Lochar Mosses
Socio-Economic Appraisal

Report for Southern Uplands Partnership

Second Draft
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1. Introduction

The Lochar Mosses undoubtedly represent one of the great raised mire complexes surviving in Britain today. The persistence of raised mire vegetation, despite almost 35 years of plantation forestry, and the rapid response shown by these remnant patches of vegetation now that forest cover has been removed, suggests that the hydrology of these areas remains fundamentally sound. There seems every reason to believe, on the basis of present evidence, that a thriving mire vegetation could be restored on the site within 30 years. As such, the Lochar Mosses would then represent one of the finest surviving raised mire complexes in western Europe.

Lindsay RA & Freeman J (2006) The Lochar Mosses: Present Condition and Future Potential

1.1 The Report

This Report is the second draft of the socio-economic appraisal of the possible impacts of the restoration of the Lochar Mosses, an area of raised mire to the south west of Dumfries. It forms the first component of the study, which will also comprise a Masterplan for implementation of the project. In addition, a brief review of comparator projects has been undertaken, which is included as an Annex.

The report is based on a review of documentation and interviews with key actors in the area. There remain some further information and clarifications to be made. In addition, maps of the area are being prepared to inform the development of the Masterplan.

This draft Report is presented for comment and amendment.

1.2 Lochar Mosses

The area described as Lochar Mosses for the purposes of this study comprises four areas that were formerly part of an integral raised mire stretching from the Solway to the north of the town of Dumfries. They comprise (south to north):

- Longbridge Muir/Black Grain Plantation/Cockpool Moss;
- Ironhirst Moss;
- Racks Moss;
- Craigs Moss.

The area is so-called as the Lochar Water runs through the Mosses. It excludes the area to the North West of Dumfries rather confusingly known as Lochar Moss, which used to be contiguous to this complex.

Like many other peatlands in Scotland, for the past four decades the area has been used for commercial forestry. The exception to this is part of Longbridge Muir, a Site of Special Scientific Interest, which was not afforested, and a neighbouring part that was cleared with the support of the EU's LIFE programme in 2002/3.

The Mosses were the subject of a 2006 study[1] (Lindsay and Freeman (2006)) that indicated both the environmental importance of the site and its capability for restoration.

1.3 The Study

The current study has been commissioned by the Southern Uplands Partnership (SUP) on behalf of the Lochar Mosses Wetland Restoration Project, which include participation from Scottish Natural Heritage (SNH) and Forestry Commission Scotland (FCS).

The rationale for the study is summarised in **Figure 1.1** below. It is intended to be a milestone in the development of what is potentially a very significant project at a European level.

Figure 1.1: Study Rationale

Activity	Objective	Output	Outcome
Socio-economic study	Establish evidence base	A report that puts forward the business case	A rationale for taking the project forward
Masterplan	Delivery plans and mechanisms	An action plan for stakeholders to implement	A clear route forward to implementation

The remainder of this Report comprises:

- A brief description of the complex and issues involved;
- An appraisal model;
- An initial assessment of potential benefits arising from restoration; and
- A review of issues and challenges.

[1] Lindsay RA & Freeman J, 2006 The Lochar Mosses: Present Condition and Future Potential University of East London

2. The Lochar Mosses

2.1 Introduction

It is not the purpose of this report to undertake a technical assessment of the Lochar Mosses. This was very comprehensively undertaken by Lindsay and Freeman (2006) that provides the base assessment for the project development. However, for context, it is necessary to provide a very brief review of the issues and area.

2.2 Peatland Restoration

A peatland can be defined as an area with a layer of naturally accumulated organic material (peat) of at least 30cm in thickness at the surface (excluding the plant layer), which consists of at least 30% organic material by dry weight. Peat originates due to water saturation. Peat soil is either saturated with water for long periods or (artificially) drained[2].

Recent years have seen significant interest in the ways in which peatlands are managed, moving on from the drainage approaches that were common in the 1960s and 1970s. It is now recognised that important environmental benefits can accrue from leaving them in their natural state, and there is a general assumption against the draining and exploitation of historic peatlands, in recognition of their role as environmental asset, habitat and carbon store[3].

In particular, with increased international interest in climate change mitigation and greenhouse gas (GHG) emissions, the role of peatlands as carbon store has become an important consideration. Peatlands are the largest single store of carbon in the UK, and it has been estimated that they store three billion tonnes of carbon, which is more than the forests of Britain and France combined[4]. The recent Cancun Summit[5] acknowledged this role, and for the first time recognised that carbon savings from peatland restoration could be included alongside forestry planting in helping meet emissions reduction targets[6]

However, while there is topical focus on GHG, there are other potential benefits, in:

- **environmental** terms, in supporting diversity in plant and animal species and in meeting Habitats Directive[7] targets; and
- **social** terms, in encouraging participation in supporting, and understanding of, the natural environment; and
- **economic** terms, in contributing to the development of existing businesses and visitor attractions in the area, and in the potential creation of new activities.

The mire complex that is represented in Lochar Mosses therefore has the potential to be managed to deliver wider socio-economic benefits for the locality.

[2] http://v-c-s.org/docs/VCS-Program-PRC-Public-Consultation-Document.pdf (accessed 17 Jan 2011)
[3] http://www.mirewiseuse.com/ (accessed 17 Jan 2011)
[4] www.yorkshiredales.org.uk/28july09peatpartnership.doc (accessed 17 Jan 2011)
[5] http://unfccc.int/2860.php (accessed 17 Jan 2011)
[6] http://www.iucn-uk-peatlandprogramme.org/news/144 (accessed 17 Jan 2011)
[7] http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm (accessed 17 Jan 2011)

2.2 The Mosses

The Lochar Moss complex represents a raised mire complex of significant depth with four separate "domes"[8], stretching from the Solway Firth north west to the regional centre of Dumfries. A map of the area is provided at **Figure 2.2,** over. These four large sites formed a hydrologically-linked complex of peat forming systems including raised mires and fens. The area covers c.2,600ha (c.10 square miles).

While extensive, the Lochar Mosses are the remains of a much larger area that played a significant role in the development of the locality, and which, in the past, has been exploited for fuel and encroached by farming use. Proposals for drainage of the area go as far back as the 18th century[9].

Over the past forty years, the area has been used for conifer plantation. The southern part of the complex, mainly comprising the FCS managed Longbridgemuir woodland, was cleared of trees as part of an EU funded LIFE project between 2000/3. Part of this area has Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) status.

Lindsay and Freeman (2006) suggest that even as it currently stands, Lochar Mosses is in the top 20 raised mire peat mosses in Britain and the top five in terms of quality. Restoration would elevate this to European status, due to its unique characteristics.

