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Assessing Scotland's Progress on the Environmental Agenda:

A Report Commissioned by RSPB Scotland, the Scottish Wildlife Trust and WWF Scotland

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Disclaimer: The arguments expressed in this report are solely those of the authors, and do not reflect the opinion of any other party.

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Responsibility for the views expressed here remains solely with the authors.

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GLOSSARY

BSS	Boiler scrappage scheme
CAP	Common Agricultural Policy
CAR	Water Environment (Controlled Activities) Regulations
CBD	Convention on Biological Diversity
CCC	Committee on Climate Change
CCAGS	Crofting Counties Agricultural Grants Scheme
cCELIS	Cross Compliance Electronic Information System
CCS	Carbon Capture and Storage
CRRU	Cetacean Research and Rescue Unit
DECC	Department of Energy and Climate Change
DPMAG	Diffuse Pollution Management Advisory Group
EAP	Energy Assistance Package
EIA	Environmental Impact Assessment
EU-27	27 Member States of the EU
EU	European Union
EU-ETS	EU Emissions Trading System
FAS	Farm Advisory System
FFBC	Farming for a Better Climate
GAEC	Good Agricultural and Environmental Condition
GBRs	General Binding Rules
GHG	Greenhouse gas
HEEPS	Home Energy Efficiency Programme for Scotland
HIS	Home Insulation Scheme
HNV	High Nature Value
HWDT	Hebridean Whale and Dolphin Trust
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Agency
LFA	Less Favoured Area
LFASS	Less Favoured Area Support Scheme
LMO	Land Manager Options
LULUCF	Land Use, Land Use Change and Forestry
MPAs	Marine Protected Areas
MSFD	Marine Strategy Framework Directive
MtCO2e	million tonnes of carbon dioxide equivalent
MTE	Mid-term evaluation
NAEI	National Atmospheric Emissions Inventory
NCA	Natural Capital Asset
NER300	New Entrants Reserve
NFUS	National Farmers Union of Scotland
NVZ	Nitrate Vulnerable Zone
RBD	River Basin District
RDC	Rural Development Contracts
RDP	Rural Development Programme
RBMPs	River Basin Management Plans
RP	Rural Priorities
RPP1	Report on Proposals and Policies
RPP2	Scotland's Second Report on Proposals and Policies
SACs	Special Areas of Conservation
SBSR	Scottish Budget and Spending Review
SDS	Skills Development Scheme
SEPA	Scottish Environment Protection Agency
SMRs	Statutory Management Requirements
SNH	Scottish Natural Heritage
SPAs	Special Protected Areas

SRDP	Scotland Rural Development Programme
SRUC	Scotland's Rural College
SOM	Soil organic matter
SSSIs	Special Sites of Scientific Interest
UAA	Utilised Agricultural Area
UHIS	Universal Home Insulation Scheme
WDCS	Whale and Dolphin Conservation Society
WFD	Water framework directive

EXECUTIVE SUMMARY

For good reasons the environment has a high political profile in Scotland. This Report is concerned with three important components of the environmental agenda and the way in which they are being taken forward by the responsible authorities in Scotland.

- The delivery of environmental outcomes on agricultural land by means of a range of current policies, including agri-environment schemes, cross-compliance conditions on direct payments to farmers and implementation of the EU Water Framework Directive.

- The selection and management of a new network of Marine Protected Areas.

- Policy measures designed to reduce greenhouse gas emissions and to mitigate climate change.

Each of these topics is addressed individually in three separate chapters, aiming to identify some of the leading questions and the policy responses that have been adopted. The progress that is being made in meeting the objectives and aspirations set out in legislation and other key policy documents is then considered. Some of the objectives under review are determined entirely by the Government and by more local authorities in Scotland. Others arise primarily from obligations under EU legislation.

Taking each main policy theme in turn:

The Farmed Environment

There is a particularly rich heritage under the management of farmers and foresters in Scotland but there are twin environmental pressures, on the one side from more intensive systems, primarily in the lowlands and on the other from the decline in the viability of High Nature Value farms. Several different policy measures are in place in rural areas, a number of which are reviewed here, with some recommendations put forward:

- The Scottish Rural Development Programme is perhaps the most important measure. While in many respects ambitious in design, overall it has not delivered its full potential with respect to the environment. The main reasons for this include a slow start, a complicated application process, numerous programme modifications and a shortfall in accessible advice to farmers. Implementation of the programme was slow relative to the anticipated timetable and was behind that of most other EU countries. There are also concerns about the emphasis of some measures within the programme, including the focus on more prosperous rather than High Nature Value farms within the well-funded measure supporting Less Favoured Areas. A new programme will need to be drawn up and agreed in the coming year.

