Oweninny Wind Farm Phase 3

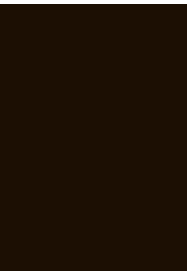
Environmental Impact Assessment Report

Appendix 1.4 Strategic Framework for the Future Use of Peatlands

STRATEGIC FRAMEWORK FOR

THE FUTURE USE OF PEATLANDS

BORD NA MÓNA



Lough Boora Parklands, Co. Offaly.

BORD NA MÓNA

Bord na Móna
Main Street
Newbridge
Co. Kildare
www.bnm.ie

Technical assistance in the preparation of the framework was provided by:

Brady Shipman Martin
Block 6
Belfield Office Park
Clonskeagh,
Dublin 4
www.bradyshipmanmartin.com

May 2011

CONTENTS

The Bord na Móna peatlands are principally located in the midland counties and are organised and managed as Bog Groups.

STATEMENT OF INTENT

Bord na Móna will balance and optimise the commercial, social and environmental value of the company's land bank and pursue its full potential for a variety of appropriate and sustainable future land uses in the context of:

- *The continuation of commercial peat production activities to meet market demand;*
- *National and regional need for infrastructure, strategic industry, strategic national reserves and other key land uses;*
- *National, regional and local planning, environmental and energy policy, including carbon management;*
- *The economic return to Bord na Móna and the State;*
- *The economic contribution of the activity to the host area, including employment potential;*
- *The impact of the proposed land use on biodiversity value and the potential to aid the achievement of national biodiversity targets; and*
- *The limitations of the physical nature of peatland areas, including cutaway.*

FOREWORD

From its establishment in 1946, Bord na Móna PLC has developed some of Ireland's extensive peat resources on an industrial scale primarily for fuel, energy and horticultural growing media. As part of this development, the company acquired extensive areas of peatlands, together with other lands and properties. These lands extend in total to about 80,000 hectares.

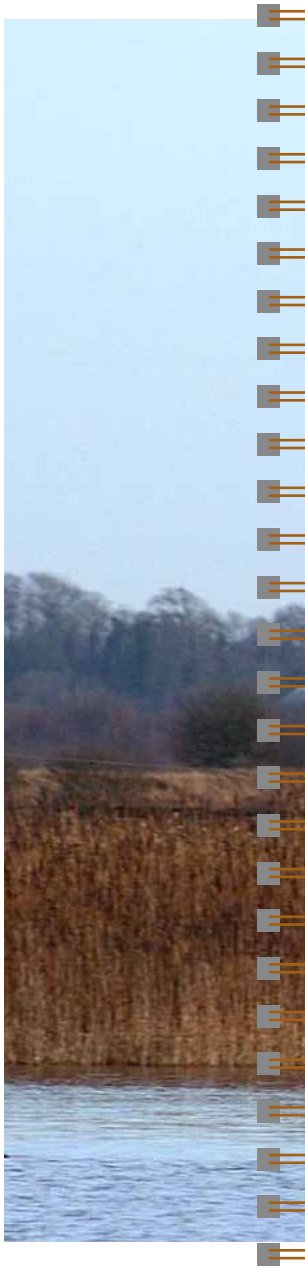
At one time, it was anticipated that this vast land resource might be widely used for agriculture and forestry. However, following extensive trials and experiments, it is now clear that the future of the land lies in a wider mix of uses, with special regard to:

- the role that peatlands can play in continuing to supply energy to the country, both through traditional fuels and renewables;
- their potential to meet national and regional land requirements for infrastructure and industry;
- the benefits they can bring in terms of recreation and amenity; and
- their contribution to Ireland's national biodiversity targets.

Some of the land bank is now out of peat production and is used for a variety of purposes, including wind energy, forestry, tourism and amenity and industry. Other uses are being planned, whilst a number of bogs with high biodiversity value have been handed over to the National Parks and Wildlife Service.

The peatlands of Bord na Móna will continue to be harvested to meet demands for energy and horticultural growing media. At the same time we need to plan for the future use of the remaining lands. This is a complex task, outlined in this strategic framework and is a process that will continue in the years to come. To assist the process, Bord na Móna has established a Land Use Review System to enable regular review of the potential of the lands. The process will also involve consultation with relevant interested parties, especially those involved in planning and the environment.

This is an exciting project that further marks the transformation of Bord na Móna into an environmentally aware and sustainable company. The process builds on, and will enhance, the other actions of Bord na Móna in meeting its stated sustainability goal, in developing its Carbon Management Strategy, and in implementing the company's vision – *'A New Contract with Nature'.*



Gabriel D'Arcy
Chief Executive Officer
Bord na Móna

1. Gabriel D'Arcy, Chief Executive Officer, Bord na Móna.
2. Kilberry works and adjoining peatlands, Co. Kildare.
3. Whooper swans and bird hide at Lough Boora Parklands, Co. Offaly.

EXECUTIVE SUMMARY

Cutaway bogs present a range of complex options that require to be considered on a bog-by-bog basis, bearing in mind also the considerable internal variation within bogs.

Introduction

Bord na Móna plc is a publically owned company, originally established in 1946 to develop and manage some of Ireland's extensive peat resources on an industrial scale. In accordance with government policy at the time, Bord na Móna acquired extensive peatlands and associated areas principally for the industrial harvesting of peat for energy (electricity production and briquettes) and as horticultural growing media. These lands extend in total to about 80,000 hectares and are located mainly in the Irish midlands. This vast land resource is characterised by fragmentation, with over 130 individual bogs, many of which are comprised of numerous individual land parcels.

Character of the Peatlands

Most of the landholding consists of peatlands, which differ considerably from lands located on mineral soils, even when cutover or cutaway[1]. Cutaway bogs are characterised by varying depths of remaining peat and a variety of underlying soil types. Many areas require pumped drainage and will flood naturally when peat production ceases. The lands are living environments with a capacity to re-vegetate naturally (though not necessarily as bogs).

Cutaway was originally seen as having considerable potential for agriculture, horticulture and forestry. However, extensive research and trials over many years have shown that economic as well as technical difficulties render the use of cutaway for agriculture and horticulture realistically unviable, whilst the potential for forestry is limited.

Factors Affecting Future Potential

Cutaway bogs present a range of complex options that require to be considered on a bog-by-bog basis, bearing in mind also the considerable internal variation within bogs. Many of the options for future use are compatible and can be co-located. For example, it may be possible to co-locate wind energy, water storage and management, amenity and biodiversity.

1. Cutover bogs are those from which the upper layers of natural vegetation have been removed to facilitate peat harvesting and include bogs currently in production. Cutaway bogs are areas where peat harvesting has been discontinued, usually because it is no longer economically viable to remove any remaining peat.

Bord na Móna is currently considering the most appropriate and sustainable use of the landholding and has established a Land Use Review System, based on the company's geographical information system, to continuously assess the potential of these lands, taking into account the following factors:

1 The nature of the cutaway, including future drainage (it is estimated that more than half of the land will eventually flood), the depths of remaining peat and the underlying soil types. Generally, the deeper the remaining peat, the fewer the economically viable development options and this is a particular issue where peat harvesting ceases mid-way through the production life of a bog.

2 Location and proximity to infrastructure, such as motorways, railways and the electricity and gas grids, as well as urban areas, give some cutaway peatlands relative advantage over more remote areas in terms of potential future land uses. The relationship of lands to designated nature conservation areas, to tourism facilities and attractions and major water bodies is also significant.

3 Timescale is also important. Whilst the peat resource could be harvested for a further 30 years or more, actual production will depend on market demand. As stated above, mid-life cessation of peat production may limit or preclude certain uses. Moreover, the rate of harvesting on each bog is fixed and is significantly dependent on weather. It is not practical to increase the depth harvested each year and it is, therefore, not feasible to significantly 'speed-up' peat harvesting. Moreover, nature quickly re-colonises cutaway and this can present issues in holding land for alternative future uses.

4 The peat resource and its associated land bank were acquired in the national economic interest. The objective of Bord na Móna is to balance and optimise the commercial, social and environmental value of the land bank. Commercial land uses must generate a satisfactory return, directly or indirectly, bearing in mind the cost of preparing the land for alternative uses. Where the future land uses have social and/or environmental value, but not commercial value, a system to recognise the economic value of such services should be established.

5 The potential of the Bord na Móna land holding to meet national and regional needs is demonstrated by the Water Supply Project for the Dublin and Midland Region which proposes to use an area of cutaway bog as a reservoir. Other potential needs that may be addressed include wind energy, other power generation, industries and infrastructure with a requirement for isolated locations (for example, those covered by the Seveso directive) and/or large land requirements, as well as tourism and recreation.

6 Clearly, future land uses must conform to all relevant environmental, planning and nature conservation legislation. At present, peat is harvested under the terms of Integrated Pollution Prevention and Control (IPPC) licences issued by the Environmental Protection Agency (EPA). Conditions attaching to these licences require decommissioning following termination of peat production and the implementation of a cutaway bog rehabilitation plan agreed with the EPA. The rehabilitation plan generally requires that the land be permanently left in an environmentally stable condition. In accordance with legislation, plans and proposed projects for areas of cutaway will be screened for potential impacts on sites with European conservation designation and appropriate assessments will be carried out where required.

7 Future land uses must also conform to relevant planning policies at national, regional and local levels. Currently, the development plans of most of the pertinent planning authorities envisage use of cutaway for tourism and amenity, wind energy (and biomass energy) and biodiversity with little recognition of the potential for other uses.

8 In addition to the wider national and regional issues, regard must be had to local considerations. These include local community demands, often for recreation and amenity, requests for small areas of land for various uses, boundary management and trespass issues, the impact of actions on neighbouring properties and political and employment issues.

Wind turbines at Oweninny Wind Farm.

Framework for Future Land Use

Over one-fifth of the landholding is already committed to future uses that include forestry (land leased to Coillte); tourism and amenity, as with the Lough Boora Parklands; industry and infrastructure including waste management and recovery, aggregate production, water storage and wind energy. In addition, certain bogs have been conserved for their high biodiversity value.

The remaining peatlands with the greatest range of potential and the greatest capacity for sustainable multiple uses lie in the east of the country, partly because of their gravity drainage, whilst those along the Shannon are likely to become wetlands. Some of the options for the future use of cutaway bogs are **compatible and can be co- located**. However, some level of remediation, rehabilitation and/or development is required for all future land uses on cutaway and this has cost implications.

Some of the land bank will have **potential for commercially beneficial uses**. This potential is greatest at locations where the land bank coincides with major infrastructure, such as motorways and the electricity grid. About 9% of the land bank is already committed to wind energy use and this could grow to one-third or higher, depending on national and European market demand and national energy policy. For example, there may be opportunities to export electricity from 'clean energy hubs' in the midlands to the United Kingdom and European markets. Given the scale and location of the emerging cutaway areas, potential exists to develop certain types of industry and infrastructure to support national and regional development.