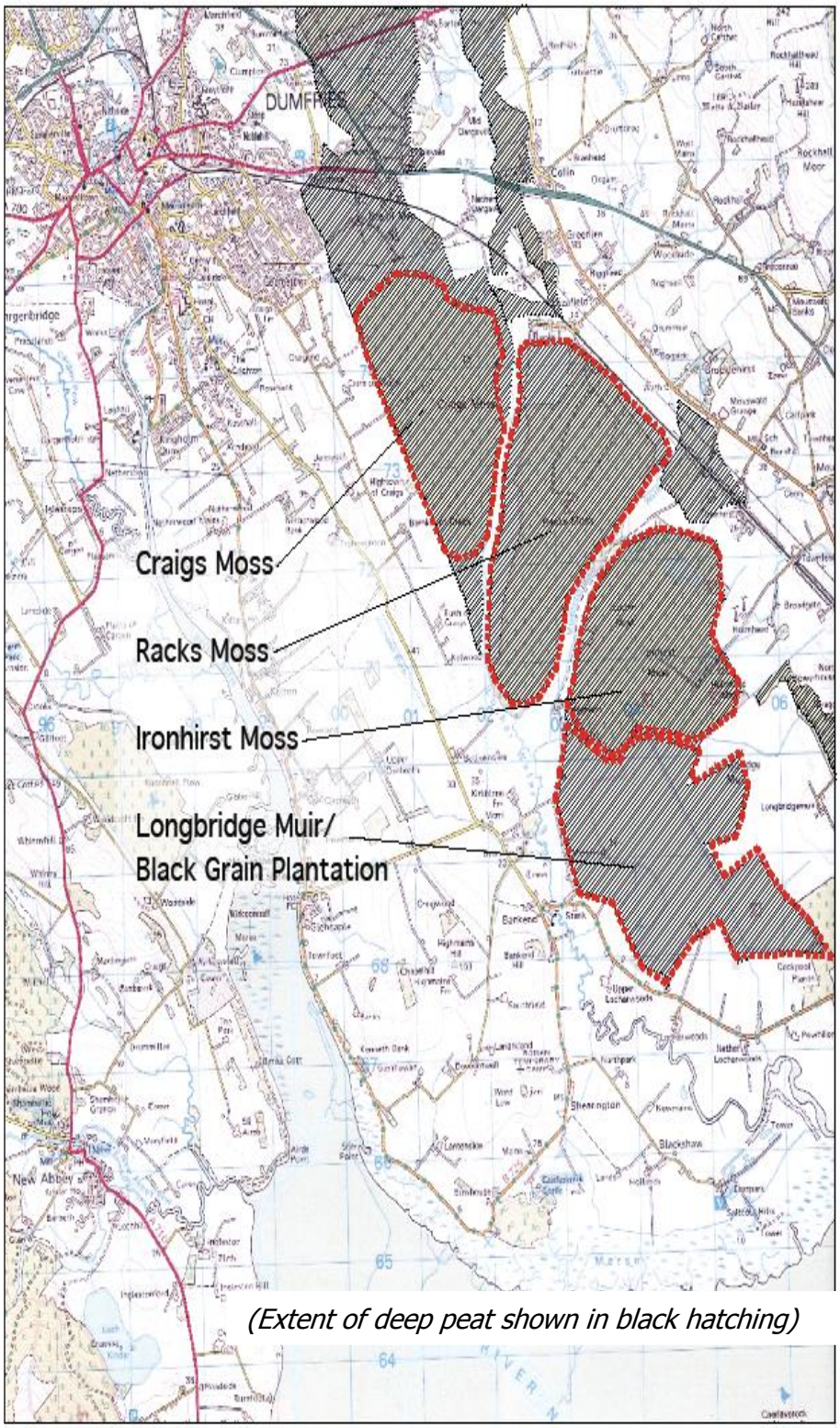
Figure 2.1 below summarises the four domes that make up the Mosses, their extent, current condition, and ownership.

Figure 2.1: Lochar Mosses

Moss	Current Condition	Area[10]	Ownership
Longbridge Muir/Black Grain Plantation/Cockpool Moss	Original mire in SSSI and SAC with additional restored area. Some limited afforestation around the edges	700ha	Forestry Commission and private ownership (c.150ha)
Ironhirst Moss	Under forest cultivation	630ha	Forestry Commission
Racks Moss	Under forest cultivation	630ha	Forestry Commission
Craigs Moss	Forest currently being harvested	600ha	Private ownership (Kerr Investments)

[8] For a detailed description, see Lindsay & Freeman (2006)
[9] http://www.engineering-timelines.com/who/Smeaton_J/smeatonJohn7.asp (accessed 17 Jan 2011)
[10] Estimate only, subject to review – not surveyed limit

Figure 2.2: The Four Domes



(Extent of deep peat shown in black hatching)

3. Appraisal Model

3.1 Potential Impacts

The assumptions behind the proposals are that there are a number of benefits that will arise from project implementation, and which are capable of measurement. These are summarised in **Figure 3.1** below.

Figure 3.1: Linkages

Clearly, this implies a mixture of quantitative and qualitative assessment. It also has to acknowledge that the process of restoration, if undertaken, will be a long term process, taking up to 30 years to complete. Consequently, there will be a range of factors that can intervene in this period, impacting on organisational capacity, funding availability, and opportunity.

The appraisal also has to take into account "optimism bias", the demonstrated, systematic, tendency for project appraisers to be overly optimistic. Many project parameters are affected by optimism – appraisers can overstate benefits, and understate timings and costs, both capital and operational[11]. It is therefore essential that projected benefits are rooted in reality, and are not simply the measurement of desired outcomes. This is especially important where the benefits are assumed to accrue from related or ancillary projects, for example tourism activities, for which there is currently no apparent sponsor or funding.

[11] The concept was introduced in the 2005 edition of the Treasury Green Book (http://www.hm-treasury.gov.uk/d/green_book_complete.pdf) (accessed 17 Jan 2011)

Quantification is clearly an issue. The clearest argument is that of GHG capture, although this in itself is a highly technical and debated field. Quantifying the benefits from other activities will be based on making significant assumptions, which will have to be tested in practice.

3.2 Appraisal Method

Valuing the socio-economic benefits from environmental improvement is a therefore complex field.

The resources available in the current study do not make it possible to deploy some of the approaches used to assigning money values to non-marketed assets as *stated preference*[12] techniques or measures that apply utility functions, described as *revealed preference*[13] models. The appraisal is therefore constructed around a logic model for the processes involved. This enables an understanding of the expected inter-relationships and a judgement of the extent to which the intervention can achieve its intentions at each stage.

The key concepts within this approach are summarised in the inset, below.

