed in Annex 1of the Habitats Directive as an important habitat to protect. An assessment of the disturbance to these habitats is required as they have serious consequences in terms of carbon loss and water quality.	Medium	GOV RES	
MPB6:	Subsidies that promote excessive and destructive uses of peatlands and their ecosystem services should be eliminated.	High	GOV	MPL8 MPE5 MPE9
MPB7:	Consideration for the protection and conservation of peatland biodiversity should be integrated into other government policies, such as climate change policy, renewable energy policy, strategy for invasive species and the Water Framework Directive.	Medium	GOV	MPC7
MPB8:	Traditional knowledge as well as relevant scientific findings and data should be made available to all of society but particularly stakeholders and decision makers, thus raising awareness and understanding of peatland habitats and associated biodiversity.	Low	GOV NGOs	MPP3 MPP7

5.4 Management of Peatlands for Carbon, Climate and Archives (MPC)

5.4.1 Observations

Irish peatlands are a huge carbon store, containing more than 75% of the national SOC. A constant high water table that restricts aerobic decay is a prerequisite for long-term storage of carbon in peatlands and preserving the information stored in the peat (archaeological and palaeo-environmental archives).

Peat soils are sensitive to degradation processes such as erosion, compaction and contamination. Studies in the BOGLAND project demonstrated that natural or undamaged peatlands help to regulate the global climate by actively removing carbon from the atmosphere but this important function is reversed (i.e. there is a net release of carbon) when the peatland is damaged. Disturbances, such as peat extraction, drainage or flooding, have considerable impact on carbon cycling within the peat soil with implications for their potential for sequestration and storage of carbon. Peat extraction transforms a natural peatland, which acts as a modest carbon sink, into a cutaway ecosystem which is a large source of carbon dioxide. An area of raised bog damaged by domestic peat cutting may emit as much as six to seven times more carbon dioxide than in a near-intact part of the peatland, due to peat oxidation intensified by the lowering of the water table.

In addition, the carbon cycling of degraded peatlands may be particularly vulnerable to future changes in climatic inputs compared to intact peatlands. However, considerable uncertainty exist in predicting the effects of future climate change on the carbon stores within peatlands, partly due to the complexity of the climatic system itself but also as a result of response variations both between and within individual peatlands.

Restoration may be an effective way to reduce carbon dioxide emission and maintain the carbon storage of peatlands. While natural peatlands are able to buffer the impact of external perturbations such as small changes in climate, they are unlikely to survive as carbon sinks, with large magnitudes of changes in precipitation and temperature.

5.4.2 Targets

- To retain, enhance and maximise the value of peatland as a carbon store (Actions MPC1, 2, 3, 6, 7, 10);

- To promote carbon dioxide absorption by the peatland vegetation and to encourage carbon accumulation in the peat (Actions MPC2, 3, 9, 10);
- To decrease carbon emissions and other carbon loss (through fluvial, erosion or burning processes) from degraded peatlands (including cutovers and cutaways) (Actions MPC1, 2, 3, 4, 6, 7, 9, 10);
- To restore the hydrological integrity of degraded peatlands (Actions MPC1, 2, 3);
- To safeguard the archaeological and palaeo-environmental information stored in the peat (Actions MPC1, 2); and
- To mitigate potential climate change effects including the spread of invasive species (Actions MPC2, 5, 8, 10).