For economic as well as technical reasons, it is unlikely that forestry and agriculture will account for more than about 10-15% of the total land bank and it is currently estimated that approximately a further 7% may be appropriate for tourism and amenity uses, including the further development of the existing Lough Boora Parklands.

Biodiversity is important in relation to all peatlands and provides a contribution to wealth and health through **ecosystem services.** It consequently has economic as well as environmental value. It is currently estimated that the primary use of about a quarter of the Bord na Móna land bank will eventually be wetlands or other areas with a high value for biodiversity as well as for the provision of ecosystem services. Some of these areas may also be used for wind energy.

It is the intention of Bord na Móna to **continuously assess and evaluate the potential** of the company's land bank, using the **Land Use Review System**. The assessment will inform the preparation of a set of knowledge-based management plans for the various areas of peatland, which will identify appropriate, compatible and sustainable uses and which, in turn, will inform the cutaway bogs' rehabilitation plans required under the terms of the IPPC licences. Bord na Móna will discuss and consult with relevant government departments, national agencies, regional and local authorities as well as other stakeholders as part of this process.

The policy of Bord na Móna is not to open up any undrained new bogs for peat production. Lands identified as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use. Generally, cutaway that floods naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.

It is the intention of Bord na Móna to actively pursue the full potential of the land bank as this potential is identified and confirmed through the review system and the set of management plans. In pursuing the potential, Bord na Móna will seek to sustainably balance and optimise the **commercial, social and environmental value of the resource**, including its value for carbon management and biodiversity, with regard to commercial benefits and the national interest. Where compatible and appropriate, the policy will be to co-locate various land uses.

Fishing at Lough Boora.

Edenderry Power Station.

01

INTRODUCTION

The strategic intent of the company is to develop a range of sustainable businesses including the use of new energy and waste management technologies.

Background to Bord na Móna

Bord na Móna PLC was originally established in 1946 to develop some of Ireland's extensive peat resources on an industrial scale primarily for fuel and energy and as horticultural growing media.

Today, the strategic intent of the company is to develop a range of businesses including the use of new energy and waste management technologies. The company is active in a number of industrial sectors, including conventional and renewable energy generation; commercial and domestic fuels; horticultural growing media; wastewater treatment and air pollution abatement and resource recovery.

The stated vision of Bord na Móna is 'A New Contract With Nature'. This reflects the changing emphasis in the company from a producer of fuel, energy and horticultural products to a broad-based, environmentally sustainable business.

Bord na Móna Mission Statement

"We conduct our affairs with openness, honesty and integrity. We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services. We capitalise on international opportunities where we have a competitive advantage. We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through excellence and commitment of our people. We engage in sustainable, profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders."

Wetland.

Purpose of Strategic Framework

The company has a vast land bank, comprising uncut, working and cutaway peatlands and some other lands, totalling approximately 80,000 hectares. These lands, located mainly in the midlands, represent one of the company's principal potential assets but are also important resources for the nation as a whole.

However, the land resource is characterised by fragmentation, with over 130 individual bogs, many of which are comprised of numerous individual land parcels. Furthermore, the character of peatlands differs considerably from lands located on mineral soils, even when cutover or cutaway.

Cutover bogs are those from which the upper layers of natural vegetation have been removed to facilitate peat harvesting and include bogs currently in production. Cutaway bogs are areas where peat harvesting has been discontinued, usually because it is no longer economically viable to remove any remaining peat.

Peat production is likely to continue for many years to come. However, extraction has been completed in some areas of bog and, over the coming decades, increasingly greater areas will come out of production and be available for alternative land uses.

This document sets out a strategic framework for the consideration of future potential uses. It reviews and assesses the land bank resource, identifies key issues, considers options for future land use based on the significant research carried out by Bord na Móna and other organisations, and establishes a strategy and framework for the on-going assessment of the land bank and the formulation of appropriate strategies, polices and actions.

Land Use Review System

The Strategic Framework for Future Use of Peatlands is intended to be a dynamic activity; a process that will evolve and develop over time as additional information becomes available and as the most appropriate future land uses for individual bogs and other parcels of land becomes clearer. The key element of the framework is a Land Use Review System, based on Bord na Móna's geographical information system and its sets of data bases. The existing data bases were supplemented by additional material prepared specially for the framework. The system will allow for monitoring, on-going assessment and review of the potential of the land bank in the light of changing circumstances. The system is described in Appendix 1.

An initial appraisal of the land bank, using the review system, has informed the formulation of the strategic framework.

02

PEATLANDS AND CUTAWAY

Peatlands cover 16.2% of the landmass of Ireland. Bord na Móna currently owns or controls approximately 7% or about 80,000 hectares of the country's peatlands, spread throughout twelve counties in approximately 130 bogs. These lands are predominantly bog and are not similar to mineral soil lands, even when cutaway.

Extent and Location

At its formation, Bord na Móna acquired the lands, works and factories of the Turf Development Board, which were primarily located in the east midlands. Further lands were acquired in three broad tranches corresponding to three development programmes:

1

First Development Programme
The First Development Programme commenced on the formation of the company in 1946 and focused primarily on the development of sod peat. The bogs developed under the programme were mainly located in the east midlands.

2

Second Development Programme
The Second Development Programme commenced shortly after the First Programme and extended the lands and output of peat significantly. During this programme the emphasis was switched to milled peat production.

3

Third Development Programme
In the 1970s Ireland's over- reliance on imported energy was recognised and as a result Bord na Móna began the Third Development Programme, which saw the acquisition of a further 35,000 hectares of bog and the development of a further briquette factory at Littleton, Co Tipperary.

Peatlands.

The main land bank of Bord na Móna is in the midland counties of Longford, Offaly, Meath, Westmeath, Roscommon, Laois, Tipperary, Kildare, and East Galway. The company also owns peatlands in Kerry, Mayo and Donegal.

The 130 individual bogs are organised and managed in a series of Bog Groups, composed of a very large number of individual land parcels. The Bord na Móna land bank was acquired primarily for the harvesting of peat, in line with government policy for economic development, and for other uses allowed under the Turf Development Acts. The underlying rationale for the acquisition of the land was, therefore, the wider national interest. Compulsory purchase powers were made available to Bord na Móna to ensure that the task could be carried out successfully.

Historic Attitudes to Peatlands and Cutaway

Peat has played an important role in the history and development of Ireland, particularly in the midland counties and certain western counties where vast areas of peatland exist.

Historically however, bogs were considered bleak wasteland areas, unsuitable for agricultural or other productive uses.

Nevertheless, at the same time, the edges of many bogs were being cut by hand to provide fuel, principally for local consumption. Interest in draining the lands and using them for agriculture also increased and peat or 'turf' was cut as much for the agricultural value of the land as for its fuel value.

The emphasis in reclaiming bogs for agricultural use continued throughout the eighteenth and nineteenth centuries, encouraged by various Acts of Parliament and by the rapid increase in the population of the country. Whilst many areas of bogland were reclaimed, huge areas of peatland remained.

The reduction in the population of the country following the Famine reduced the pressure for land and consequently for the reclamation of boglands.

Meanwhile, peat continued to be cut by hand for fuel on an increasing scale. It is estimated that substantial quantities of peat were cut every year in the eighteenth and nineteenth centuries and industrial-scale organisation of hand-cut peat began to develop. However, the peat varied greatly in quality and composition.

Attitudes towards the peatlands shifted from their potential for agriculture to their value as sources of fuel, which could potentially be developed on an industrial scale. The harvesting of peat in other countries was studied and, following a number of experimental and unsuccessful ventures, industrial harvesting of peat was finally established under the Turf Development Board and later Bord na Móna. Thus, by the middle of the twentieth century the view that peatlands had considerable value as sources of fuel was well established.

For more than 50 years, Bord na Móna has carried out research on the use of industrial peatlands following cessation of extraction. The initial emphasis in the research was on transforming the cutaway into a productive growing medium in the expectation that it would prove possible to reclaim the wastelands of the bogs for agriculture, horticulture and forestry and thus effectively expand the area of the country available for productive farming.

The reality has proved to be more complex. Extensive trials have shown that economic as well as technical difficulties render use for agriculture and horticulture realistically unviable, whilst the potential for forestry is limited.

Peat Harvesting

The traditional method of harvesting peat is to manually cut sods vertically from the side face of a peat deposit or bog. This method is highly labour intensive but continues to be used in some places today. Small-scale private peat producers also use machines, principally excavators with hoppers, that extrude macerated peat.

In the early years, Bord na Móna (and previously the Turf Development Board) concentrated on the production of machine turf, using machinery that cut and macerated the peat and spread the sods produced on the bog to dry. Whilst the process was significantly mechanised, and power stations at Portarlington and Allenwood were built to use the peat, development in the 1950's favoured a move, on technical grounds, from the labour intensive production of sod peat to the capital intensive production of milled peat.

Bord na Móna now produces a total of approximately 4 million tonnes of milled peat per year at eight production centres, including 310,000 tonnes of horticultural peat.

The milled peat is supplied to three thermal power plants, owned by the Electricity Supply Board and by Bord na Móna, for the generation of electricity; and is also used for the manufacture of peat briquettes at two factories, and for the production of growing media and composts.

Milled Peat

Milled peat refers to peat that has been air dried and is in powder or crumb form. It takes approximately 5 years of drainage to bring a bog to a stage from which milled peat can be produced. A milled peat bog is laid out in a series of 15 metre wide production fields, of variable length but averaging about 1 kilometre.

A key characteristic of milled peat production is that the level of the overall bog is reduced slowly, year by year, in contrast to the production of sod peat, which is cut from vertical faces within the bog.

Production of milled peat is generally carried out during the months of April to September, during periods of good drying weather.

Types of Peatland

The term 'bog' is widely used in Ireland to describe areas of various types, all of which are characterised by a naturally occurring layer of accumulated organic dead matter with at least 30% dry mass (i.e. peat). The principal peatland types in Ireland include:

Fens

Fens are formed in areas where there is a constant flushing of base-rich ground water. They generally have a high pH and are mineral and species rich. Apart from some protected sites, most fens in Ireland have been drained for agricultural purposes. In the midlands, fen peat development was generally superseded by the formation of raised bog, so that many raised bogs are underlain by fen peat.

Raised Bog

Raised bogs are dome-shaped masses of peat, dependent on the presence of Sphagnum or peat mosses. They are acid environments with a waterlogged surface above which the peat moss grows. They are extensive in the Irish midlands.

Atlantic Blanket Bog

Blanket bogs cover extensive areas where high rainfall maintains waterlogged conditions. They are acidic. Atlantic blanket bog is found in lowland areas below 200 metres altitude where rainfall exceeds evaporation.

Mountain Blanket Bog

Mountain blanket bogs form on mountain plateaux and shallow slopes in areas of high rainfall.

Raised bog represents, by far, the greatest extent of peatland type owned and harvested by Bord na Móna, supplemented by areas of Atlantic Blanket Bog, especially in Mayo.

Milled peat harvesting.

Four operations take place in the process of milled peat production - Milling; Harrowing; Ridging and Harvesting.