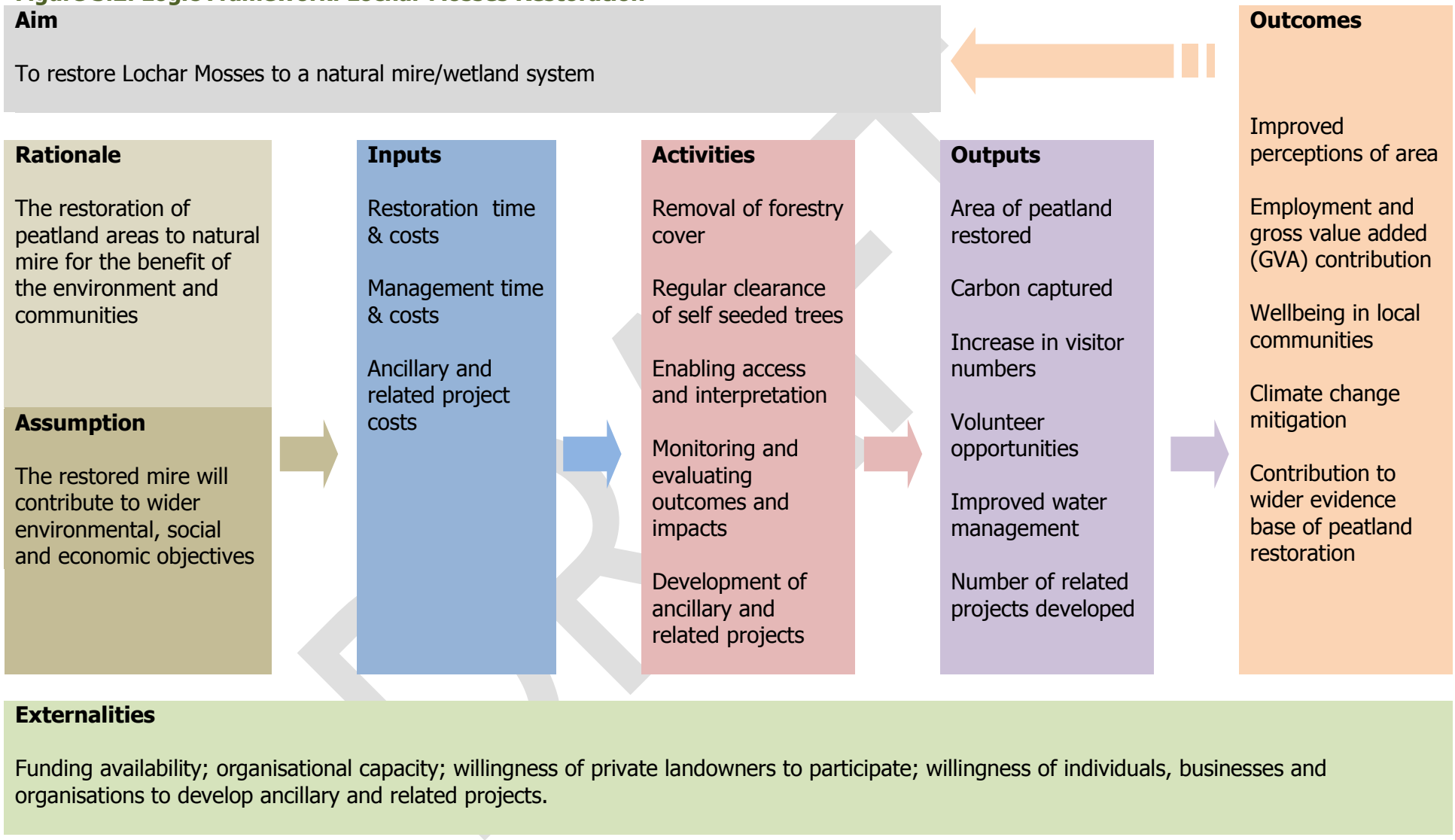
- **Aim** is a specific goal or purpose that the intervention is attempting or intending to reach.
- **Rationale** is the basis of understanding that informs the approach.
- **Assumptions** are the underpinning expectations that inform the approach.
- **Inputs** are financial and non-financial resources put into the intervention in order to deliver activities and achieve outputs.
- **Activities** translate inputs into outputs. They are the measurable processes or procedures intended to stimulate outputs and outcomes through participation.
- **Outputs** are the immediate results arising from interventions ("facts and figures"). For example, the number of participants in an event.
- **Outcomes** are the changes that can be attributed to the interventions, net of additionality (would it have happened without programme intervention? – *deadweight* – is it replacing activity elsewhere? – *displacement*).
- **Externalities** are other influencing factors that do not form an immediate part of the programme.

Ultimately the intervention should lead to **impacts**, which are the long term structural improvements happening in the locality as a direct result of the intervention. Consequently these are less amenable to immediate measurement and attribution to activities than outputs.

The logical framework used to inform the appraisal is therefore summarised in **Figure 3.2**, over. This will be used to inform the Masterplan.

[12] David Pearce and Ece Özdemiroglu *et al* (2002) Economic Valuation with Stated Preference Techniques: Summary Guide DTLR http://www.communities.gov.uk/documents/corporate/pdf/146871.pdf (accessed 17 Jan 2011)
[13] See for example http://www.uea.ac.uk/env/cserge/research/26.htm (accessed 17 Jan 2011)

Figure 3.2: Logic Framework: Lochar Mosses Restoration



4. Potential Benefits

4.1 Range of Potential Benefits

The model assumes that the benefits that could potentially arise fall into the following categories. These are:

- Tourism;
- Recreation and Leisure;
- Quality of Place;
- Land Management and Biodiversity;
- Climate Change Mitigation.

These are discussed in the following sections.

4.2 Tourism

A recent SNH sponsored study estimated that total net visitor spending in Scotland attributable to nature-based tourism per year is around £1.4 billion with 39,000 associated full time equivalent jobs[14]. Clearly, there is significant regional disparity of this impact, with Dumfries and Galloway capturing 14% of Scottish tourist trips and 17% of night stays[15].

However, the types of activity undertaken by tourists in Scotland[16] suggest that the outdoors are a significant attraction with, for example, UK visitors to Scotland undertaking activities such as:

- exploring scenery (73%);
- looking at wildlife (56%); and
- taking long walks (48%)

An indication of the scale of the tourism activity in the area can be gauged from work undertaken on nature-based tourism in the Nith Estuary[17]. **Figure 4.1** below shows the reported visitor numbers for key attractions to the immediate south of the Mosses.

Figure 4.1: Key Visitor Attraction Visitor Data

Attraction	Approximate annual visitor numbers
Caerlaverock Castle	32,000
Caerlaverock National Nature Reserve	28,000
Caerlaverock Wildfowl and Wetlands Trust Wetland Centre	17,000

[14] Bryden, D.M., Westbrook, S.R., Burns, B., Taylor, W.A., and Anderson, S. 2010. Assessing the economic impacts of nature based tourism in Scotland Scottish Natural Heritage Commissioned Report No. 398

[15] Based on a comparison of 2008 D&G and 2009 Scottish data. http://www.visitscotland.org/pdf/tourism-in-dumfries-galloway_2008-provisional.pdf (accessed 17 Jan 2011)

[16] http://www.visitscotland.org/pdf/Tourism%20in%20Scotland%202009.pdf (accessed 17 Jan 2011)

[17] Wood-Gee V (2010) Greater Nith Estuary Nature Based Tourism Cluster Development Plan

In addition to Dumfries itself, on the other side of the Nith Estuary:

- Mabie Forest has c.105,000 visitors annually (primarily mountain bikers);
- Mersehead Royal Society for the Protection of Birds (RSPB) Reserve attracts c.27,000 visitors;
- Sweetheart Abbey attracts c.9,000 visitors;
- Kirkconnel Flow National Nature Reserve attracts c.2,000 visitors.

These numbers are significant, and give some idea of the scale of the current local audience for nature based tourism. This is borne out by recent research that suggested that the Galloway Great Kite Trail generated c.20 additional full-time equivalent jobs (FTEs) and c.£700,000 additional spend in 2009 [18]

However, it has to be acknowledged that restored peatlands in themselves are not necessarily a major draw. The numbers are therefore limited.

For comparison, Flanders Moss near Stirling, which is almost comparable in scale, increased visitors from 300 before 2006 to an anticipated c.5,000 pa[19]. On the optimistic assumption that 50% of these visitors had come to the area specifically to see the Moss, and that all of these stayed at least one night in the area, this generates c.£120,000 spend the in local economy a year, before any multiplier effects[20].

While raised bogs such as the Lochar Mosses are sensitive to human interaction, there are examples of ways in which peatlands have been used to encourage participation and use, such as the South Yorkshire Peatlands Way[21] , the Derbyshire Moors for the Future Partnership[22], or further afield, ecotourism projects in Finnish peatlands[23].

Apart from "pure" tourism, there are also examples of visitor centres that act as an educational resource and attraction, and which links with recreation and leisure activities. In Ireland the:

- Bog of Allen Nature Centre[24] provides a range of access, educational, and archaeological activities to assist in the preservation and interpretation of local peatlands; and
- Peatlands Park near Dungannon[25] provides a similar range of activities for two linked natural nature reserves.