5.4.3 Actions – 2. Management of peatlands for carbon, climate and archives (MPC)

		Priority	Remit	Link
MPC1:	Strict protection of peatlands sites that have been designated for conservation is critical for the maintenance of their carbon storage and sequestration capacity and associated ecosystem functions. This requires (1) stopping and removing any disturbances on these sites, and (2) setting up a management plan with the aim of maintaining the active peatland system and restoring the full functioning status of the peatland.	High	GOV	MPB2 MPB3
MPC2:	Peat oxidation should be stopped in all protected peatlands as well as in degraded peatlands where possible as protected peatlands are only a minor part of the total area of peatlands. This requires a programme of restoration which should follow an adaptive management approach, i.e. assessing individual sites and developing individual management plans to maximise the natural functions of each as each peatland is different.	High	GOV	MPC1 MPB4 MPS1 MPS2 MPW3
MPC3:	In order to combat carbon dioxide emissions from peat oxidation, water management in degraded peatlands should be optimised (reduce drainage) and preserve the palaeo-information within the peat. Water management for restoration purposes needs sufficient time and resources to take cognisance of the local hydro-geology which has often very localised conditions.	High	GOV	MPC1 MPC2 MPW2 MPW3
MPC4:	Invasive species should be actively removed from protected sites and appropriate long-term management should be set out for those sites in relation to updated climate change scenarios.	Medium	GOV	MPB1 MPC1
MPC5:	An appropriate form of rehabilitation or restoration should be a licensing condition for any exploitive use of peatlands.	High	GOV	MPL6
MPC6:	Measures to reduce peat (carbon) loss from degradation such as erosion should be introduced at management plan level (e.g. commonage) and in other policies (agri-environmental).	Medium	GOV	MPB7
MPC7:	Burning of peatland as a management practice to facilitate the extraction of the peat or to increase the population of grouse (promoting heather growth) should be strictly controlled. The Muirburn Code (Scottish Natural Heritage, 2005) should be used as best practice in using fire as a management tool to avoid accidental fire and additional carbon emissions.	Medium	GOV	
MPC8:	The establishment of a network of protected areas representing the geographical distribution of peatland types should be a priority in order to off-set climate change threats.	High	GOV	MPB1
MPC9:	The first option for after-use of cutaway peatlands should be to promote, where possible, the return to a natural functioning peatland ecosystem. The favoured management option should therefore involve re-wetting or the creation of a wetland.	Medium	GOV	
MPC10:	New production techniques such as paludiculture (growing biomass in a wet environment) should be developed and promoted to generate production benefits from cutaway and cutover peatlands without diminishing their environmental functions. Paludiculture is probably the after-use option that can have the most benefit from a climate mitigation point of view: avoiding carbon emissions from the degraded peatland, from the displaced fossil fuels and also from its transports.	Medium	GOV IND RES	MPE4

5.5 Management of Peatland for Water (MPW)

5.5.1 Observations

Natural peatlands are essentially wetlands, i.e. hydrological systems, and their ecological functioning is primarily dependent upon the dynamics of water flow. Water is the single most important factor enabling peat accumulation and a waterlogging condition is a prerequisite for peat formation and preservation.

Changes in the hydrological regime that sustains the peatland will invariably disturb the normal hydro-ecological functioning of the peatland. Restoration of the hydrology is also vital for the maintenance of other functions such as control of carbon emissions and attenuation of water quality. The ability of peatlands to regulate water flow is contentious. In fact, blanket bogs tend to exacerbate run-off under conditions of high rainfall while failing to provide a regular base flow in dry periods. Under normal weather conditions, they may provide some beneficial regulatory effect on water flows downstream. Some fens can act as transition areas for water, providing storage and maintaining base flows to the downstream system. Bogs and fens often have complex modes of water transport (depending on peat properties and conditions) and identifying these pathways is crucial if saturated conditions in the peat and its dependent ecology are to be maintained.

5.5.2 Targets

- To preserve and restore the hydrological status of protected peatlands in a catchment (Actions MPW1, 2, 3);
- To restore water levels and flow regimes as close to the natural conditions as possible in all protected sites (Action MPW2);
- To avoid unnecessary drainage in forested peatlands and other peatland activities that lead to deterioration of the quality and quantity of the water (Action MPW3); and
- To maximise the use of cutaway peatlands for water regulation (Action MPW4).

5.5.3 Actions – 3. Management of peatland for water (MPW)

		Priority	Remit	Link
MPW1:	It should be ensured that peatlands (including cutaway peatlands) are fully included in the development of River Basin Management Plans and that they are appropriately assessed in Strategic Environmental Assessment of County Council Development Plans.	Medium	GOV	MPL1
MPW2:	A methodology/approach should be developed to systematically investigate and quantify the environmental supporting conditions and hydro-ecological linkages that can be peculiar to any given peatland.	Medium	GOV RES	MPC3
MPW3:	An appropriate water-table level (i.e. drainage) should be adopted as good practice on utilised peatlands	Medium	GOV RES	MPC3
MPW4:	The enhancement of cutaway peatlands for flood storage and attenuation should be investigated.	Low	GOV RES	

5.6 Management of Peatlands for Other Land Uses (MPL)

5.6.1 Observations

Peatlands are extremely sensitive to any kind of management options that affect the range of natural functions they have been providing since the last ice age, and have come under serious threat in the last 50 years or so. The BOGLAND project came some way in demonstrating to managers and decision makers the compelling evidence of the importance of Ireland's peatland resource as a major carbon store, the role of natural (intact) peatlands as carbon sinks, the large GHG emissions from degraded peatlands, the role of peatlands in watershed management, their contribution to biodiversity and the attributes that confer on them a cultural and informative function. Therefore, peatland management approaches that preserve or restore the major natural functions of peatlands should be promoted. The past management

of peatlands often implied other land uses, which have aimed at exploiting the economic resource and in most cases affected deeply the natural functions of peatlands. While many of the serious and extensive impacts in relation to peat extraction and peatland use for forestry and agriculture occurred in the past and are unlikely to be repeated in quite the same way in the future, any development on a peatland should be carefully evaluated in order to balance the various values involved.