- **Milling**
  A thin layer of peat, usually about 15mm deep, is milled from the surface of the drained fields by tractor-towed pin millers and left to air dry over a period of a few days. This layer of peat is called a crop. Typically the water content of the crop after milling is about 80%. The miller itself consists of a number of rotating drums fitted with pins to cut the peat. It is towed and powered by an agricultural tractor.

- **Harrowing**
  The layer of milled peat is turned to ensure even drying. This is done using a machine called a harrow which turns over the dry peat at the surface to expose the wet peat underneath.

- **Ridging**
  When the layer of milled peat has dried sufficiently, it is collected in ridges in the centre of each field. The process is carried out using a ridger machine which has V-shaped blades the same width as the field. The blades are towed by a tractor and move across the field pushing the peat to the middle.

- **Harvesting**
  There are two main methods used by Bord na Móna in the harvesting of milled peat. The Peco method, in which every eleventh field is used to stockpile the peat and receive the output of the five fields on either side, is the principal method. In some locations, the Haku method is used, in which the output of each field is transported in trailers to large central stockpiles. In either case, light railways are laid alongside each pile and the pile loaded into trains . The railway is then lifted and moved to the next pile.

The processes of milling, harrowing, ridging and harvesting are repeated for each crop and are collectively described as a cycle. Generally at least 12 mm of evaporation is required to dry a crop to the target moisture content. This normally takes a period of 3 to 4 days. In an average year, 12 crops or production cycles are achieved. However, due to the changeable nature of the Irish summer weather, the number of crops produced varies considerably from year to year.

Each year, the network of drainage ditches is deepened by a few centimetres in preparation for the following year's harvest.

The Development of Cutaway

The raised bogs, which form the principal resource of Bord na Móna, are dome-shaped peatlands that lie over a base of alluvial deposits, formed in ancient lakes, and an undulating base of boulder drift, laid down following the last glaciation and which generally varies considerably in depth (Figure A). Typically, the greatest depths of peat lie over the alluvial deposits.

Milled peat production results in a gradual horizontal lowering of the peatland surface. As the surface lowers, the peat over the boulder drift becomes exhausted, whilst significant depths of peat remain over the alluvial deposits and depressions within the boulder clay. Figure B shows a typical raised bog after approximately 25 years of industrial production. Peat production has ceased around the periphery of the bog and possibly also in areas of relatively higher levels of boulder clay within the bog.

Eventually, the peat is milled down close to the alluvial deposits and production ceases. Typically, this will happen about 50 years after commencement of industrial production. In many cases, extraction of peat will have been continued below the level that can be drained by gravity (Figure C). Therefore, pumped drainage in the later decades of peat production may be required. Surveys suggest that some 60% of the eventual cutaway area will lie below the gravity drainage level.

Following cessation of extraction, the options for lands drained by pumping are relatively limited, as it is not normally economically feasible to continue pumping. Policy has been to designate these areas as future alkaline wetlands.

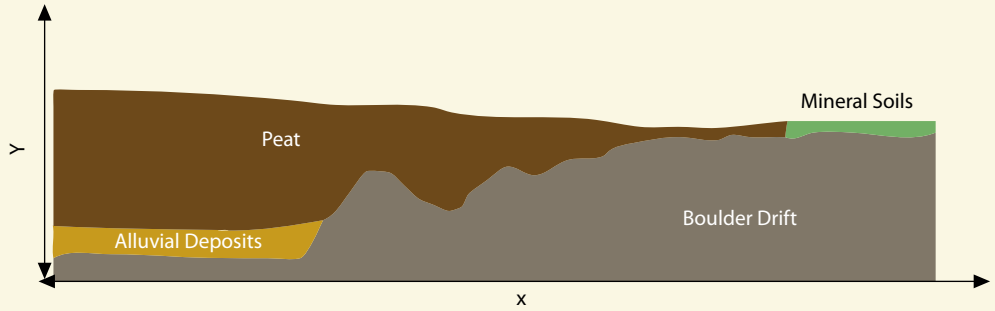


Fig. A Typical uncut raised bog (not to scale)

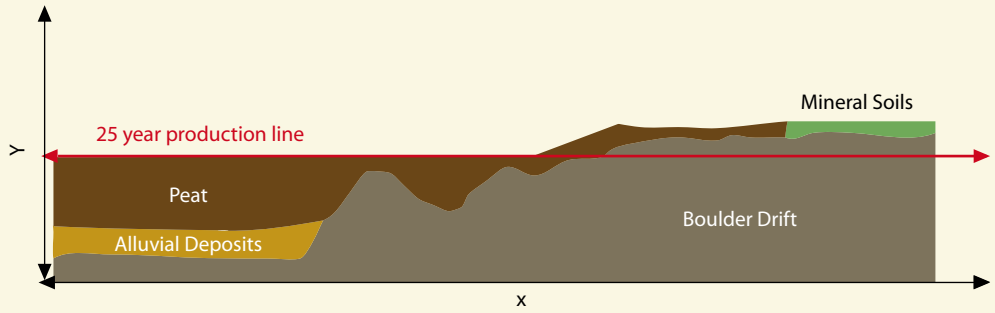


Fig. B Typical industrial raised bog after approximately 25 years production (not to scale)

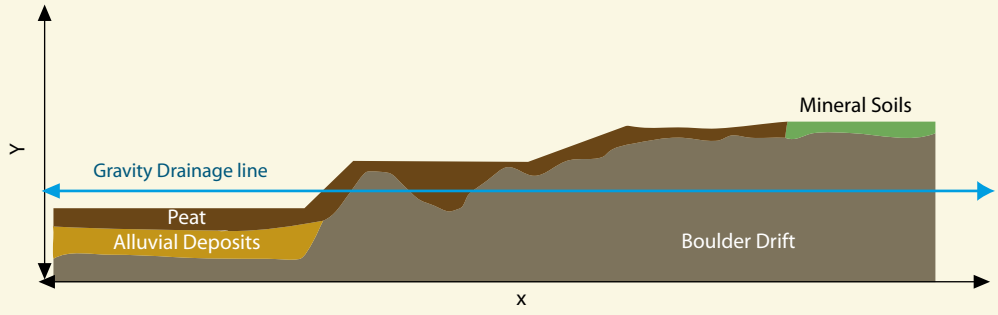


Fig. C Typical industrial raised bog following cessation of production (not to scale)

Residual Peat Variation

Contamination from the underlying boulder clay or other drift can increase the ash content of milled peat, making it unsuitable for electricity generation, and this will affect the depth of residual peat.

Decisions on the cessation of peat extraction are generally taken on a field-by-field basis. Where extraction meets an uplift in the bog floor (which could extend from a few square metres to several hectares), a decision may be taken to withdraw from production all or part of the field and this too will affect the variability of residual peat.

Residual peat depths range from zero (or practically zero) on uplifts within the bog floor to some 2-3 metres within depressions (Figure D).

Research into transforming cutaway into productive land has concentrated on the lands above the gravity drainage level. The milled peat process is not capable of leaving a uniform peat depth over the whole area. Consequently, there is considerable variation in the nature and depth of the residual peat and this, in turn, has led to varying results in the establishment of forest or other crops.

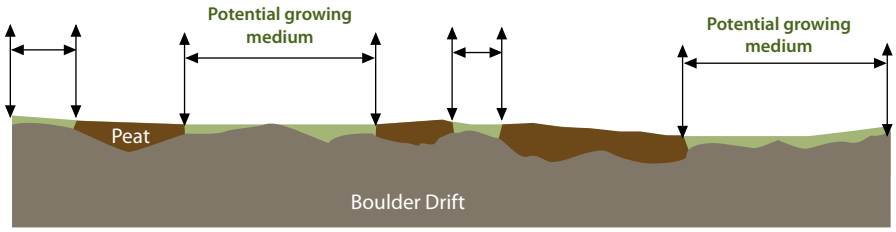
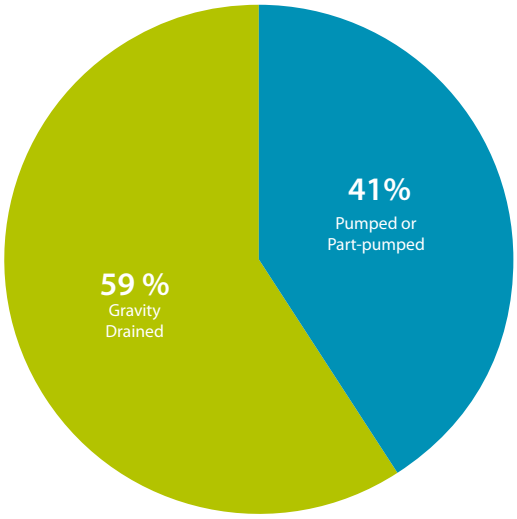
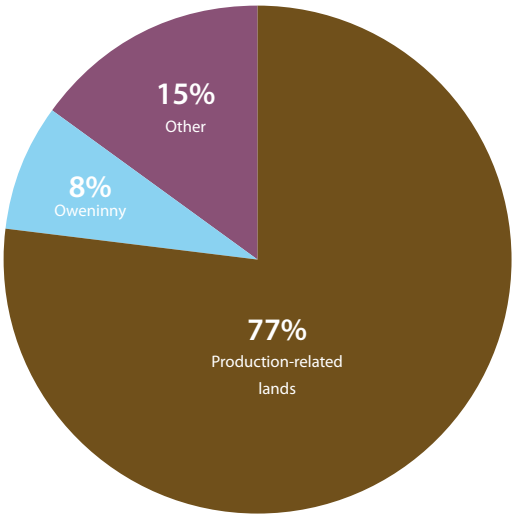


Fig. D Potential for establishing growing medium on cutaway (not to scale)



At present, some 41% of the land holding has either pumped drainage or is partially pumped. These lands will flood when pumping ceases following cessation of peat production and this has significant implications for potential long-term land-uses. Moreover, the percentage of land pumped or part-pumped will increase as peat extraction extends below the gravity drainage line on more bogs.



About three-quarters of the land bank is currently required for peat production purposes. The lands at Oweninny and other locations in Co. Mayo have ceased production and are used for wind energy and biodiversity. The other lands include some uncut bogs, cutaway devoted to forestry, the bog complex at Lough Boora, Co. Offaly, which has been developed for recreation and tourism, and lands used for other purposes such as waste management and gravel extraction.

Character of Cutaway

The principal features of cutaway may be summarised as including:

- Generally, cutaway areas are of large scale and with open topography.
- The extent of cutaway within a bog area develops gradually over time to eventually extend over the whole or a large part, of the bog area.
- Cutaway areas are characterised by complexity and by fragmentation, although many areas are linked through the network of industrial railways.
- Many cutaway areas lie below the gravity drainage line and will flood, completely or partially, when pumping ceases.
- Cutaways are living environments with significant capacity to re-vegetate naturally (though not necessarily as bogs); and
- Cutaway areas have varying depths of remaining peat, a variety of underlying soils and variability in pH and nutrient status.

Consequently, cutaway bogs are not uniform and differ significantly from areas of mineral soil. Moreover, they can vary widely over short distances.