A small start in providing controlled access to the Mosses has recently been undertaken at Mouswald Loch, which has involved the local school and landowner.

[18] Molloy, D. and Rollie, C.J., 2010. The Galloway Kite Trail: Economic impacts within Dumfries & Galloway. RSPB Scotland, Edinburgh

[19] http://www.nnr-scotland.org.uk/downloads/publications/The_Story_of_Flanders_Moss_National_Nature_Reserve.pdf (accessed 17 Jan 2011)

[20] The Scottish Tourism Multipliers were last updated in 1993, and there is some concern that they are outdated and inappropriate – see http://www.scottish.parliament.uk/s3/committees/europe/papers-10/eup10-16.pdf (accessed 17 Jan 2011)

[21] http://www.thorne-moorends.gov.uk/events/peatlands_way.html (accessed 17 Jan 2011)

[22] http://www.moorsforthefuture.org.uk/mftf/main/AboutTheProject.htm (accessed 17 Jan 2011)

[23]http://www.metsa.fi/sivustot/metsa/en/Projects/LifeNatureProjects/AapaMireLife/EcoTourism/Sivut/Ecotourism.aspx(accessed 17 Jan 2011)

[24] http://www.ipcc.ie/BOAorientation.html (accessed 17 Jan 2011)

[25] http://www.peatlandsni.gov.uk/education/about.htm (accessed 17 Jan 2011)

The educational aspect is obviously important, although pressure on budgets will have an effect on activities where there is a cost to the institution, such as a school. This clearly raises issues over where the cost for this type of activity can be met, which is discussed in subsequent sections.

The ecological importance of the Mosses is also likely to lead to interest in sharing the science and experience of the restoration process. This is confirmed by experience in Kirkconnell Flow, which has been the subject of visits from a range of groups, including:

- Forestry groups from Ireland;
- Students from Glasgow University studying environmental science;
- Land agents on continuing professional development activities; and
- Representatives from the National Scenic Area.

In addition, interest in the Mosses is not solely linked to their ecology. Clearly, they have interacted with local communities over the centuries, and there have been significant archaeological finds over the years[26]. In addition, Lindsay and Freedman suggest that the condition of the peat in some areas points to the possibility of previously unnoticed buckwheat cultivation, which is unique in Scotland, and could be directed towards archaeological and historical interests. The importance of providing a fully rounded interpretation of both human interactions with the Mosses as well as their ecological contribution should not be underestimated in contributing to visitor numbers.

Overall, the Mosses are well placed to contribute to the range of activities that are available in the locality. At one level, this may simply be adding to the scale and range of natural environment attractions in the area. At a higher level, this could involve the development of an interpretation and visitor centre which could provide an attraction and educational centre.

Clearly, this would be contingent on proposals on feasibility for such a centre. However, the scale of the proposed intervention, and its international importance, at the very least create an initial argument for consideration.

In the scope of this study, it would be unrealistic to simply pluck figures out of the air. Even with minimum tourism related developments, such as walkways and viewing platforms, it would be realistic to expect meeting or exceeding the visitor numbers of Flanders Moss, with the possibility of levering c.£200,000 a year into the local economy. Larger scale development would have to be subject to a separate appraisal, which would not simply be limited to tourism impact.

4.3 Recreation and Leisure

While recreation and leisure is linked to tourism, it primarily focuses on the activities of local residents. For example, the Scottish Recreation Survey for 2007[27] indicated that 44% of the adult population in Scotland made at least one visit per week to the outdoors for leisure and recreation purposes. In addition, 80% claimed to have made at least one outdoors trip in the previous 12 months. Most of these visits recorded during 2007 began from home (95%) rather than while staying away from home[28]. There is a local population of around 100,000

[26] A list of finds has been made available through the Dumfries and Galloway Council archaeologist
[27] http://www.snh.org.uk/pdfs/publications/commissioned_reports/321.pdf (accessed 17 Jan 2011)
[28] Bryden, D.M., Westbrook, S.R., Burns, B., Taylor, W.A., and Anderson, S. 2010. Assessing the economic impacts of nature based tourism in Scotland Scottish Natural Heritage Commissioned Report No. 398

in Dumfries and neighbouring areas, who, although they have a wealth of natural resource on their doorstep, could be encouraged to take an interest in the Mosses.

Experience from elsewhere shows that the development of a local natural resource can provide volunteering opportunities for local residents to participate in the maintenance and interpretation of the resource. This participation can range from active involvement in clearing new tree growth, or encouraging young people to learn how to make brooms at Halloween[29], as for example happens in Flanders Moss, to encouraging people to "invest" in small areas of peatland, as happens in Ireland, providing a sense of ownership and involvement.

Volunteering opportunities are clearly important for a range of issues. Not only does it help connect people with their locality, there is a proven link between outdoor activity and physical and mental wellbeing, with, for example, work undertaken in 2002 for Forest Research illustrating the health benefits of open spaces[30].

Again, the scale of volunteering opportunities is difficult to quantify, although they will also create the opportunity for mitigating clearance costs and maintenance of the Mosses over their re-establishment phase.

4.4 Quality of Place

SNH has recently launched a consultation on the contribution of the natural heritage to better place-making[31] . These benefits relate to key ecosystem services such as:

- provisioning services – places that help to reduce the use of resources in construction and use of buildings; promote local food, water and energy supplies; and, provide opportunities to walk and cycle on better connected streets and green networks;
- cultural services - a resource for environmental education, leisure and recreation; distinctive and attractive places that inspire people and provide a sense of history (or heritage/place/identity) and places for calm relaxation and escapism;
- regulating services that govern climate and waste; and
- supporting services include soil formation and nutrient cycling.

The primary ecosystem services that the Mosses can impact on are therefore cultural and supporting.

The Dumfries and Galloway region already has a strong reputation as an environmentally attractive area, although much of the focus has traditionally been on Galloway. The re-establishment of the Mosses has the potential to strengthen perceptions of the area between the Caerlaverock NNR to the south and Nith NSA to the west.

Putting a value on this is problematic - for example, would an inward investor come to Dumfries on the basis of restored peatland? In itself, this is highly doubtful, although it could potentially be part of a basket of wider environmental considerations that would be taken into account.

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[29] http://www.stirlingobserver.co.uk/2010/10/15/learn-witch-crafts-at-flanders-moss-51226-27471853/ (accessed 17 Jan 2011)
[30] Forestry Commission (2003) Health and Well-being: Trees, Woodlands and Natural Spaces Edinburgh
[31] http://www.snh.go .uk/about-snh/what-we-do/health-and-wellbeing/natural-heritage-and-placemaking/ (accessed 17 Jan 2011)

Ecological improvements also impact on wellbeing issues[32]. The natural environment provides physical, mental and social wellbeing benefits. There are synergistic effects between these benefits, which have a potentially major contribution to local communities.

4.5 Land Use

Earlier consultations have suggested that there is an element of potential conflict with neighbouring farming landowners, primarily over fears of potential flooding impact on the livestock and limited arable in the area. There is currently a Lochar Moss Drainage Committee, formed under an Improvement Order through Land Drainage (Scotland) Act 1958[33] that takes responsibility for deepening the Lochar Water to improve land drainage. Amongst other impacts, this has lowered the water level adjacent to the mosses.

Current land use in these areas makes changes to these levels difficult, and will require active co-operation of neighbouring landowners to manage these border areas. The same effect occurs on the eastern side of the bogs where drainage over the years has reduced the water level against the mires. The water courses carry enhanced nutrient and sediment levels which impact on the condition of the mires. Equally, however, restored peatland has the potential to assist water management in the area, retaining water flows that would otherwise be flushed out through drainage systems.