5.6.2 Targets

- To implement strict planning control of all types of development (exploitive uses) on peatlands (Actions MPL1, 2, 3, 4, 5, 6, 7, 10, 11);
- To minimise peatland habitat loss due to illegal and ill-planned developments or associated side-effects (Actions MPL1, 2, 3, 4, 5, 7, 8, 10, 11);
- To enforce current legislation regarding unauthorised activities on peatlands (Actions MPL5, 7); and
- To implement sustainable farming regimes on all priority habitats (Actions MPL8, 9).

5.6.3 Actions – 4. Management of peatlands for other land uses (MPL)

		Priority	Remit	Link
MPL1:	A code of good practice for development on peatlands should be produced and systematically used for assessing any development proposals involving peatlands. Such a code should emphasise the current legislation framework (EIA, AA, Integrated Pollution Prevention Control (IPPC) licensing) within which any developments can proceed and include evidence-based guidance for the relevant authorities, including the following recommendations.	High	GOV	MPE1
MPL2:	Good practice guidance for EIA involving peatlands should be developed. The EIA Directive specifies that thresholds do not preclude sensitive areas and as such peatlands are to be considered sensitive areas for any development and thus require an EIA.	High	GOV	MPL4
MPL3:	Wind-farm development on mountain blanket bogs of conservation value should be banned. Particular guidance should be given in the case of an EIA for wind-farm developments on peatlands. Such EIA should follow the guidance from the EU Commission regarding such development on Natura 2000 sites and the wind energy guidelines of the DOEHLG (2006), especially with regards to road construction, fragmentation of the habitats and ground investigation. The guidelines include an assessment of the peat strength over the profile depth. Such tools have been developed within the BOGLAND project and should be used in stability assessment. The UCD-DSS technique is a direct simple shear device that allows the strength of peat to be assessed in a mode of deformation that is appropriate for stability assessment.	High	GOV NGOs RES	MPE1
MPL4:	Appropriate Assessment should be carried out where exploitative utilisation is taking place on or near protected sites, regardless of the size of the development. An EIA should not suffice in this case.	High	GOV	MPB3
MPL5:	All commercial peat-cutting enterprises should require planning permission and a licence. Enforcement against unauthorised peat extraction should be pursued.	High	GOV	MPS3 MPE1 MPE2 MPE3
MPL6:	Licensing requirements should be tightened so that sites of 10 ha or more need to be restored or rehabilitated after peat extraction.	High	GOV	MPC5
MPL7:	Sausage machine cutting should be banned on all protected sites and this ban should be enforced.	High	GOV	MPE9
MPL8:	No form of peat cutting should occur within an agri-environment scheme.	High	GOV	MPB7
MPL9:	Sheep grazing on hill and mountain peatlands can be sustainably managed using a stocking density based on habitats and by acknowledging seasonal variations in vegetation cover and composition.	Medium	GOV	MPS4

MPL10:	Relevant authorities should ensure that forest policies and other land-use management plans continue to protect and enhance peatlands.	Low	GOV	MPS5
MPL11:	The aforementioned code of good practice may necessitate an environmental system management (ESM) programme to be established for all peatland-related development. An ESM programme monitors and controls the impact of an enterprise's activities on the environment by establishing an environmental policy with objectives and procedures (the similar to ISO 14001 standard) which could then be audited by the EPA.	Low	GOV	MPL1

5.7 Management of State-Owned Peatlands (MPS)

5.7.1 Targets

- To achieve, maintain and take the lead in good management practices on state-owned peatlands (Actions MPS1, 2, 3, 4, 5, 6, 7);
- To increase the proportion of natural peatlands and reduce carbon emissions from state-owned land (Actions MPS1, 2, 4);
- To carry out good practices for the sustainable management of forested peatlands in state ownership (Actions MPS5, 6); and
- To reduce conflicts between governmental policies (Actions MPS5, 6, 7, 8).