The most significant factor affecting the potential use of cutaway is drainage. The hydrology of individual bogs can be complex and it is estimated that over half of the land bank could eventually flood.

All of these factors influence future land-use following the cessation of peat production.

Existing Land Uses

Most of the Bord na Móna bogs are currently in use, directly or indirectly, for peat production. Existing areas of cutaway are used for forestry, biodiversity, amenity, wind energy, waste management, aggregate extraction or a combination of two or more of these uses.

At present about 77% of Bord na Móna lands is required to support peat production operations.

The Boora Bog complex in Co. Offaly is one of the oldest areas of commercial production and as a result was the first large area in which large tracts of cutaway emerged. An integrated biodiversity and amenity facility has been developed at Lough Boora over recent years and the facility offers hiking, cycling, angling, birdwatching and a sculpture park as well as being home to some of Ireland's endangered flora and fauna.

Bord na Móna is the majority shareholder in Renewable Energy Ireland Ltd., which established Ireland's first commercial wind farm in 1992 at Oweninny cutaway blanket bog near Bellacorick, Co. Mayo. The Oweninny bog, on which the wind farm is located, covers 8% of the Bord na Móna landholding. The wind farm comprises 21 wind turbines, with a total installed capacity of 6.45 MW.

The company currently has plans to develop further wind farms at Mountlucas, Co. Offaly, and at Bruckana, on the borders of Counties Tipperary, Kilkenny and Laois, as well as further development at Oweninny.

Forestry plantation areas comprise about 5% of Bord na Móna lands, which are leased to Coillte. There are also established commercial developments at Drehid, Co. Kildare and Derryarkin, Co. Westmeath.

Irish forest.

Research on Potential Future Uses

Cutaway was originally seen as a promising resource with potential especially for agriculture, horticulture and forestry. Considerable research has been undertaken by Bord na Móna and other organisations and this, together with trials undertaken over many years, has shown that whilst cutaway peatlands have potential for alternative uses, there are significant technical and economic difficulties in establishing suitable growing conditions for agriculture, horticulture and forestry.

The principal alternative uses for cutaway that have been researched are outlined in Appendix 2 and include:

- **Alternative Energy - Wind**
- **Alternative Energy - Biomass**
- **Agriculture and Horticulture**
- **Forestry**
- **Biodiversity and Ecosystem Services**
- **Amenity and Tourism**

Sunset at Lough Boora.

03

BIODIVERSITY

Peatlands are an important and diverse ecosystem increasingly recognised as a vital part of the world's wetland resources.

Biodiversity Value of Peatlands

Biodiversity refers to the different forms and inter-relationships of all living things. The concept embraces both the importance of genetic diversity and the significance of ecosystems and habitats and stresses their interdependence and interconnectedness.

Many human activities, including urban development and changes in farming practices, can lead to loss of habitat and to a reduction in biodiversity, thereby upsetting the balance of nature.

Peatlands are an important and diverse ecosystem increasingly recognised as a vital part of the world's wetland resources. Pristine, untouched bogs generally have the highest biodiversity value, as well as sites with rare species.

Following cessation of industrial peat extraction, spontaneous natural re-vegetation of the land will commence. However, the plant communities that establish on cutaway bog are different from those on un-drained virgin bog. The reason for this is that cutaway is generally an alkaline medium and the plant species that become established reflect this.

In recognition of the importance of preserving representative examples of different bog types, Bord na Móna adopted the following policy in 1987:

"Bord na Móna fully recognises and accepts the need to preserve representative examples of different bog types, as well as areas of special natural beauty and significance".

Following the adoption of this policy, 6,500 hectares of peatland, including Clara, Raheenmore and Mongan Bogs in Co. Offaly and the Sheskin bog complex in Co. Mayo, were transferred to the government and this land is now managed by the National Parks and Wildlife Service (NPWS).

1. Grey Heron at Lough Boora.
2. Damselfly at Lough Boora.
3. Wild Berries at Lough Boora.

Concept of Ecosystem Services

The term 'ecosystem services' refers to the services people obtain from the natural environment and the economic and social value held by these services.

Services can be direct or indirect and include provisioning services such as food and water; regulating services such as flood control, carbon storage and water filtration; cultural services such as recreation and nature conservation; and supporting services such as nutrient cycling and dispersal.

The concept of ecosystem services is becoming more important as extensive habitat and biodiversity loss resulting from human activities has put the delivery of these natural services at risk. To this end ecosystem services are increasingly considered in land management policies and decisions.

Habitats and Species

A variety of habitats and species occur on Bord na Móna cutaway bogs. Newly formed habitats found on cutaway bog post-production fall into the following broad categories:

- Pioneer Vegetation;
- Open Water;
- Poor Fen;
- Rich Fen;
- Embryonic Peatland Communities;
- Reedbed and Tall Herb Swamps;
- Grassland;
- Dry Heathland; and
- Birch Scrub.

Rare species of flora and fauna can also occur on cutaway bogs, including species listed on Annex II of the European Union Habitats Directive (e.g. Otter and Marsh Fritillary Butterfly) and Annex I of the EU Birds Directive (e.g. Golden Plover and Kingfisher). A number of mammals including the rare Red Squirrel and a large number of butterfly species have also been recorded on Bord na Móna bogs.

Biodiversity Action Plan 2010-2015

The Bord na Móna Biodiversity Action Plan 2010-2015 sets out the commitment of the company in relation to biodiversity and outlines the specific biodiversity projects and activities that the company proposes in the medium term.

The stated objectives of the Bord na Móna Biodiversity Action Plan (2010-2015) are:

1 **Objective 1**
To continue to carry out all works in line with best practice guidelines and relevant legislation across all Bord na Móna bogs.

2 **Objective 2**
To survey and identify potential biodiversity areas within Bord na Móna bogs.

3 **Objective 3**
To promote and develop best practice in terms of rehabilitation plans for all Bord na Móna bogs to stabilise former peat production areas and enhance biodiversity.

4 **Objective 4**
To promote and develop best practice in terms of rehabilitation plans for all Bord na Móna bogs to stabilise former peat production areas and enhance biodiversity.

5 **Objective 5**
To monitor the progress of the Bord na Móna Biodiversity Action Plan.

The action plan highlights the work that has been carried out by Bord na Móna to date in assessing the biodiversity value of the landholding, in increasing understanding of how cutaway bogs rehabilitate and re-colonise following cessation of peat production.

There are extensive areas of connected peatland within the Bord na Móna landholding. These connections, many of which were put in place to facilitate the industrial railway system, have potential as wildlife corridors, facilitating the movement of flora and fauna between areas. They can also provide connections to habitats outside of the Bord na Móna lands.

Bord na Móna utilises a number of techniques to assist in the rehabilitation and management of cutaway including:

- Hydrological management;
- Planting and/or addition of fertilisers;
- Reedbed creation;
- Grazing and/or scrub clearance;
- Disturbance of substrate; and
- Woodland management.

The Lough Boora Parklands in Co. Offaly and the Oweninny Bogs in Co. Mayo are among the areas in which rehabilitation works have been carried out.

Classification

Since the 1990's, Bord na Móna has adopted a programme of enhancement of biodiversity which has become closely linked to the after-use and rehabilitation of cutaway.

A survey of the ecological baseline of the Bord na Móna bogs commenced in 2009 to ascertain the biodiversity value of each bog within the company's landholding. Bogs are given a biodiversity classification from A - E:

- A - Internationally important
- B – Nationally important
- C – High Value, locally important
- D – Moderate value, locally important
- E – Low value, locally important

It is the intention that these surveys will form the basis for management plans and for the rehabilitation plans required under the terms of the IPPC licenses held for each bog area. They will also inform decisions in respect of future development proposals.

Natura 2000 Sites

Under Article 6 of the Habitats Directive (92/43 EEC), there is a requirement to undertake an appropriate assessment of the potential impact of plans and proposed projects on sites with European conservation designation (Natura 2000 sites - Special Areas of Conservation and Special Protection Areas). Consequently, it is Bord na Móna policy that all plans and proposed projects on cutaway be screened for potential impacts on Natura 2000 sites and, where required, a full assessment will be carried out to determine the appropriateness or otherwise of the proposal in the context of the conservation status of the sites.

Bog cotton at Lough Boora.

04

FACTORS AFFECTING POTENTIAL USES

The Factors

The strategic framework for future land use on the Bord na Móna landholding takes account of a number of important considerations and factors as indicated on the diagram opposite, some of which have already been discussed.

1

1. Nature of Cutaway

As stated previously, drainage is a key issue relating to cutaway. Current estimates indicate that at least half of all cutaway peatlands will eventually flood and this, in turn, limits the potential range of future land uses that can be considered. Wetland biodiversity is the most obvious, although this could be combined with amenity and recreation and possibly wind energy.

Experience from the research programmes carried out to date indicates that the character of dry cutaway, including the physical state of the land following completion of peat harvesting and the potential to create suitable growing media, is very variable. The creation of suitable ground and growing conditions for agriculture and forestry are difficult to achieve economically.

Residual peat depths are critical and the cessation of harvesting part-way through the life of a developed bog can give rise to problems. Generally, where the remaining peat is deep, there will be fewer economically viable development options open for consideration.

Peatlands are living systems. Once peat harvesting ceases, nature quickly re-colonises the cutaway. However, the species are not generally those associated with uncut or virgin boglands and, in particular, most Sphagnum species do not normally grow on cutaway. Nevertheless, the re-colonised vegetation, and its associated fauna, has a biodiversity value that may limit or preclude economically beneficial uses in the future. The reservation of land for future uses can, therefore, be difficult.

Moreover, the character of cutaway requires that the land be remediated for most commercial uses with consequent costs.

2

2. Location and Infrastructure

Boglands, because of their character and former use, are generally located in areas that are relatively remote and peripheral. This remains the case for many areas of peatland.

However, peatland areas located close to major infrastructure such as motorways, railways and the electricity and gas grids, as well as urban areas, have clear advantages over more remote areas in terms of potential future land uses.

The relationship of lands to designated nature conservation areas, to tourism facilities and attractions and major water bodies are also significant, as is the presence or absence of rural housing in the immediate vicinity.

Peatlands located close to major transport infrastructure have relative advantages in terms of the range of potential future uses. There may, therefore, be potential at locations such as Cúil na Móna and Littleton arising from the proximity to motorways.

Certain areas of peatland are well-located in respect of the electricity and gas grids, not least because of the development of peat-fired power stations. Consequently, these peatlands have relative advantage as locations for new alternative, or even conventional, power projects.