In the current absence of a hydrological study, the overall impact of this question cannot currently be settled. This is a key consideration for any development, and the economic interests of these farming neighbours will clearly need to be taken into account in any restoration project. If it is agreed to take the proposal to the next stage, undertaking a comprehensive hydrological study will be an essential step.

There is, however, a policy predisposition to supporting the intervention. For example, the Scottish Rural Development Programme recognises these issues, and has specific funding streams[34] that support good soil management on upland and peatland sites, with the aim of:

- protecting and enhancing wildlife and biodiversity;
- protecting and managing fragile upland soils;
- supporting the achievement of good water status by reducing upland soil erosion; and
- mitigating greenhouse gas emissions by maintaining and enhancing upland vegetation that forms peat soils and acts as a natural carbon store.

In addition, the Scottish Soil Framework[35] has established the Soil Focus Group which is to develop and build on the Framework, taking into account specific consideration of:

- Climate Change - soils are affected by a changing climate, and can themselves contribute to climate change through greenhouse gas emission;
- Flooding - soil management plays a central role in sustainable flood management;
- National Food Policy - there is a need for Scotland's soils to retain their capacity to produce sufficient and high quality food; and

[32]Newton N (2007) Wellbeing and the Natural Environment: A brief overview of the evidence http://www3.surrey.ac.uk/resolve/seminars/Julie%20Newton%20Paper.pdf (accessed 17 Jan 2011)
[33] http://www.legislation.gov.uk/ukpga/Eliz2/6-7/24/contents (accessed 17 Jan 2011)
[34]http://scotland.gov.uk/Topics/farmingrural/SRDP/RuralPriorities/Packages/ReducingGreenhouseGas/WildlifeUplandPeatland (accessed 17 Jan 2011)
[35] http://www.scotland.gov.uk/Publications/2009/05/20145602/0 (accessed 17 Jan 2011)

- Water Quality - soil management and water quality are intrinsically linked.

It is therefore reasonable to assume that agreement can be reached over the balance between the utilisation of the borderlands around the Mosses, and maintaining the water table that will restore their condition.

There is additional potential for some negative long term employment impact on forestry with the removal of woodlands, although this is likely to be very limited in scale, and at least in the short term, opportunities will be created in clearing current afforestation.

However, other economic land management opportunities are likely to present themselves if the Mosses are restored, including:

- The development of agri forestry around the fringes of the Mosses;
- Grazing the Mosses with specialized stock, such as konik ponies or shetland sheep;
- The potential for enhanced shooting opportunities;
- Hydrological services to maintain water levels.

These economic opportunities have the potential to provide diversification activities that could contribute to the local economy and support farming activity.

4.6 Climate Change Mitigation

The major environmental consideration is the role of peatlands as a carbon store. It is estimated that 2500 tonnes of carbon are stored in each hectare of peat. This means that the UK has around 20 years of industrial CO_2 emissions locked in its peatlands[36], which has the potential to be released as a result of drainage. This role has been confirmed in a recent RSPB sponsored study[37].

The Scottish Government has a climate change mitigation policy, with targets for emissions reduction in the Climate Change (Scotland) Act 2009[38]. The immediate target is to bring about a reduction of at least 42% in Scotland's greenhouse gas emissions by 2020, from 1990 levels, with annual targets now set for 2010 onwards. There is also an understanding that some soils can be effective as a sink for carbon[39]

The climate change talks at Cancun have recognised that carbon savings from peatland restoration should be included alongside forestry planting in helping meet emissions reduction targets[40]. The Scottish Government will therefore be permitted to include wetland management and can take account of the benefits of peatland restoration that has been carried out since 1990 onwards.

[36] http://www.northpennines.org.uk/index.cfm?articleid=12392(accessed 17 Jan 2011)
[37] http://www.rspb.org.uk/news/details.asp?id=tcm:9-255206 (accessed 17 Jan 2011)
[38] http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact (accessed 17 Jan 2011)
[39] Scottish Government Discussion Paper December 2010 http://www.scotland.gov.uk/Resource/Doc/921/0109512.pdf (accessed 17 Jan 2011)
[40] http://www.iucn-uk-peatlandprogramme.org/news/144 (accessed 17 Jan 2011)

However, there are major difficulties over how this can be calculated. Where forest drains are blocked as part of a restoration process, the resulting impacts on methane emissions are unknown. For example, the time taken for afforestation to produce a net sink for carbon on organic soils is not fully understood[41], and work, such as the ECOSSE project[42] has been ongoing to help understand the overall effects of carbon aspiration in soils.

This calculation of carbon capture is therefore a highly technical area, with limited empirical evidence and a range of views over eventual impact. For the purposes of this assessment, estimates from a recent expert group have been used. While the range is very broad, it has been estimated that undisturbed peatland sinks 25-90 tonnes carbon per km^2 per year. On the other hand, drained peatland emits 200-400 tonnes carbon per km^2 per year[43].

Figure 4.2 below therefore illustrates the ranges within which the carbon budget of Lochar mosses operates.

Figure 4.2: Estimated Carbon Budget for Lochar Mosses

Moss	Annual Carbon Budget (tonnes C/km^2/year)			
	Capture if restored		Emission if drained	
	Upper	Lower	Upper	Lower
Longbridge Muir/Black Grain Plantation/Cockpool Moss	630	175	-2800	-1400
Ironhirst Moss	567	158	-2520	-1260
Racks Moss	567	158	-2520	-1280
Craigs Moss	540	150	-2400	-1200
TOTALS	**2304**	**641**	**-10240**	**-5140**

The difference in carbon budget between the best case capture and worst case emission scenarios is therefore **12,544 tonnes of carbon per km^2 per year**. Clearly, the true answer lies somewhere in between and has to take into account the facts that the:

- ranges are so wide;
- land under the existing forestry plantation has not yet been completely degraded; and
- existing forestry plays a part in carbon capture, although this impact exists only over a period of tens of years, as opposed to thousands of years for peatland.

[41] http://www.scotland.gov.uk/Resource/Doc/921/0109512.pdf (accessed 17 Jan 2011)
[42] ECOSSE: Estimating Carbon in Organic Soils - Sequestration and Emissions: Final Report http://www.scotland.gov.uk/Publications/2007/03/16170508/0 (accessed 17 Jan 2011)
[43] "Carbon Budgets in the Uplands" Paper following a workshop led by Dr Mary-Ann Smyth, with specialist Prof Rob Marrs and facilitator Jools Cox, 21 April 2010. http://www.heathertrust.co.uk/assets/documents/1762010103132_Workshop_Final_version Carbon_Budgets_in_the_Uplands.pdf (accessed 17 Jan 2011)

There remains lack of clarity over the ways in which peatland restoration can be measured to potential carbon trading. In the words of the Voluntary Carbon Standard (VCS) Association:

Carbon sequestration from restoring peat forming conditions is not elaborated as a separate activity type, however, should a credible methodology be developed and approved for monitoring such practice, it is an eligible activity under VCS.[44]

4.7 Summary

Figure 4.3 below summarises the potential benefits described in this section, with preconditions, where applicable.