5.7.2 Actions – 5. Management of state-owned peatlands (MPS)

		Priority	Remit	Link
MPS1:	The present management of state-owned peatlands should be evaluated and alternative management options aimed at increasing the natural functions of peatlands should be implemented.	High	GOV	MPB1 MPB2
MPS2:	An assessment of state-owned raised bogs and blanket bogs should be carried out not only in the context of the Habitats Directive but with the aim of applying best management practices. Management options should be appraised against functional criteria. A range of response options may apply depending on the type and level of impact of the disturbances.	High	GOV	MPB4 MPC2
MPS3:	Where the current disturbance is illegal, it should be immediately removed by enforcing the law as good governance and law enforcement are key to the sustainable management of peatlands.	High	GOV	
MPS4:	Where the current disturbance has not impacted on the major functions of the peatland (e.g. appropriate grazing intensity, controlled turf cutting), the disturbance should be maintained at an acceptable level as a management option and should be monitored.	High	GOV	MPL9
MPS5:	The management options regarding state-owned forested peatlands should be critically reviewed and management options identified by Coillte regarding the western peatland forests fully implemented in view of managing this national asset in the most sustainable fashion.	Medium	GOV	MPL10
MPS6:	Western forested peatlands which are commercially unproductive should be candidates for either (1) restoration of peatland ecosystems, (2) long-term retention of trees, or (3) promoting regenerating native scrub. The effects of these management options on GHG emissions, especially peat oxidation, should be investigated.	Medium	GOV RES	MPS5 MPL10
MPS7:	Policy regarding wind-farm developments on state-owned forests (on peat) should be seriously appraised by a group of independent experts in each case (life-cycle analysis).	High	GOV	MPL1 MPL11
MPS8:	A government or national institution (National Working Group) should be developed to take the lead in demonstrating what after-uses are being seriously considered for industrial cutaway peatlands. An after-use policy considering the public's preferred options, namely amenity, wildlife and wind energy options, should be drafted.	Medium	GOV NGOs	MPE3 MPP5 MPP8

5.8 Management of Peatlands Using Socio-Economic and Policy Instruments (MPE)

5.8.1 Observations

The BOGLAND project findings demonstrate that the sustainable management of peatlands is difficult, given that the policies currently influencing peatlands are outdated and largely irrelevant to the needs of a modern Irish society whose understanding of the value of peatlands is changing. Regulatory and economic instruments are needed to achieve a balance between the various objectives and to achieve a sustainable use of the peatland resource including a satisfactory level of peatland conservation. There is a conflict between the short-term socio-economic benefits of utilising peatlands and the peat resource and the long-term social and environmental value of peatlands in situ and in functioning conditions.

The introduction of the carbon tax on domestic fuels may have produced a perverse incentive for increased private peat extraction. Much of this activity exists in the informal economy and the tax coupled with a more general increase in conventional fuel costs may have changed behaviour. Evidence for this is, however, only anecdotal at present.

The past socio-economic policy to utilise the peatland resource to promote self-reliance in energy, regional development and employment may still be realised with a shift from peat extraction to green industries on cutaway peatlands. These include appropriate wind-farm developments, paludiculture (in particular the cultivation of *Sphagnum* moss for use as a growing medium to replace horticultural peat), and the growth of alder for the provision of biomass material in peat-fired power plants. All these activities should be incentivised as they could replace a non-sustainable, finite peat extraction industry.

Peat is amongst the most carbon intensive of fuels. Like all energy installations, peat-fired power stations have been allocated allowances for free until 2012 on the European Union Emissions Trading Scheme (EU ETS). The scheme aims to provide utilities with a continuous price incentive to move away from energy with high carbon emissions. From 2013, all electricity generation plants, including the peat-fired stations, will be subject to auctioning rather than free allocation. Due to the necessity to pass on this cost of purchasing allowances to cover the high emissions, the peat-generated electricity will become more expensive. It has been suggested that some of the revenues generated by the sale of allowances to the industry will be recirculated back to the national treasury. It is stated in the Revised ETS Directive (2009/29/EC) that 50% of these revenues *should* be used for climate-related activities. This is a mechanism by which funding for the protection of peatland carbon stocks (through management or active restoration for example) might be found. While this allocation of revenues is a matter for national policy, there are some discussions at international levels that may create additional incentives to pursue a peatland policy. The inclusion of Wetlands, and in particular wetland restoration within any post-Kyoto agreement would create a mechanism by which enhanced carbon sinks (or reduced carbon loss) might be accounted for as part of compliance with agreed targets (IPCC, 2010, 2011).