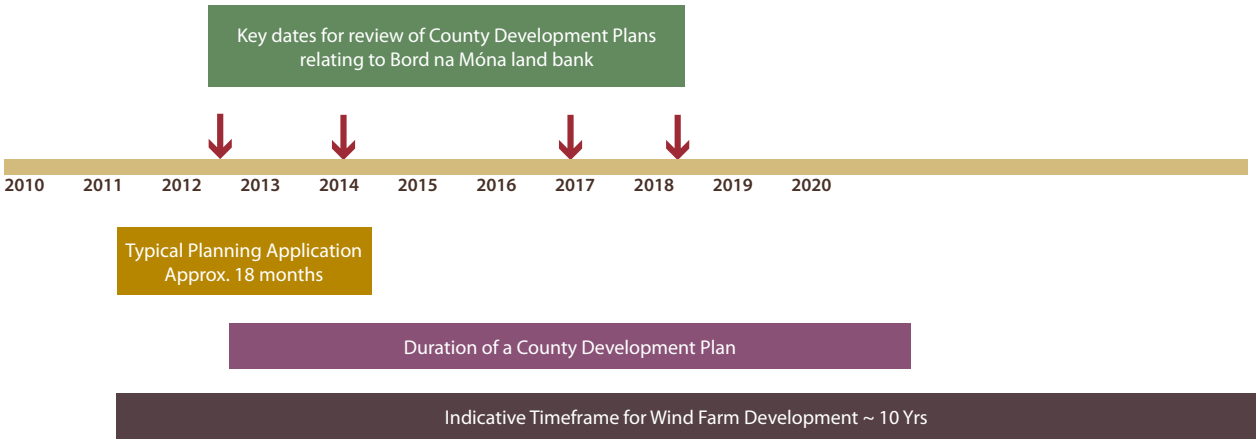
3

3. Timeframe for Peat Extraction

Whilst the peat resource could be harvested for a further 30 years or more, actual output will depend on market demand. As stated above, mid-life cessation of production on a bog will generally result in greater depths of residual peat, which may limit or preclude certain future uses.

The rate of harvesting on each bog is fixed and is significantly dependent on weather. Production can only be expanded by increasing the area of extraction, as it is not practical to increase the depth harvested each year. Consequently, it is not feasible to significantly 'speed-up' peat harvesting.

Effectively, peatlands can only be released for alternative uses on a whole bog basis, rather than individual production fields, for reasons relating to the IPPC licences as well as for physical reasons.



The timeframe for future land uses is also affected by outside factors that may impinge on decisions to be taken. For example, the objectives and policies of the relevant statutory development plans will be significant, as are the timeframes for seeking planning approval.

4

4. Economics

The peat resource of Bord na Móna and its associated land bank was acquired in the national interest and the resource has potential as a national asset.

The objective of Bord na Móna is to balance and optimise the commercial, social and environmental value of the land bank. Commercial land uses must generate a satisfactory return to Bord na Móna and the State, directly or indirectly, bearing in mind the cost of preparing the land for alternative uses.

Where future land uses have social and/or environmental value, but not commercial value, it is appropriate that a system be developed which recognises the economic value of this land and the input of Bord na Mona as managers of the land. For example, the provision of ecosystem services, such as use of the land as a carbon sink or to provide biodiversity, has value at national and/or regional level.

The cost of preparing land for alternative uses is a critical factor.

5

5. National and Regional Needs

As the population of Ireland continues to grow, so does the pressure on existing infrastructure. The potential of the Bord na Móna peatlands to meet national and regional infrastructure needs is demonstrated by the Water Supply Project for the Dublin and Midland Region which proposes to use an area of cutaway bog at Garryhinch as a reservoir for water taken from the Shannon.

Other potential needs that may be addressed include wind energy, other power generation and industry. In particular, certain cutaway areas can potentially accommodate industry, or infrastructure, with a requirement for an isolated location, for example, those covered by the 'Seveso' directive. Similarly, large tracts of land in single ownership, such as cutaway, have potential for the accommodation of industry or infrastructure that has a large land requirement.

Location, especially proximity to major roads or railways, is a critical factor in relation to potential of cutaway to accommodate infrastructure and industrial needs.

Recreation and tourism have long been seen as viable activities with which to diversify the rural economy and to create additional employment. The potential of cutaway peatland as recreation and tourism attractions has been recognised and promoted.

The Lough Boora Parklands represent a successful recreation and tourism facility developed from an area of cutaway bog. It contains a range of habitats, including birch and willow woodlands, grasslands, reedbeds, heather and moss areas, intermediate wetlands, large areas of natural re-colonisation and lakes together with parkland interpretation. Activities supported at the Lough Boora Parklands include walking, hiking, cycling, coarse angling, game fishing and birdwatching. The facility also contains a sculpture park and a mesolithic site.

6. Legislation and Regulation

Peat is harvested by Bord na Móna under the terms of Integrated Pollution Prevention and Control (IPPC) licences issued by the Environmental Protection Agency (EPA). Conditions attaching to these licences require decommissioning following termination of peat production and the implementation of a cutaway bog rehabilitation plan agreed with the EPA. The rehabilitation plan generally requires that the land be permanently left in an environmentally stable condition. This requirement, together with other practical considerations, means that lands can effectively be released for alternative uses only on a whole-bog basis .

Clearly, future land uses must conform to all relevant environmental, planning and nature conservation legislation, including as appropriate regulations relating to areas with European conservation designation, such as Special Protection Areas (SPA) and Special Areas for Conservation (SAC), as well as national designations, such as National Heritage Areas (NHA).

7. Land Use Planning Policies

Similarly, future land uses must conform to relevant planning policies at national, regional and local levels.

Currently, the development plans of most of the pertinent planning authorities envisage use of cutaway for tourism and amenity, wind energy (and biomass energy) and biodiversity. However, there is little recognition of the potential for other uses.

The principles of good planning generally direct industrial and similar uses to urban areas. This effectively limits the use of Bord na Móna lands to rural activities, together with certain specific types of infrastructure and industry, as discussed above. However, planning policies should recognise the specific requirements of those types of industry and infrastructure that are unsuited for location in urban areas and the role that cutaway peatland can play in meeting these requirements.

8. Local Considerations

In addition to the wider national and regional issues, regard must be had to local considerations. These include local community demands, often for recreation and amenity, requests for small areas of land for various uses (which need careful consideration to avoid adversely affecting the integrity of the overall land holding), boundary management and trespass issues, the impact of actions on neighbouring properties and political and employment issues.

05

LAND USE FRAMEWORK

The cutaway bogs of Bord na Móna are a land resource of national significance that offer a range of opportunities and options for alternative uses.

The Potential

The cutaway bogs of Bord na Móna are a land resource of national significance that offer a range of opportunities and options for alternative uses. The resource is, however, complex, for the reasons discussed in Chapters 2, 3 and 4, and the options require to be considered on a bog-by-bog basis, bearing in mind also the considerable internal variation within bogs.

The difficulties in establishing suitable growing media limit or preclude the use of cutaway for agriculture, horticulture and forestry, which were at one time anticipated as the most likely use of the lands.

For these, as well as economic reasons, it is unlikely that forestry and agriculture will account for more than about 10-15% of the total land bank. However, these difficulties do not generally affect the potential of the land bank for wind energy, infrastructure or industrial use or for their biodiversity value.

The land resource was assembled in the national interest, including the potential to support balanced regional development. Consequently, the potential of cutaway to meet national and/or regional needs should be a priority consideration in determining future land uses. The proposed Water Supply Project for the Dublin and Midland Region, which utilises cutaway at Garryhinch, represents an example of how peatlands can be used to meet such a need.

Wind energy is another potential use of national significance that is well-suited to areas of cutaway, with their large land parcels, open topography, suitable wind speeds, relative remoteness from major residential areas and, in many cases, relatively good access to the electricity grid. Cutaway, even where flooded, has many comparative advantages over other potential wind energy sites, including off-shore areas.

A significant proportion of the land bank could therefore accommodate additional wind energy infrastructure, the extent of which is more dependent on the domestic and export market for electricity and national energy policy than on the physical character of the cutaway. It may also be possible to integrate wind energy generation on cutaway with biomass and/or conventional electricity generation to create 'clean energy hubs' in the midlands, supplying power to the United Kingdom and Europe as well as to the domestic market.

Wind Turbines at Oweninny Wind Farm.

About 9% of the land bank is already committed to wind energy use, including the existing wind farm at Oweninny and areas such as Mountlucas where planning and grid connection consents are being pursued. Ultimately, the proportion of the land bank accommodating wind energy infrastructure could be one-third or even one-half of the total area.

Whilst physically, cutaway could accommodate a wide range of infrastructural and industrial uses, it is recognised that good planning practice is to direct industrial and commercial development to urban areas where a workforce and supporting services are available. Nevertheless, there are certain industries that are not suited to, or cannot readily be accommodated in or immediately adjacent to, urban areas. These include:

- Industries with a requirement for large areas of land;
- Industries that require relatively isolated locations, such as those covered by Directive 1996/82/E.C. (Control of Major Accident Hazards Involving Dangerous Substances), commonly known as 'Seveso' industries; and/or
- Industries with a specific location requirement relative to road and rail networks.

Cutaway peatlands can meet these specific requirements and, particularly for strategic industries or infrastructure, cutaway represents a better long-term use of land than highly productive mineral soils. In this regard, consideration will be given to identifying appropriate areas of cutaway that could be suitable for strategic industry which could be developed to support national and regional development.

It is recognised that only a proportion of the land bank will have potential for industrial and similar beneficial uses. This potential is greatest at locations where the land bank coincides with major infrastructure, such as at Coolnamona in relation to transport or near existing or former power stations, such as Shannonbridge, in relation to energy.

Cutaway peatlands have potential to support tourism and recreation activities, as evidenced by the development of the Lough Boora Parklands. However, such facilities need to be concentrated in one or two locations to be effective, although it may be possible to accommodate smaller, community-based schemes, principally for local recreational use, at other locations. It is estimated that approximately 7% of the overall land bank may be designated specifically for tourism and amenity uses in the future, including the further development of the Lough Boora Parklands.

Biodiversity is important in relation to all peatlands and provides a contribution to wealth and health through ecosystem services. It consequently has economic as well as environmental value. Current estimates indicate that about a quarter of the entire landholding will be dedicated to high value biodiversity and ecosystem services, whilst lands used for other purposes, such as wind energy, may also have significant biodiversity value.

It may be noted that some level of remediation, rehabilitation and/or development is required for all future land uses on bogs owned by Bord na Móna, including use for biodiversity, and this has cost implications.

It may also be noted that it is currently estimated that over half of the landholding will flood but much of this flooded land will have potential for wind energy and other uses, in addition to its biodiversity value.

Co-location

Many of the options are compatible and can be co-located. For example, depending on local conditions, it may be possible to co-locate wind energy, water storage or management, amenity and biodiversity. This capacity has been demonstrated at Oweninny and Lough Boora, whilst the Water Supply Project for the Dublin and Midland Region proposes that the lands at Garryhinch be used for amenity as well as water storage.

Successful co-location depends on several factors including:

- Environmental designations;
- Site context; and
- Access or proximity to roads and infrastructure.

National and Local Policy

At present, there is no national high-level government policy or guidance for the future use of cutaway. However, many of the relevant regional and local authorities recognise the potential of cutaway and include objectives and policies for long-term use in regional planning guidelines and development plans. These, however, are not consistent and do not generally take account of the full range of potential uses and the scope for co-location.