Figure 4.3: Summary of Benefits

	Benefits	Preconditions
Tourism	Employment and GVA Minimum additional £200,000 local annual spend, contingent on projects Educational benefits	Willingness of organisations and businesses to develop and invest in new projects
Recreation & Leisure	Volunteering Opportunities Wellbeing	Support management structure in place
Quality of Place	Perceptions of area Wellbeing	
Land Use	Improved land and water management Spread of good practice Economic diversification	Neighbouring landowners willing to participate
Climate Change Mitigation	Potential for between 5,800 and 12,500 tonnes carbon retained per year Potential revenue stream over time	Whole area of four domes is cleared. Private owners willing to participate

The costs associated with clearance need to be set against these benefits. As evidenced by the work undertaken in Longbridge Muir, these can be significant. Not only is there the initial clearance costs (against which the cost of the crop can be offset), but a maintenance cost to ensure that there is no tree regrowth in the cleared area. Estimates of these costs amount to £200,000 for initial clearance of 320ha, with an annual maintenance cost of £20,000 over three years. While some of the remaining area has already or will be cleared as part of the normal process, and crop costs can be offset, these figures suggest an initial annual maintenance cost of over £105,000 for the remaining area. This is in addition to any development and access costs.

[44] http://v-c-s.org/docs/VCS-Program-PRC-Public-Consultation-Document.pdf (accessed 17 Jan 2011)

5. Issues & Challenges

5.1 Introduction

While it is problematic to undertake a full quantification of the potential benefits of the restoration of the Lochar Mosses, the initial indication is that there are sufficient benefits to make the intervention worthy of further development. The next stage of this process is the development of a Masterplan defining the actions, milestones and funding that could make the proposals reality.

There remain some further individual consultations to be undertaken at this stage, and there will be a requirement to bring the full range of interest for a discussion over the potential benefits and actions. In view of the timescales involved, it is suggested that this workshop includes consideration of the draft Masterplan, in order that there is the opportunity for input at an early stage, and that stakeholders can be signed up to the intervention. This will require a level of openness and commitment on the part of key partners, and some understanding of the resourcing requirements involved.

5.2 Timescale and Ownership

The restoration of the Mosses is an ambitious project. Lindsay and Freeman (2006) suggested a maximum 30 year period, although evidence of recovery was apparent within a much shorter timeframe.

There are clearly considerations of harvesting cycles for FCS which need to be clarified, in order to assess when remaining areas of conifer forest could and should be most cost-effectively removed.

While it is not essential that all the four domes are included, the potential impact of full scale restoration is a major part of the intervention's attractiveness, as it emphasises the international importance of the Mosses, and creates the opportunity for maximising funding opportunities and attracting interest from outside Scotland. It may well be, however, that the Action Plan will acknowledge the need for phasing the process, and consequently extending the timescale.

5.3 Project Development

There are also important implementation issues to be considered. For example, the current public spending environment is not conducive to sourcing significant financial contributions. Taking the project forward will also require the active participation and joint working of a range of interests, challenging some concepts of land ownership, use and access. However, there is scope for the development of a working partnership with community interests that could prove attractive to certain funders and could lead to significant community benefit.

On the positive side the policy direction, especially on climate change issues, is highly conducive to peatland restoration. **Figure 5.1**, below, uses the VCS risk assessment model for assessing the conservation of undrained peatland[45] which suggests that the intervention is highly suitable for GHG emissions consideration.

[45] http://v-c-s.org/docs/VCS-Program-PRC-Public-Consultation-Document.pdf (accessed 17 Jan 2011)

Figure 5.1: Risk Assessment: Avoided Planned Peatland Drainage

Consideration	Risk
Ownership type and user rights of the project area	
Established NGO or conservation agency owner; or owner-operated private land; or publicly owned and managed land	Low
Hydrological connectivity with adjacent areas	
Agreements exist with actors in areas hydrologically connected to the project area	Medium
Proven technology	
Technologies (e.g., dam construction and maintenance) proven (in practice or experiment) to result in successful long term carbon benefits	Low
Management capacity of project developer	
Project developer has proven capacity to design and successfully implement PRC and combined activities, or, project developer has limited experience in the design and implementation of activities but advisory team includes experts in peat dynamics	Low
Future income	
Appropriate management plan, and financial analysis demonstrates that likely income stream(s) will finance future management activities (e.g., carbon finance to be used for project management, tending operations)	Low
Future/current opportunity costs	
Alternative land uses in the project area and in areas hydrologically connected to it, and causing drainage, are unlikely to become attractive in the future	Low
Endorsement of project by local population and local/national political establishment	
Endorsement given and not likely to change in the future	Low
Devastating fire potential	
Low fire return interval (> 10 years) in the project region	Low
Incidence of severe droughts in the project region	
Infrequent (< 1 in 10 yrs)	Low

Annex:
Peatland Management Practice Scoping Paper

1. Introduction

This document, part of the socio-economic impact assessment of the restoration of the Lochar Mosses:

- provides brief descriptions of comparable projects elsewhere;
- highlights findings from project reviews;
- gives an overview of academic research on peatland management; and
- attempts to draw out key themes.

It is an initial draft to highlight key projects and issues, and is part of a suite of papers that will inform the appraisal of the Lochar Mosses project.

2. Examples

2.1 Caithness and Sutherland Peatlands

Probably the largest area of Atlantic blanket bog in the world, this 400,000ha blanket bog is one of the UK's showcase peatlands of international importance. A partnership of statutory bodies, non governmental organisations (NGOs) and landowners agreed a strategy to help restore damaged habitat, secure sustainable development and promote the benefits of a healthy peatland ecosystem. With the benefit of EU Life funding, large areas of drains were blocked and plantation trees removed to help restore the peatland.

2.2 Great Fen Project

This project is similar in scale to Lochar, aiming to restore 3,700ha of land, much of which is commercially farmed, to wetland over a period of 40-50 years. Located between Huntingdon and Peterborough, it has already been recognised as having the potential for significant impact, having recently been awarded the Royal Town Planning Institute's Silver Jubilee Cup.

The project's aim is to join two existing National Nature Reserves, Holme Fen and Woodwalton Fen, creating new opportunities in biodiversity and local socio-economic benefits. The project is a partnership of the Environment Agency, Huntingdonshire District Council, Middle Level Commissioners, Natural England and the Wildlife Trust, supported bu local volunteering through the Great Fen Local group.

2.3 Flanders Moss

Flanders Moss National Nature Reserve lies about 10 miles west of Stirling. The aim of this project overall was to reconnect people with this internationally important peatland nature reserve. Flanders Moss had been very inaccessible to local people and visitors for many years. The local tradition is that it is a dangerous place to visit and the project aim was to overcome these preconceptions and enable people to visit the site safely in a way that doesn't damage the site but so that they can appreciate the special feel of the site. This was achieved using a range of methods through two different LEADER projects. The first built a path and boardwalk, developed interpretation and worked with one local school on an art project. The second project added a viewing tower to the path and involved the local communities through oral history and poetry projects.

2.4 Mires-on-the-Moors

Starting in 2006, the Exmoor Mire Restoration Project re-wetted 313ha of blanket bog by blocking up 50km of drainage ditches and peat cuttings over 12 sites on Exmoor. The restoration work was extended for a further 5 years on Exmoor and Dartmoor in a new joint project called Mires-on-the-Moors. The partnership lead by South West Water received permission from Ofwat in its Asset Management Plan (AMP5) to raise £3.8 million for the next 5 years from customers' bills to fund the moorland catchment restoration work.

Restoration of Dartmoor's peatlands will be managed by the Dartmoor National Park Authority (DNPA) with the support of the Environment Agency, Duchy of Cornwall and Natural England which together make up the Action for Wildlife Partnership. The work will be carried out in close partnership with Dartmoor commoners recognising their unique skills

2.5 Moors for the Future

Moors for the Future Partnership is a private-public upland partnership project to restore the Peak District moors in England. Past damage from land management and pollution has led to some of the worst erosion of a peatland in the UK with consequent losses to amenity recreation, sporting interests and water management companies. With over 10 million day visits made each year this popular area is now the focus for major restoration efforts to revegetate bare eroding peat surfaces.