- The drafting of the new Scotland Rural Development Programme is an opportunity to review the best means of meeting environmental priorities in the light of past experience. More investment in farm advice would be worthwhile, not least with respect to cross compliance.

- Measures to address water pollution from agriculture are needed and are being put in place. This is showing results where there is close interaction with farmers and there is scope for further concerted action to achieve good ecological status of all water bodies as required under the WFD.

- The application of the EIA regulations in agriculture was examined; although difficult to appraise, questions arise about whether it has been applied as methodically as is needed to safeguard semi-natural habitats and important landscape features.

The New Network of Marine Protected Areas

An ecologically coherent network of MPAs is needed in Scotland and the Government is committed to developing one. A robust and environmentally sound set of principles was established to guide development of the network and site designation but these have not been entirely followed in the designation process.

- Scientific considerations which should have been primary in the selection of sites were made secondary to or superseded by socio-economic considerations in some cases.

- Existing spatial protection measures seem to have had too much influence on site designation.

- Resource constraints within the administration have clearly had an influence on these decisions.

- So has the weighting given to the views of leading economic interests concerned with fisheries, and energy supply for example.

- While there are opportunities to address such concerns, so far Scotland seems to be following the same trajectory set by authorities in England and Wales where delays have been serious as well. This is disappointing given Scotland's exceptional marine heritage.

Responding to Climate Change

Scotland has some of the most ambitious objectives for mitigating climate change to be found in Europe. A number of measures in pursuit of the target have been initiated by the Government whilst others are still at an early stage of development.

- There has been encouraging progress in some areas, particularly in relation to renewable energy where capacity has grown rapidly.

- However, there are considerable concerns about whether it will be possible to meet mitigation targets for 2020 and 2030, both in the traded and non-traded sectors. These have been accentuated by the excess of emissions over targets in both 2010 and 2011.

- Uncertainties in EU climate policies which underpin elements of the strategy have contributed to these concerns.

- There is a case for more active and larger scale deployment of measures on the demand side which are not yet being put in place. These are becoming more urgent as the 2020 deadline approaches.

- In the housing and transport sectors, particularly, uptake of some initiatives is rather low and the projected public expenditure on policies identified as necessary to meet targets is falling short of the required level.

- Further action on waste management, where Scotland lags behind many other European countries, also could contribute to meeting climate targets.

Policy Ambitions and Delivery

There are parallels between the different policies. On the whole, ambitions have been raised in recent years and climate policy in particular has a foundation of concrete targets for reduced emissions by given dates. These are fixed in the upper bracket of what other European governments have set at the present time, particularly regarding the renewable energy sector. Aspirations for the new Marine Protected Areas also represented a major step forward when they were announced and they are underpinned by principles which are in tune with ecological priorities. There are no explicit corresponding goals for raising ambitions in the farmed environment although the design of an integrated farm level approach to social, environmental and economic measures in the rural development framework is forward looking.

However, the mechanisms to deliver these ambitions have not been scaled up to the same extent, with some notable exceptions. Some common themes can be discerned:

- Limitations have been placed on public expenditure on the scale required to deliver key objectives.

- There are associated constraints on the capacity of some of the institutions with direct responsibilities for delivering objectives.

- In some cases there has been a reluctance to confront some of the leading economic interests potentially affected by greater environmental ambition.

- A wider range of measures appears necessary to meet some of the objectives which have been set, as illustrated by climate policy.

The opportunities remain huge and some of the rebalancing suggested in this report would not be particularly radical. It would, however, give substance to Scotland's growing aspirations as an environmental front runner in Europe.

1 INTRODUCTION

This report is concerned with three important components of the environmental agenda in Scotland and the way in which it is being delivered by the responsible authorities. Three policy areas were selected for analysis by the bodies commissioning the research given their individual significance as well as certain linkages between them. The policies selected are:

- The delivery of environmental outcomes on agricultural land by means of current policies, including agri-environment incentive schemes, cross-compliance conditions on direct payments to farmers and implementation of the Water Framework Directive.