5.8.2 Targets

- To incentivise low carbon emissions industries (Actions MPE1, 2, 6, 7, 8, 9);
- To move away from non-renewable, non-sustainable, peat-based industries (Actions MPE1, 2, 3, 4, 5, 8); and
- To promote cutaway peatland after-use for green industries (Actions MPE6, 7).

5.8.3 Actions – 6. Management of peatlands using socio-economic and policy instruments (MPE)

		Priority	Remit	Link
MPE1:	Management of peatlands for economic requirements should be in accordance with relevant international legislation and conventions, national laws and regulations.	High	GOV IND	MPL1 MPL4 MPL5
MPE2:	The Cessation of Turf Cutting Scheme should be fully implemented on *all* the raised bogs designated as SACs and be given full political back-up.	High	GOV	MPL5 MPE3

MPE3:	The cessation of turf cutting on other designated sites (blanket bogs) should be immediately assessed and solutions proposed from a forum of adequate representatives.	High	GOV	MPS3
MPE4:	A cost–benefit analysis at the macroeconomic level should be carried out in relation to peat extraction and its role in modern Ireland.	Medium	GOV	MPE8
MPE5:	The Public Service Obligation (PSO) levy allocated to the peat industry should be reviewed in the view that the continued carbon emissions from peat burning are contrary to national interest. A portion of these funds could be used to invest in the peatland resource that would bring a sustainable economic activity, carbon storage and the delivery of other ecosystem services.	Medium	GOV	MPE9
MPE6:	Carbon storage through peatland conservation, restoration and paludiculture should be supported by Ireland for the next commitment periods of the Kyoto Protocol.	Medium	GOV	
MPE7:	Wind-farm development and cultivation of *Sphagnum* moss should be encouraged on industrial cutaway peatlands through tax relief.	Medium	GOV IND	MPE5 MPE6
MPE8:	The government should engage in a review of the use of peat in the horticultural industry and phase out the use of peat as a horticultural growing medium at least in the retail market. While there is not at present a technically, environmentally suitable alternative material that could replace peat in professional horticultural crop production, Ireland should lead research in this area and economic incentives should be applied to compete with non-sustainable horticultural peat.	Medium	GOV IND	MPE4
MPE9:	Adequate funding and mechanisms to support sustainable management of peatlands should be provided.	High	GOV	MPE5

5.9 Management of Peatlands for and with the People (MPP)

5.9.1 Observations

There is a clear information deficit regarding the public benefits of peatlands and the relationship between peatlands and people is changing. People have commonly treated peatlands as wastelands, using them in many destructive ways, without taking the long-term environmental and related socio-economic impacts into account. Interestingly, the surveys carried out and the focus group discussions within the BOGLAND project demonstrated support for the protection of peatlands at both local and national levels. The results from the two surveys also indicated support for a National Peatlands Park to be located in the Midlands. However, the value of peatlands as an ecosystem providing crucial ecological, hydrological and other services has generally been disregarded by the public, mainly because it was not communicated in any meaningful way. Currently, a very significant information deficit applies to the carbon sequestration and carbon storage benefits of peatlands and the significant contribution that these make in regulating the global climate. Also, most people do not realise how few intact peatlands remain. The surveys conducted within the BOGLAND project showed that many people do not see a contradiction between the cutting of peat, particularly domestic cutting, and the value that they place on peatlands. It was also found that decisions about management of peatlands are often made remotely and by interest groups who may be insufficiently informed about the local conditions and consequences of inappropriate actions. A fundamental requirement to the sustainable management of peatlands is the raising of public awareness of their importance and their active participation at all stages of the strategy development.

5.9.2 Targets

- To increase awareness of the ecosystem services provided by peatlands (Actions MPP1, 2, 3);
- To increase communication to stakeholders, especially turbary rights holders and people living near peatlands (Actions MPP4, 5, 7, 8); and
- To generate informed debates about peatlands in national and local media (Actions MPP5, 6, 7, 8).