Moors for the Future aims to raise awareness of why the moors are special and encourage responsible use and care of the landscape; restore and conserve important recreational and natural moorland resources; and develop expertise on how to protect and manage the moors sustainably. The project is funded by Heritage Lottery Fund, Peak District National Park Authority, United Utilities, Natural England, National Trust, Severn Trent Water, Sheffield City Council, Moorland Association, Derbyshire County Council and the Environment Agency.

2.6 North Pennines AONB Partnership

Through its Peatscapes Project the North Pennines AONB Partnership aims to conserve and enhance internationally important peatland resources. The North Pennines contains 27% of England's blanket bog resource. Peatscapes supports restoration and management work through the promotion of existing agri-environment and wildlife enhancement grants and through sourcing new additional funds. The Project aims to raise the level of understanding and appreciation of the significance of peatbogs to those living in, working in and visiting the area; promote best practice in practical management works; and support and disseminate research into peatland processes, ecology and management. By 2009 over 270 kilometres of moorland drains had been blocked helping restore 1266ha blanket bog at a cost of around £300,000.

2.7 Yorkshire Peat Partnership

The Yorkshire region contains nearly 70,000 ha of upland peat which has been subject to drainage, extraction, grazing and recreational pressure, all of which have compounded the problem of peat erosion. The Yorkshire Peat Partnership aims to substantially increase the amount of peatlands restoration activity in the Yorkshire uplands through a combination of restoration, management and monitoring. The Partnership not only aims to restore and enhance peatlands but also to collect vital information through monitoring and research that may contribute to the development of peatland restoration science and guide future restoration techniques.

The working partnership consists of the Yorkshire Wildlife Trust, Natural England, Yorkshire Dales National Park Authority and North York Moors National Park Authority with further support secured from the Environment Agency. The wider steering group consists of Moors for the Future, Pennine Prospects, National Trust, Nidderdale AONB and the Yorkshire Dales Rivers Trust.

2.8 Northumberland National Park

Northumberland National Park has an ongoing programme of peatland restoration. Recently, this includes the re-flooding of Greenleighton Mire on the National Trust owned Wallington estate as part of a £34,000 project by the trust and the SITA Trust's Enriching Nature Fund after being turned into a conifer plantation. In addition, the Park maintains paths across fragile sections such as Cheviot Summit and Simonside.

Recently, a film shot in the area, "Our Beautiful Bogs" won first prize at the International Union for Conservation of Nature Conference in Durham. This was commissioned by Northumberland National Park Authority and made by the Haltwhistle Film Project with funding from the Heritage Lottery Fund.

2.9 Ireland

The Irish Peatland Conservation Council (IPCC) promotes a range of activity, encompassing environmental protection, tourism, and education around the country's peatlands. This includes selling "symbolic shares" in bogland to raise funds.

IPCC published an action plan in 2009 entitled *Ireland's Peatland Conservation Action Plan 2020 - halting the loss of peatland biodiversity*. Among the plan's findings are:

- 269,267ha of peatlands are of conservation interest in Ireland. This represents 23% of the original peatland area in the country;
- 129 actions are needed to conserve our peatlands and return degraded and threatened peatlands to favourable conservation status;
- 395 peatlands of conservation importance in Ireland have no formal conservation designation under national or international legislation;
- The key human activities leading to peatland habitat loss and degradation include turf extraction, afforestation, agricultural reclamation, overgrazing, the construction of wind farms on peatlands, tourism, trampling, dumping and burning. Drainage is associated with most of these activities;
- invasive species include *Rhododendron ponticum* and *Sarracenia purpurea*.
- Drainage of peatlands is contributing to Ireland's greenhouse gas emissions. A high water table must be restored to damaged peatlands if their greenhouse gas storage functions are to operate;
- Pollution of ground water may be leading to increased eutrophication of fen habitats; and
- The marsh fritillary butterfly, red grouse, common frog, marsh saxifrage and whorl snails are considered to be indicator species of peatland health.

The Bog of Allen Nature Centre provides a range of access, educational, and archaeological activities to assist in the preservation and interpretation of local peatlands. In Northern Ireland, the Peatlands Park near Dungannon provides a similar range of activities for two linked natural nature reserves.

2.10 Finland

Finland has extensive peatlands, which include large forest bogs and several kinds of mire, including the greatest diversity of *aapa* mires in the world. Bogs cover some 26 per cent of the Finnish land surface. Drainage of peatlands, primarily for forestry, has greatly reduced the area of undisturbed Finnish peatlands, especially since the beginning of the 1960s.

Drainage has been intense in southern and eastern Finland. In northern and western Finland, although there has been extensive peatland drainage, the high proportion of peatland land cover means that much undrained bog still remains. In Lapland, for example, where LEADER+ peatland project work was carried out, only around 20 per cent of peatland has been drained.

Finnish peatlands have economic significance through their use for fuel, with national peat-fuelled energy production second only to Ireland in world terms. Cultural links in the project study area are through past use, such as haymaking on bogs, and current enjoyment through outdoor activities such as hiking and berry picking.

According to local participants in the project workshop held in Rovaniemi, Finnish people "don't value mires highly and are somewhat suspicious of them". Despite this perception in the wider population, Finland is a country where peatland specialists have been leaders in mire research and mire conservation.

3. Project reviews

A search has uncovered two structured reviews of recent peatland management projects. These relate to the Exmoor Mires and North Scotland LIFE projects. Neither provides a comprehensive quantitative measure of socio-economic impacts but both have elements of interest.

The CCRI review of the Exmoor Mires work (Mills *et al*, 2010) concluded that the project had broadly met its aims and provided a firm basis for future work. The original target of 250ha restored was comfortably exceeded. Whilst the biodiversity gains could be demonstrated it was difficult to assess the hydrological impact due to a lack of data. The review made 49 recommendations these included:

- Ensuring that drain blocking does not interfere with agricultural use by impeding stock movements and stock checking;
- Hydrological monitoring plans for each site;
- Improved dissemination of project aims and progress to reduce local concerns;
- Improved governance and decision-making processes to ensure the views of all stakeholders are considered; and
- Developing a programme of educational outreach with local schools.

The LIFE project review was produced to meet an EU funding requirement and concentrates on performance against targets.

Figure 1: Outputs from Exmoor Mires project

Category/outputs	Original target (ha)	Final output (ha)
Tree removal	1500	2242
Drain blocking	16219	16284
Totals	*17719*	*18526*

A total of £1,011,458 was spent to restore 2,242 ha of afforested blanket bog. Although this would appear to work out at £451/ha this figure can be misleading as the total restored area does not equate to the total area that was covered in trees – in this case 1,541 ha. A more realistic figure can be calculated from dividing the total cost by the area of actual trees felled to give £656/ha.

Hill drain blocking, by its more "spread out" nature, allows much bigger areas to be restored for relatively little money with RSPB, Plantlife and SNH spending a total of £103,978 to restore 16,654 ha of drained blanket bog. This gives an average cost/ha of only £6.24 (compared to £270/ha for North Pennines) but this can be very misleading as the density of drain coverage varies enormously.

To maximise the socio-economic contribution of the project to the area, it was decided to contract out a large proportion of the project outputs (both restoration and non-restoration) using a preferred bidder system. In total, this project spent well over £1 million on external assistance to restore almost 19,000 ha of blanket bog – with 96% of that money going directly to a workforce living and working locally in Caithness and Sutherland. A further £59k was spent on non-restoration work such as EIAs, publications and signage. In addition the project provided four full time jobs for a five year period.