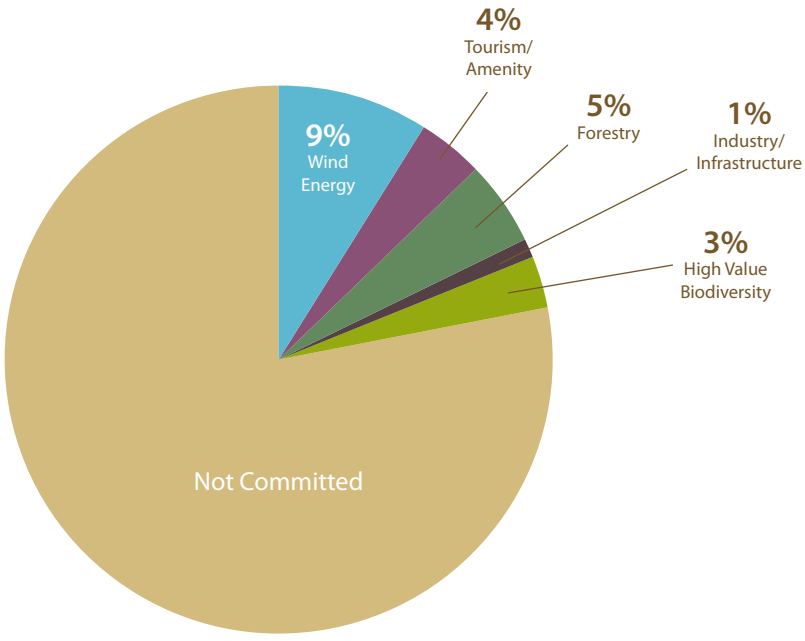
Committed Future Uses

Over one-fifth of the total landholding is already committed to future uses that include wind energy; forestry (land leased to Coillte); tourism and amenity, as with the Lough Boora Parklands; industry and infrastructure including waste management and recovery, aggregate production and water storage (as part of the Water Supply Project for the Dublin and Midland Region). In addition, certain bogs have been conserved for their high biodiversity value.

Management Plans

It is the intention of Bord na Móna to continuously assess and evaluate the potential of the company's land bank, using the Land Use Review System, which incorporates the extensive data held on the company's geographical information system.

The assessment will inform the preparation of a set of knowledge-based management plans for the various areas of peatland, which will identify appropriate, compatible and sustainable uses and which, in turn, will inform the cutaway bogs rehabilitation plans required under the terms of the IPPC licences.



This chart shows the range of uses already committed on cutaway. This totals over one-fifth of the entire land holding.

Principles

In considering the potential of the remainder of the land bank for a variety of appropriate and sustainable future land uses, Bord na Móna will have regard to all of the issues discussed above, including the limitations of the physical nature of cutaway and other peatland areas, and to the following principles:

- Future land use on cutaway and other areas of the company's peatlands will accord with the overall vision of Bord na Móna -*'A New Contract with Nature'* - and with the company's mission statement and its Carbon Management Strategy.
- A balanced approach in accordance with the principles of sustainability in the context of knowledge-based Management Plans will be applied to all cutaway and other peatland areas.
- No new undrained bogs will be opened for peat production.
- The continuation of commercial peat production activities to meet market demand.
- International, national and regional needs for renewable energy, infrastructure, strategic industry, strategic national reserves and other key land uses will have a high priority.
- Consideration of potential future land uses will have regard to the commercial benefits to Bord na Móna and the State.
- The impact on biodiversity value and the potential to aid the achievement of national biodiversity targets will be critical issues in the consideration of potential future land uses.
- Lands identified as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land uses.
- Where compatible and appropriate, suitable land uses will be co-located.
- Cutaway that floods naturally will generally be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- Over the entire land bank, the company will seek to balance and optimise commercial, social and environmental value.

Indicative Future Land Uses

At this point in time, it is impossible to say with certainty what the eventual future land use of much of the cutaway and other Bord na Móna peatlands will be. As stated above, the company has established a Land Use Review System to assist in the on-going task of assessing and evaluating the best potential uses.

An initial bog-by-bog appraisal of the land bank, using the Land Use Review System, indicates the primary potential of the resource as:

- About a quarter of the overall land bank has already been committed (see pie chart on page 36).
- About a third of the remaining lands will be devoted to biodiversity and ecosystem services, bringing the total to about a quarter of the overall lands. A considerable proportion of this will be wetlands. In addition, considerable biodiversity value will remain on lands allocated to other land uses.
- Wind energy could account for about a third of the remaining lands and about the same proportion overall. However, the percentage devoted to wind energy could be considerably greater (or less) depending on domestic and export market demand and on national energy policy. Wind energy is very suitable for co-location with other land uses.
- About 12% of the remaining land has potential for the accommodation of industry and/or infrastructure. However, only a part of this is likely to be realisable for a variety of reasons, including planning policy and market demand. A 12% share of the overall land bank is in excess of 9,000 hectares. If this were reduced by other factors i.e. to 5%, it would still represent over 4,000, which is a considerable land resource.
- Forestry/agriculture could account for 10-15% while tourism/amenity may ultimately account for about 7% of the overall land bank.

It should be noted that this refers to primary potential and that many of the land use options are compatible and can be co-located.

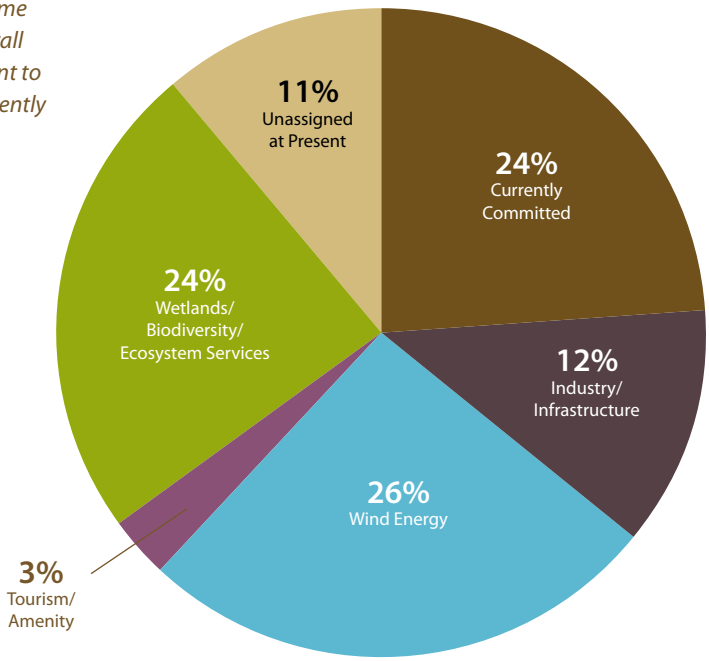
Key Actions

It is the intention of Bord na Móna to actively pursue the potential of the land bank as this potential is identified and confirmed through the Land Use Review System and other activities.

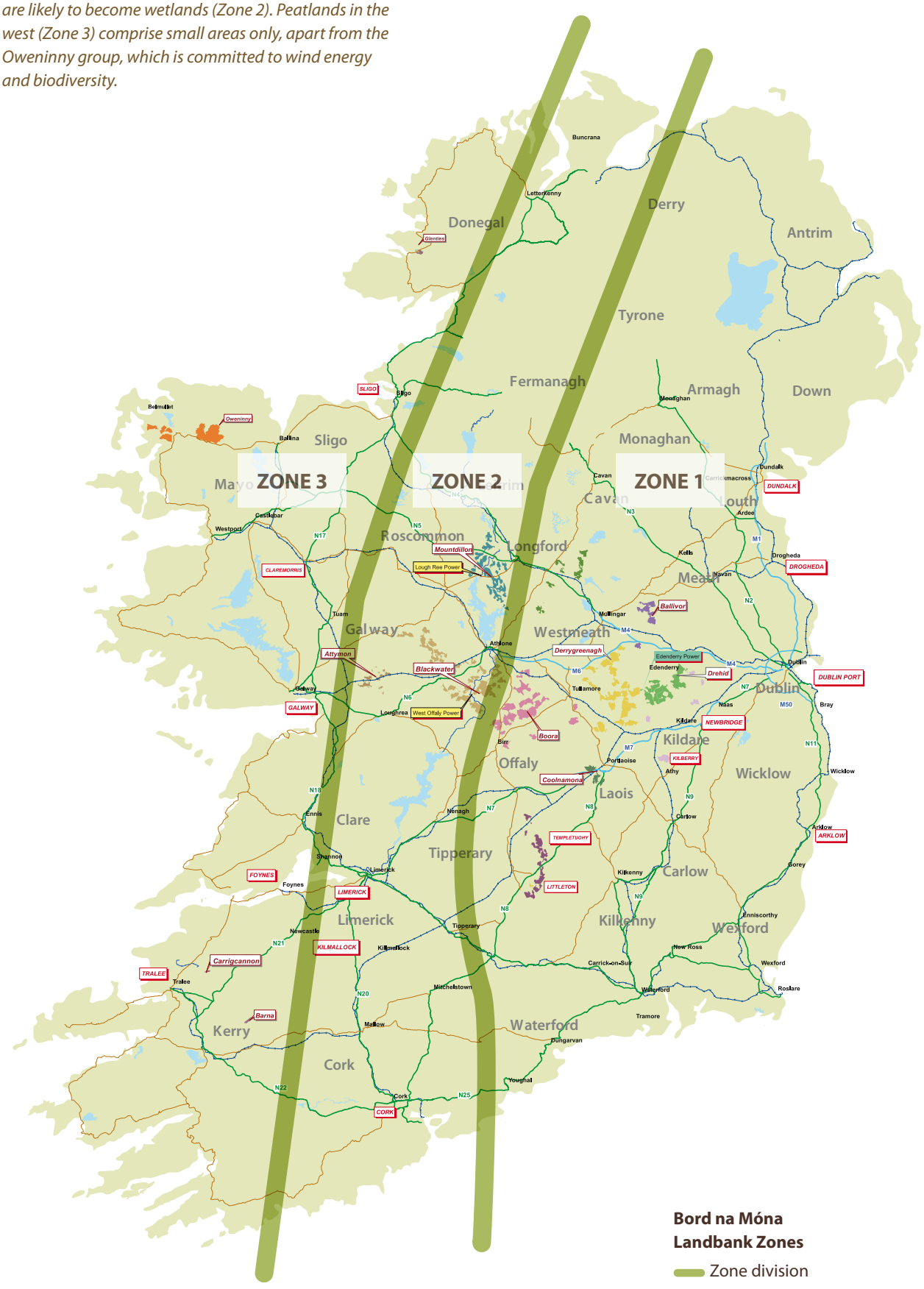
In furtherance of this intention, the company will implement a number of key actions including:

- Promotion of the Strategic Framework to relevant government departments, national agencies, regional and local authorities and other stakeholders.
- Continue assessment and evaluation of the company's land bank, using the Land Use Review System.
- Participate actively in the development of national policies and the role that peat production and cutaway peatlands can play in this regard.
- Preparation of knowledge-based Management Plans to detail potential future land uses, the actions required to facilitate such uses and to inform the rehabilitation plans required under conditions of the IPPC licences.
- Dialogue with the Environmental Protection Agency on the rehabilitation of peatlands in the context of the Strategic Framework and the Management Plans.
- Monitoring of regional and local development plans and local area plans and the making of submissions in respect of their review.
- Promotion of the concept of ecosystem services, their economic benefits and the need to establish their monetary value.
- Investigation of the longer-term implications of the land bank in terms of possible liabilities for the company.