5.9.3 Actions – 7. Management of peatlands for and with the people (MPP)

		Priority	Remit	Link
MPP1:	Peatland awareness programmes and educational material should be developed and promoted through a wide variety of media: information sharing (website, DVDs, etc.), education packs (see Irish Peatland Conservation Council), workshops, posters in public places. Clear 'peatland messages' should be provided for use across a wide range of media.	High	GOV NGOs	MPP7
MPP2:	Awareness and education could also be promoted by the improvement of public access at certain appropriate sites.	Low	GOV NGOs	
MPP3:	Traditional, indigenous knowledge of peat and peatlands as well as relevant scientific findings and data should be clearly communicated and made available to the public and to decision makers. This would also help dialogue between all the stakeholders, who may not be sufficiently aware of the information and views held by others. Information from all sources is crucial if more effective ecosystem management strategies are to be introduced.	Medium	GOV NGOs RES	MPP8
MPP4:	Local communities have a very important role as stewards of peatland resources and should be effectively involved in activities to restore and sustain the use of these resources. Local committees and other vested groups should be consulted in order to balance local concerns with the wider public 'good'. The closer the management is to the ecosystem, the greater the responsibility, accountability, participation and use of local knowledge.	Medium	GOV	
MPP5:	Governmental institutions should communicate early and extensively to the stakeholders so that they become familiarised with the benefits of peatlands other than for fuel.	Medium	GOV	MPS8
MPP6:	The Government should advocate the communication of environmental information, in particular that of peatlands, either through the promotion of its web-based information channels or through the support to NGOs that communicate this knowledge at all levels (in particular education).	Low	GOV NGOs	
MPP7:	It is critical that a national institution takes a lead in communicating information regarding peatlands.	High	GOV	MPP1
MPP8:	The creation of a National Peatlands Park deserves serious consideration and commands a degree of support from the Government.	Medium	GOV	MPS8

6 A Peatland Strategy Working Group

The BOGLAND report provided main analysis and findings that demonstrated that the Irish State needs to change the way the peatland resource is currently viewed and managed if it wishes to secure the multiple benefits offered by these natural ecosystems and avoid the costly consequences of further peatland deterioration.

A National Peatland Strategy is clearly required if the protocol for sustainable management of peatlands is to be implemented. The development of such a strategy should be carried out through the establishment of a special working group (National Peatland Strategy Working Group) whose main role would be to co-ordinate the development of a consensus that charts the way forward. In essence, the Working Group should be responsible for developing and implementing a strategy that works towards delivering the greatest net benefits (market and non-market) from the peatland resource in ways that are sustainable, that is by optimising the balance between the different aforementioned targets and necessary actions.

The remit of the National Peatland Strategy Working Group should include:

- To make a proposal for a national peatland strategy, taking into consideration the need for the long- and short-term uses of these ecosystems and the existing national, EU and international obligations and policies;
- To suggest means of implementing this strategy by evaluating the functionality of different licensing procedures with regards to the different uses of peatlands;
- To review and set up effective enforcement of procedures as well as evaluate different environmental permit proceedings required in the uses of peatlands;
- To lead the development of a policy framework that embraces the key market and non-market functions;
- To set up a management unit with appropriate experts for restoring degraded bogs and safeguarding their carbon stores;
- To make a decision on state-owned peatlands, especially those owned by Coillte and Bord na Móna;
- To take the lead in identifying sustainable utilisation and management options with regards to industrial cutaway peatlands, taking on board the findings of the BOGLAND report; and
- To make suggestions, when needed, for the sustainable use and management of peatlands.

The Working Group needs to operate across an array of administration units and embrace the exceptionally large number and wide range of stakeholders. It should be initiated by both the Departments of Communication, Energy and Natural Resources and the Department of the Environment, Community and Local Government (with, as main actors, the EPA and NPWS) and include the Department of Finance. To kick-start this exercise, the working group should initiate small workshops on specific themes in relation to each peatland identified in the protocol (or action plan).

7 Further Research

Any decision making ought to be based on sufficient and adequate information. Peatland management issues are invariably complex and cross-disciplinary. There are many gaps in knowledge from disciplines or sectors other than those most directly linked to peatlands. The BOGLAND project made great progress towards a greater understanding of Irish peatlands from the perspective of various society and scientific disciplines: biodiversity, physical resource and, for the first time, socio-economic and cultural relationships. The project highlighted specific aspects from each strand which necessitate further research (see Annex 5.1a, End of Project Report). Critical research areas that need immediate attention are presented below. Ideally, these strands should be regrouped under the umbrella of a centre of expertise for peatlands which would create a research network to improve knowledge and understanding of peatland conditions and their functions, particularly in relation to GHG emissions and water management.