The Skjern river project is often cited as evidence of the overall socio-economic value of conservation projects. The Danish government embarked on a major nature restoration programme in 2002, including transforming 2,200 hectares around the Skjern river. What was once a canalised watercourse surrounded by intensive agriculture has been restored to its natural profile, in a valley with pastures and shallow lakes.

A cost benefit analysis of the project [Dubgaard *et al*, 2003] looked at the range of benefits it offers to society –from crops produced on riverside farmland and reedbeds, to ecosystem services (retention of nutrients, flood risk reduction), outdoor recreation opportunities (hiking, boating, wildlife watching, angling, hunting) and the intrinsic value of biological diversity. It concludes that 'even the most conservative estimate demonstrates that the Skjern River project turns out to be clearly beneficial for society' – generating €32.1m worth of net benefits.

3. Academic Research

Recent academic publications related to peatland management are scarce. Two stand out – Rawlins' thesis related work on peatland management across Northern Europe and Turner's ecological-economic analysis of wetlands.

Rawlins (2008) interviewed key stakeholders across N. Europe but concentrated on two English case studies – the Fens and the Somerset Moors. She points out the criticality of

developing new approaches to peatland management where new economic and political realities (recession, EU expansion) mean that current levels of nature conservation and agri-environment funding can not be maintained. Her interviews demonstrated that peatlands are (locally) given higher value if they are used for agricultural purposes. A key message coming from discussions with land managers was that they will adopt potentially sustainable practices on peatlands if they are practical and financially viable, although in some cases they may prefer to sell land to conservation organisations rather than farm extensively.

She concludes that few stakeholders valued peat soils in themselves, but rather the services they provide. Raising awareness of these services in a local context, and joining up the variety of interests and influences, again at a locally relevant scale, are seen as the key to promoting sustainable management options for peatlands - local history and context are paramount and local solutions have to be crafted in ways that appeal individually and collectively to stakeholders.

Rawlins analysed the costs and benefits for a variety of management regimes for the Somerset Moors and concluded that extensive grazing produced the best balance of economic and social outputs but was only viable given adequate agri-environment payments. This analysis was conducted in 2005 using tiered ESA payments and pre-dated the recent rise in food prices.

Her thesis concludes that locally derived management strategies are required and that these need to be developed with local stakeholders and should be informed by the latest research.

Turner *et al* (2000) attempt to derive a methodology for the integrated ecological and economic evaluation of wetland sites. This distinguishes between direct, indirect and non-use values. Direct value is that deriving from extractive use such as livestock production or sporting rights and accrues to primary stakeholders such as the landowner or tenant. Indirect value relates to 'public goods' such as recreation, landscape, flood attenuation etc and generally accrues to secondary stakeholders such as local residents, conservation organisations or distant water consumers. Non-use value relates to ethical or aesthetic considerations such as the 'rightness' of preserving peatlands. The difficulty comes in assigning monetary value to all categories. For many indirect and non-use values the only methodology suggested for quantification is that of *contingent valuation* – this essentially comprises asking stakeholders how much they would be willing to pay to preserve that use/function.

Both Turner and Rawlins address the issue of sustainable management – given the lack of understanding of wetlands (especially the influence of climate change) and their innate fragility it is difficult to demonstrate that any usage is sustainable. A debate on degrees of sustainability (strong to weak) led to the concepts of "Responsible Peatland Management" or "Wise Use of Peatlands" which acknowledge the social and economic trade-offs involved in deriving management regimes.

4. Policy documents

The IUCN [Bishop *et al*, 2008] propose a more business based model for conserving biodiversity based on, amongst other things:

- Carbon trading/credits perhaps through intermediary operations such as the Tourism Industry Carbon Offset Service (TICOS) (www.ticos.co.uk);
- Payments for watershed protection;
- Biodiversity offsets (Biodiversity offsets are conservation activities intended to compensate for the residual, unavoidable harm to biodiversity caused by economic development projects);
- Wildlife tourism; and
- Recreational hunting and fishing (e.g. Ducks Unlimited[46])

A UNEP/CMS review of wildlife watching tourism concluded that in order to contribute to conservation at any site it needs to:

- Cover the costs of:
  - management of tourism to avoid or minimise damage,
  - providing and maintaining appropriate facilities for tourists,
  - raising awareness amongst tourists of the importance of conservation, and of practices and behaviours that assist conservation
  - restoring damage that tourism activities may cause;
- Generate additional revenues from tourism that can be used to support general conservation activities; and
- Demonstrate through tourism the long-term economic value of conservation both nationally and locally by generating tangible benefits for local communities – for example, by generating employment and stimulating private sector activities

Successful wildlife watching tourism may also generate non-monetary benefits that can include valuable political and government support for species conservation, as well as support from local communities and key stakeholders, and public awareness of the significance of wildlife in the national heritage.

The main mechanisms that are used to raise funds from tourism for conservation and for community development are:

- Entrance fees;
- User fees;
- Concessions and leases;
- Direct operation of commercial activities;
- Taxes; and
- Volunteers and donations.

In general the most successful operations were those that included direct management of activities.

[46] Ducks Unlimited (DU) is the world's largest private, non-profit, waterfowl and wetland conservation organisation, with over 1 million supporters in the USA, Canada and Mexico. Other DU affiliates are in Australia, New Zealand and Europe. Since its inception in 1937, DU has conserved more than 3.8 million ha of waterfowl habitat throughout North America and raised nearly US$1.6 billion for conservation. www.ducks.org

5. Key Themes

There are a number of recurrent themes, primary amongst these being the importance of local conditions. Costs, benefits and stakeholder attitudes vary widely.

However, common themes include:

- Projects almost unanimously report that inadequate consideration was given to local perceptions and attitudes at the outset and that liaison arrangements had to be improved to ensure all stakeholder views were considered;
- Access and educational issues form an important component of management and community engagement;
- Quantitative valuation of 'public goods' is difficult and seldom attempted. Justification/evaluation of projects tends to be based on the funder priority (e.g. biodiversity targets or flood attenuation) rather than a balanced consideration of overall costs and benefits;
- There is a consequent need for more business-based and economic models to support project development and enhancement.

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Relevant links

Bog of Allen Nature Centre
http://www.ipcc.ie/BOAorientation.html

Flanders Moss
http://www.snh.org.uk/publications/on-line/designatedareas/nnrs/FlandersMoss/FlandersMoss.asp

Great Fen
http://www.greatfen.org.uk/

Irish Peatland Conservation Council
http://www.ipcc.ie/

Mires on the Moors Project
http://www.exmoor-nationalpark.gov.uk/mire

Moors for the Future
http://www.environment-agency.gov.uk/research/planning/109038.aspx

North Pennines Peatscapes
http://www.northpennines.org.uk/index.cfm?articleid=12218

Northumberland
http://www.northumberlandnationalpark.org.uk/positiveactionbogs

Peatlands of Caithness and Sutherland
http://www.snh.org.uk/pdfs/scottish/nhighland/PeatlandsStrategy.pdf

Peatlands Park
http://www.peatlandsni.gov.uk/education/about.htm

Restored Border Mires bog brings floods of joy for wildlife
http://www.guardian.co.uk/environment/2009/aug/12/restored-border-mires-bog

Valuing biodiversity
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Yorkshire Peat Partnership
http://www.ywt.org.uk/yorkshire_peat_partnership.php