This chart illustrates the INDICATIVE primary potential of the remaining peatlands (i.e. those not currently committed). The percentage devoted to wind energy could be considerably greater (or less) depending on national energy policy. The 12% indicated for industry and amenity represents POTENTIAL, of which only a part will be realisable for a variety of reasons, including market demand. The 12% represents over 9,000 hectares. Some peatland areas, covering about one tenth of the overall land bank, require additional analysis and assessment to identify the most appropriate potential and consequently are unassigned at present.



Generally, the peatlands with the greatest range of potential and the greatest capacity for sustainable multiple uses lie in the east of the country (Zone 1), partly because of their gravity drainage, whilst those along the Shannon are likely to become wetlands (Zone 2). Peatlands in the west (Zone 3) comprise small areas only, apart from the Oweninny group, which is committed to wind energy and biodiversity.



Bord na Móna Landbank Zones

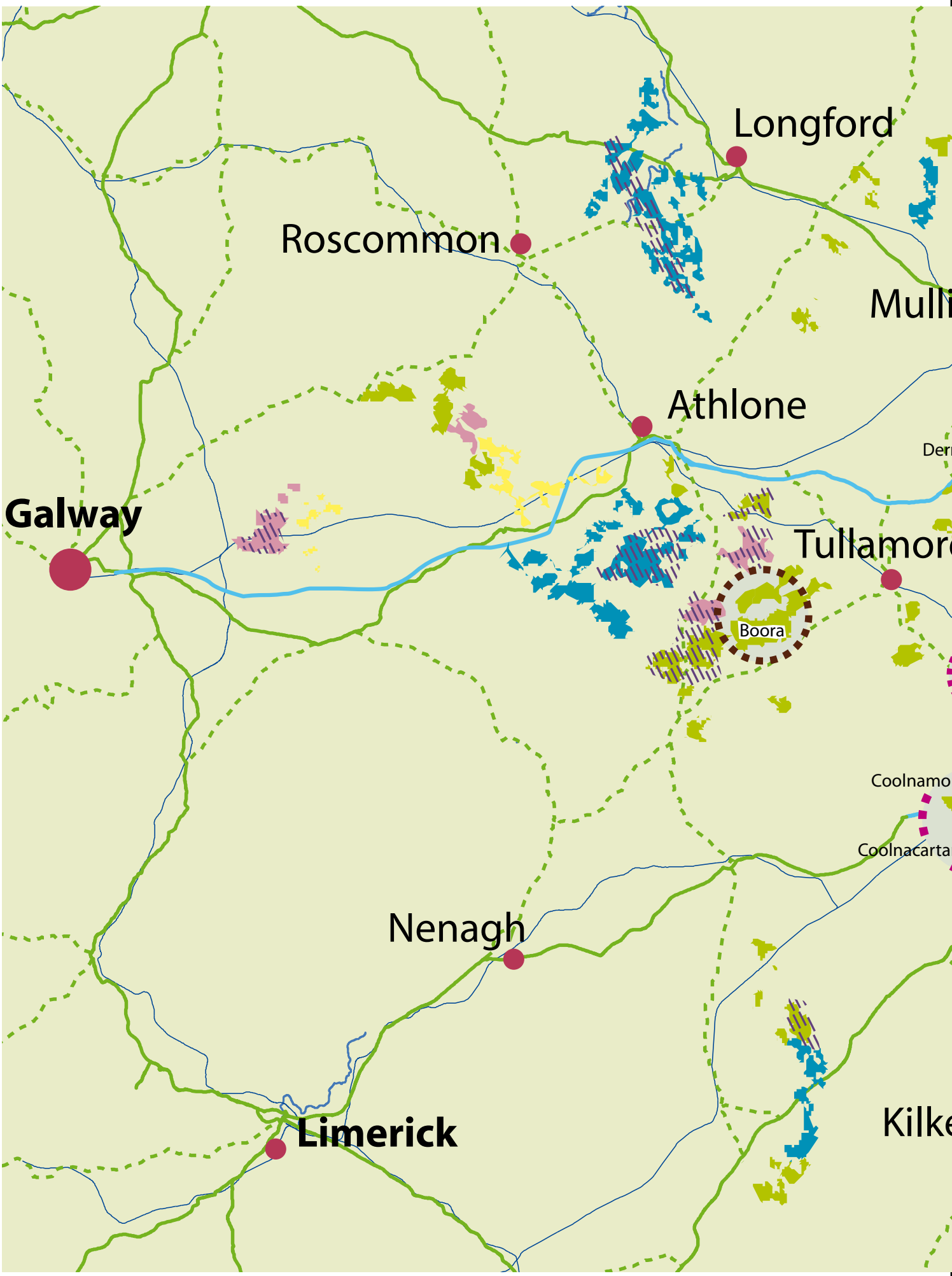
Zone division

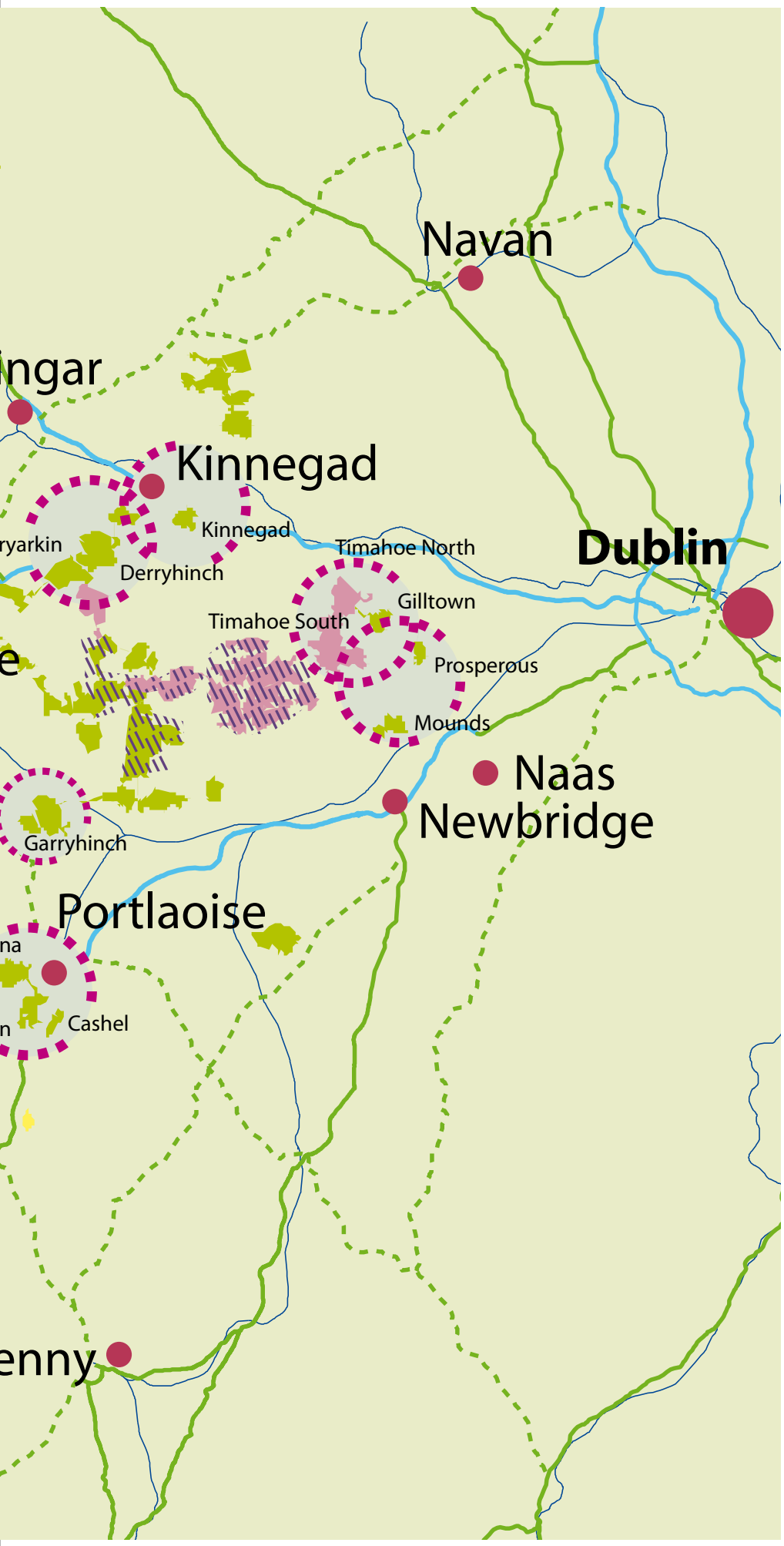
5762 Landbank zones 2010-10-06

'60 Degrees' by Kevin O'Dwyer at Lough Boora sculpture park – a series of triangles made from disussed railway tracks, sleepers and steel which interact with each other by using the movements of the sun throughout the day.

INDICATIVE Zones of potential in the midlands area

See overleaf a more detailed map of indicative zones of potential in the midlands area, as currently identified.


Longford
Roscommon
Athlone
Galway
Tullamore
Boora
Coolnamo
Coolnacarta
Nenagh
Limerick
Kilke



INDICATIVE
Zones of potential in the midlands area

Indicative zones of potential in the midlands area, as currently identified.

These will be reviewed and assessed using the Land Use Review System before final decisions are taken on their future.

Industrial/ infrastructure potential

Tourism potential

Wind energy potential

High value biodiversity

Gravity drained

Part pumped

Pumped

APPENDIX 1
LAND USE REVIEW SYSTEM

Bord na Móna has an existing Geographical Information System (GIS) that informs the management of its extensive land bank. The system contains, or is linked to, a wide range of data sets covering a broad spectrum of relevant information.

The GIS, together with its data sets, provides an excellent tool for the on-going review of potential future land uses and forms the basis of the technical Land Use Review System that has now been established. Additional relevant data sets, including information relating to recreation and tourism as well as the relationships of bogs to settlements and infrastructure, have been added to the system.

The Land Use Review System draws on the information available in the GIS to inform the systematic assessment and review of the potential of the land bank on a bog-by-bog basis. A first run of this system has been undertaken to inform the strategic framework.

The assessment fields are listed below.