Critical research areas that should be urgently addressed are:

- Investigation of the GHG emissions from peat soils under various management practices (to be used towards Tier 3 reporting of the Kyoto Protocol);
- Identification and review of practical peatland restoration projects and techniques to assess their effectiveness in terms of hydrology, carbon storage and sequestration potential and biodiversity at all levels;
- Quantification of the actual extent of domestic peat cutting, especially on blanket bogs;
- Classification and identification of all peatlands along a degradation scale;
- Research and development into alternative material to replace peat in horticultural and other products;
- Investigation of the cultivation of *Sphagnum* moss and more generally paludiculture on degraded peatlands; and
- Research wet heaths which are often associated with blanket bogs and are listed in Annex 1 of the Habitats Directive as important habitats to protect. An assessment of the disturbance to these habitats is required as they have serious consequences in terms of carbon loss and water quality.

8 General Conclusion

The BOGLAND project focused on assimilating and synthesising the scientific information needed to inform policy about Irish peatlands. It revealed the global significance of this national resource and the dilemmas of peatland management, utilisation and conservation. The project yielded a lot of information on many aspects of peatlands covering the four pillars of sustainability: environmental, social, economic and institutional. Scientific chapters are available in full in the End of Project Report, while the main findings have been compiled in the Synthesis Report.

Technical information about the services provided/affected by peatland use and management should now be readily presented to politicians and influential decision makers, with a clear impression of the consequence of alternative decisions and policies. Increasing the awareness (particularly to the wider public) of the current situation and possible future scenarios (backed up by enhanced scientific understanding) is critical to this evidence-based policy development. The *protocol* delivers an action plan or set of recommendations which should be used to draft a much-needed National Peatland Policy, which should ensure that this natural heritage is not lost in the future, but that it is safeguarded and enhanced during a challenging period of economic transition. In short, any vision of the future of Ireland must include the maintenance and enhancement of one of its last natural resources: peatlands. This protocol aims to succeed in achieving such a vision that serves the needs of the people and preserves our natural heritage.

Ireland can decide today how its peatlands, this unique natural resource, will look in 2050. To achieve sustainable management of peatlands, the vision we should aspire to is outlined below.

Irish Peatlands: 2050

- *A good awareness by Irish people of the multiple benefits brought by peatlands and recognition of peatlands as an important natural resource providing valuable ecosystem services.*
- *Active management by the Government and other stakeholders to maximise peatland functions especially the storage and accumulation of carbon.*
- *Responsible treatment of peatlands used for agriculture, forestry and commercial operations.*
- *Integration of climate impacts into decisions on economic activities on peatlands.*
- *Favourable conservation status attained for all protected peatlands.*
- *Cutaway peatlands restored where possible and embryonic bogs once again growing in Ireland. Where conditions are not favourable for restoration, cutaway peatlands rehabilitated to suit the needs and aspirations of the local population, including amenity, wildlife and green energy options.*

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Acronyms and Annotations

AA	Appropriate Assessment
C	Carbon
CAP	Common Agriculture Policy
CBD	Convention on Biological Diversity
CO_2	Carbon dioxide
DSS	Direct Simple Shear
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESM	Environmental system management
ETS	Emissions Trading Scheme
EU	European Union
GHG	Greenhouse gas
IPCC	International Panel for Climate Change
IPPC	Integrated Pollution Prevention Control
MPB	Management of peatlands for biodiversity
MPC	Management of peatlands for carbon, climate and archives
MPE	Management of peatlands using socio-economic and policy instruments
MPL	Management of peatlands for other land uses
MPP	Management of peatlands for and with the people
MPS	Management of state-owned peatlands (MPS
MPW	Management of peatland for water
NGO	Non-governmental organisation
NPWS	National Parks and Wildlife Service
PSO	Public Service Obligation
SAC	Special Area of Conservation
SOC	Soil organic carbon
UCD-DSS	University College Dublin Direct Simple Shear Apparatus

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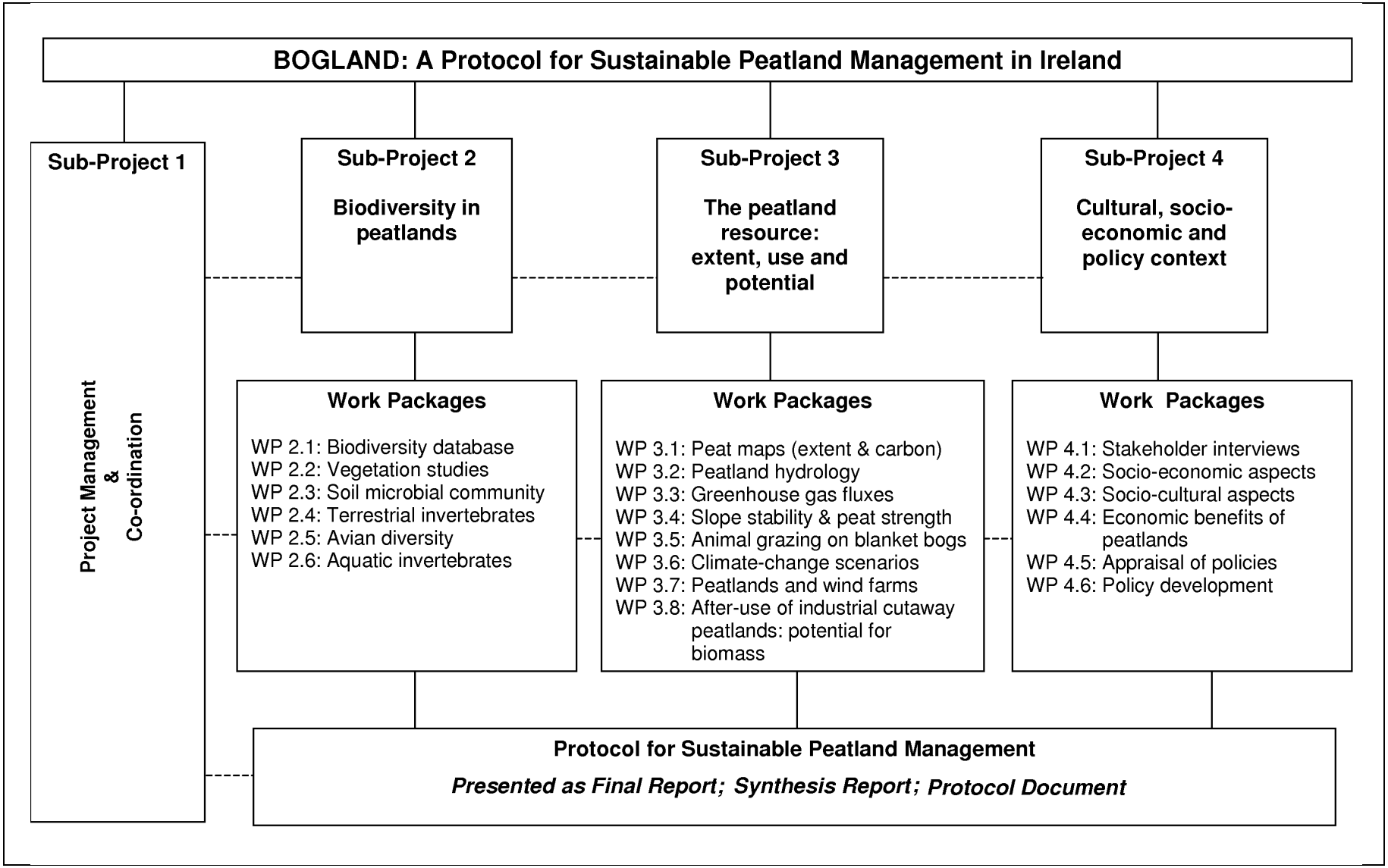
Annex 1 Research Strands and Outputs of the BOGLAND Project



An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail.
- Scardadh dramhuisce

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

NDP
National Development Plan 2007 - 2013

Science, Technology, Research and Innovation for the Environment (STRIVE) 2007-2013

The Science, Technology, Research and Innovation for the Environment (STRIVE) programme covers the period 2007 to 2013.

The programme comprises three key measures: Sustainable Development, Cleaner Production and Environmental Technologies, and A Healthy Environment; together with two supporting measures: EPA Environmental Research Centre (ERC) and Capacity & Capability Building. The seven principal thematic areas for the programme are Climate Change; Waste, Resource Management and Chemicals; Water Quality and the Aquatic Environment; Air Quality, Atmospheric Deposition and Noise; Impacts on Biodiversity; Soils and Land-use; and Socio-economic Considerations. In addition, other emerging issues will be addressed as the need arises.

The funding for the programme (approximately €100 million) comes from the Environmental Research Sub-Programme of the National Development Plan (NDP), the Inter-Departmental Committee for the Strategy for Science, Technology and Innovation (IDC-SSTI); and EPA core funding and co-funding by economic sectors.

The EPA has a statutory role to co-ordinate environmental research in Ireland and is organising and administering the STRIVE programme on behalf of the Department of the Environment, Heritage and Local Government.

epa
Environmental Protection Agency
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Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government