Bog Info:	BSM Bog ID BNM Bog No. BNM Bog Name BNM Bog group County IPPC Licence no. Area in hectares (as per GIS system) Works/buildings
Electricity network:	within 1 km within 5 km Distance to (km)
Gas network:	within 1 km within 5 km Distance to (km)
Wind:	Speed Local authority wind strategy policy
Planning Context:	
Transport/access:	
Settlement:	
Archaeological Features:	
Main land use:	Type Area
Other land use:	Type Area

Cutaway %:		
Drainage:	Gravity Pumped Part pumped	
Biodiversity:	Current value Features Links	
General Bog comments:		
Projected:	Extraction cessation Drainage Biodiversity Value Main habitats	
Potential:	Infrastructure:	Value Comment
	Wind Farm:	Value Comment
	Tourism/Amenity:	Value Com-
ment		
	Other:	Value Comment
Summary:		
Primary Land Use Potential:		

APPENDIX 2
RESEARCH ON CUTAWAY

Opportunity

When peat production ceases Bord na Móna will be presented with the opportunity to create new landscapes from its cutaway bogs. These landscapes can bring socio-economic and environmental benefits at local, regional and national level.

There are a variety of future land use options open for consideration, which must be considered in the context of a complex set of factors.

The following paragraphs show how the initial perceptions as to the future use of cutaway peatlands were fully tested. It helps to show how the technical knowledge base evolved and how the most appropriate options for the future of the cutaway peatland landscape emerged.

Background

Within a few years of the establishment of Bord na Móna, research began into the uses which might be appropriate for the new landscapes. There was a belief that cutaway offered the opportunity to create "new lands" suitable for agricultural, horticultural and forestry use. The initial results from the original sites selected for the research were very positive and this heightened expectations leading to debates as to whether it was best to leave the peat in situ as a growing medium for horticulture and forestry, or use the peat as a source of fuel for electricity generation. The impact of the international fuel crises of the nineteen-seventies on Ireland's energy resources gave priority to the use of peat for fuel purposes, as this offered security of national supply. Consequently, most of the lands that would eventually become available for alternative uses were stripped of as much of the peat overlay as economically possible.

During the nineteen-seventies and eighties, research work was augmented by the development of demonstration-scale ventures into horticulture, grassland farming with beef and cereal growing. Equally, coniferous forestry and short rotation coppice for energy purposes were developed to the demonstration level.

The following synopsises the key issues that emerged for each of the above uses. These issues are framed in the context of a much clearer understanding of the nature of industrial peatlands and the knowledge base that built up over the decades.

Alternative Energy – Wind

Ireland has one of the best wind regimes in Europe and while coastal regions and elevated areas have the best domestic resource, the wind regime in the midlands is still very good in comparison with many parts of Europe.

Cutaway peatlands can provide excellent sites for the erection of wind farms. In general terms, peatlands are wide, flat and open with little or nothing to impede wind flows. In addition, the isolated location of many peatlands, away from population clusters and existing houses, enhances their suitability. The large scale of many peatlands allows them to

visually absorb wind turbines without a major impact on the receiving landscape. Peatlands, with appropriate wind speed levels, that are in close proximity to the electricity grid are prime candidates for windfarm development. In addition to windfarms it is also possible, depending on site specific issues, to accommodate complementary uses such as grasslands or wetlands to support biodiversity and/or tourism amenity uses.

Oweninny bog was developed as a wind farm by Bord na Móna together with a group of developers in 1991. At that time 24 wind turbines were installed on the Bord na Móna lands. Further to this, in 2003, planning permission was granted for a further 320MW wind farm at Oweninny, which when constructed, will be one of the largest wind farms in Europe.

Bord na Móna is currently developing a number of wind farms to meet domestic demand and which contribute to the achievement of national targets for electricity from renewable sources.

There is a strong drive by the European Union to integrate electricity markets across Europe and it has set a target of 20% of electricity to come from renewable sources by 2020, with each member state having its own specific target. Increased physical interconnection between electricity systems in the various countries is required to achieve this. The development of the East-West interconnector between Ireland and the UK is one such example.

Ireland's good wind resource gives it a comparative advantage over many other parts of Europe and presents an opportunity to develop wind farms that can focus on export potential. In addition to wind-generated and other renewable electricity, there may also be an opportunity to export electricity from conventional generating stations. Bord na Móna is currently co-firing the Edenderry Power Station with biomass and has secured planning permission for a c.600 MW capacity gas-fired generation development in the midlands. These existing and planned developments, combined with the potential for large scale clustered wind farms possibly together with other generation technologies, provide an opportunity to develop 'clean energy hubs' in the midlands, which could export power to the UK and European markets. Appropriate interconnection infrastructure would be required to provide access to these export markets.

Proposals for wind farm development will have to comply with the policies and objectives of their relevant county development plans and any wind strategies for their relevant location, as well as environmental assessment, including appropriate assessment under the Natura 2000 legislation.

Alternative Energy – Biomass

It was envisaged that the peatlands could be retained for energy production by establishing short rotation forestry over areas of industrial cutaways. However, plantations of willow species that were established in the nineteen-seventies directly on cutaway, without intrusive conversion of the growing medium, did not survive and died out within a few years. A further trial plantation established in 2005 on well-prepared cutaway, while initially showing promise, failed to provide the necessary yield to make the growing of willow biomass viable. The yield was less than 20% of the yield attainable on good arable land.

Coniferous Forestry

Afforestation was initially envisaged as the most favourable option for the after-use of post-production cutaway bogs. As early as 1955, experiments on the use of cutaway for forestry were carried out at Clonsast, Co. Kildare. These initial experiments yielded optimistic results and on foot of these results in the nineteen-eighties, Coillte leased approx 4000 hectares of cutaway for the growth of forestry.

This area was planted with Sitka Spruce and Lodgepole Pine. However, a survey carried out of this crop in the 1990's showed a disappointing growing performance. Differing depths of peat, underlying soils, pH levels, microclimates and frost and drainage issues impacted on the success rate of these forestry programmes. In addition, tree growth is affected by the fact that the peat remaining after the milling process is quite dense, having been compacted for thousands of years under several metres of peat and then for many seasons under heavy machinery.

On foot of these results, the BOGFOR research programme was set up in 1996 by a group of organisations including Bord na Móna, Coillte, Coford and UCD. The aim of the programme was to focus on the specific problems related to the afforestation of milled-cutaway peatlands. The programme investigated a range of issues such as cultivation methods, species selection, drainage and vegetation control as well as soil characteristics and climatic limitations.

The findings of the BOGFOR programme indicated that careful selection and preparation of sites, together with proper selection of species, is necessary in order to successfully produce commercial forest crops on cutaway. Afforestation trials have been carried out at ten sites over the past decade. Each site recorded a proportion of successful establishment and growth but no site showed 100% success. The first commercial plantation of Norway Spruce following the use of a bedding plough as a means of preparing a growing medium was planted in 2010. Results to date are positive.

Several other factors must be taken into consideration in relation to the siting of forestry programmes. Forestry can have a major visual impact on the landscape and can also impact upon biodiversity. In addition, drainage, aerial fertilisation and clearfelling directly impact on surface water quality. The release of carbon from the peat as a result of ground preparation is also likely to be a factor in the initial years. Any proposed forestry that is likely to have significant impacts on the environment requires Environmental Impact Assessment prior to being permitted. In addition any proposed forestry in excess of 50 hectares is required to seek planning permission.

Horticulture

A range of field vegetables was successfully grown at research scale in Lullymore from the mid-nineteen-sixties to well into the seventies. This research did not, however, transfer to other demonstration sites and the reasons for this were initially not fully understood. The peat type (layered woody fen) which comprised the growing medium at Lullymore was rather unique and could not be replicated at other sites.

Grassland

During the nineteen-seventies and eighties, the techniques to convert cutaway into sustainable quality grasslands were developed. It basically involves the deep ploughing of the residual peat and the mixing of it with 10-15cm of the underlying soils. This was successfully accomplished across 1,500 hectares of cutaway at a number of locations. These lands, which were sold on to the private sector, continue to be successfully farmed today.
It is important to understand that the criteria necessary for the successful conversion of cutaway to grassland (gravity drainage, peat depth of 30cm-1m, developed boulder till subsoil with low stone content) are only available on a very small percentage of emerging cutaway, estimated at 10% or approximately 8-10,000 hectares. While the technical conversion to sustainable grassland is possible, the economic viability of doing so at the present time is questionable because, in addition to the cost of the actual conversion of the growing medium, the cost of the installation of the necessary infrastructure of roads, buildings, etc. has also to be incurred. Consequently, in the short term, it is not envisaged that cutaway will be converted to agricultural use and the decision for the longer term is dependent on the economic circumstances that prevail in the future.

Cereal Growing

Unlike grassland, where the crop is used in the vegetative state, the growing of cereals has proven to be much more technically problematic. This is because cereals go on to the inflorescence stage where a balanced availability of macro and micro nutrients is critical. Cereal growing on cutaway industrial peat lands is not recommended.

Cranberries and Blueberries

Both these crops require acidic media for their growth and were therefore trialled on deep acidic peat. While the cranberries were successfully established, the lack of severe winter frosts meant the plants did not go through the necessary vernalisation which would cause the conversion of the buds into fruiting rather than vegetative growth. It was very noticeable that the crop yield after the winter of 2009-10 was significantly up on yield over the previous decade. On the other hand, late spring frosts, prevalent on midland bogs, were detrimental to the fruiting buds of blueberries. Neither cranberries nor blueberries can be deemed as viable options.

Biodiversity and Ecosystem Services

As research continued into the technical parameters necessary for the successful development of grassland and forestry, it became evident that substantial areas of cutaway would not meet these criteria and that alternative uses would have to be found. At the end of peat extraction, substantial areas, up to 50% of the total industrial cutaway land area, will be below the winter flood level of the surrounding arterial drainage. Small areas of these lands began to emerge from peat production by the late nineteen-eighties and it was evident that these areas were attractive to winter migrating wild bird species, especially Whooper Swans, Teal and Wigeon.

It was therefore decided to reverse previous drainage at the Turraun bog site in Co. Offaly and to retain it as a permanent wetland area. When this was done, both the flora and fauna numbers and their diversity began to increase and the first surveys of both were initiated. Over the two decades that have passed since the original reversal, the Turraun site has matured and stabilised. By the mid-nineteen-nineties, a particular challenge faced Bord na Móna as peat production was about to cease on 6,500 Hectares of industrial blanket bog in North West Mayo. Because of the nature of the peat type and the sloping landscape, peat stabilisation was a major challenge. Following five-years of intensive research and monitoring, a system of drain blocking was developed. This was implemented over a two year period from 2004 to 2006 over the total site. By the end of 2010, over 85% of the former industrial peatlands were colonised with pioneering vegetation and sphagnum species have begun to proliferate. Recent measurements of the carbon flux at this site indicate a positive net flux. Bord na Móna has funded third-level research on Carbon emissions from Cutaway bogs and this work will continue with a view to achieving a better understanding of this complex issue.

Amenity and Tourism

Significant work has been carried out at Lough Boora Parklands in Co. Offaly to develop the cutaway bogs into an amenity of local and regional importance. Recently a feasability study was completed to assess the potential to develop an Ecotourism destination at Lough Boora.

Little Egret at Lough Boora.

Bord na Móna
Main Street
Newbridge
Co. Kildare
www.bnm.ie

BORD NA MÓNA