- The selection and management of a new network of Marine Protected Areas.

- Policy measures designed to reduce greenhouse gas emissions in order to mitigate climate change.

Each of these topics is addressed individually in distinct chapters of this report. In each case the focus has been on identifying the primary issues at stake and the policy responses which have been adopted. These are then considered in relation to the progress that is being made in meeting the objectives and aspirations set out in legislation and other key policy documents. Some of these objectives are determined entirely by the central government and other authorities in Scotland. Others arise primarily from obligations under EU legislation. There is a particular focus on whether outcomes can be measured and whether levels of expenditure and delivery arrangements are appropriate to the goals being pursued.

The approach taken has been to work from the literature, reviewing both government documents and independent analysis, along with commentary by stakeholders. This literature base was supplemented by a number of interviews, both face to face and on the telephone. The three sponsoring bodies have pointed to the relevant material and been generous with their time in discussing the issues at stake and the evidence available.

In considering the Scottish experience, the review seeks to set this in a European context. At one level this involves recognition of the drivers and the constraints in place as a result of the EU framework within which many of the policies considered here are being applied. At a second level some attention has been given to comparing progress in Scotland with that in other parts of Europe. This is not a simple exercise, particularly in the context of a fairly rapid review of the kind undertaken here. Direct comparisons between Scotland and other countries can be made only with a significant number of caveats and riders to reflect the differences in national conditions, whether they are geographical, economic, political or derived from other characteristics of the countries concerned. Such comparisons may be complicated by the fact that environmental data for Scotland is often reported at the UK level, and that a significant amount of comparative analysis subsumes data for devolved

administrations. A rather detailed and structured exercise would be required to provide a rigorous comparison between Scotland and other countries in Europe of a similar size or with parallel aspirations for the environment.

However, in the chapters that follow the experience in Scotland has been considered in relation to that elsewhere in Europe, looking at the level of ambition which has been set and the issues arising in delivering the relevant outcomes. A broader perspective on performance in the three areas of policy taken together is offered in the concluding chapter.

Scotland is well known for the quality of its natural environment and in recent years the Government has set a series of rather ambitious objectives for maintaining and enhancing the environment in both urban and rural areas. It is clear that the environment is seen as a priority by the Scottish Government and the theme receives prominence in broader political statements as well as in particular spheres of policy. In setting the bar relatively high, the Government then needs to take the necessary measures to match its aspirations including the allocation of adequate funding. The issues that then arise form the background to this report.

We are grateful to the considerable range of people in Scotland who gave their time to the team working on this project. They are in no way responsible for the conclusions that we have drawn.

2 THE FARMED ENVIRONMENT

Key Messages

Scotland's agricultural landscape is particularly rich in its diversity of habitats, the extensive areas of High Nature Value (HNV) farming systems and the significant proportion of carbon rich soils. At the same time, there are sustained environmental pressures associated with agricultural management such as water pollution and a continuing decline in the viability of some of the most environmentally valuable farming systems. This is despite the range of regulatory instruments in place and the availability of funding sources to protect, maintain and enhance the farmed environment. The key findings from this review of the implementation of the main policies used in Scotland are:

- The Scottish Rural Development Programme (SRDP) has an ambitious integrated design seeking to address social and economic concerns in parallel with environmental objectives. In practice it has not delivered its full potential with respect to the environment, for reasons which include a slow start, a complicated application process, numerous programme modifications and a lack of accessible advice to farmers. More specifically the extent to which it is able to deliver environmental outcomes is hampered by:
    - The extent to which the SRDP is skewed towards support for less favoured areas, where the distribution of support favours productive farms rather than the HNV systems;
    - The very limited budget allocated to agri-environment schemes compared to the country's agricultural area (second lowest of all 27 Member States)

  - The focus of environmental expenditure within designated sites, so that there is more limited funding available to support environmental management in the wider countryside;
  - Extremely low uptake of environmental advice by land managers
  - A lack of published evidence on the implementation, targeting and environmental effectiveness of the SRDP.

- Progress is being made in addressing diffuse water pollution, led by SEPA, demonstrating the importance of systematic monitoring and the provision of advice to land managers. However, breaches of the Nitrates Directive continue to be a cause of concern.

- There is some doubt about whether the communication and subsequent application of the requirements of the EIA regulations in agriculture is as methodical as is needed to protect semi-natural habitats, reducing the potential of what could be a powerful tool.

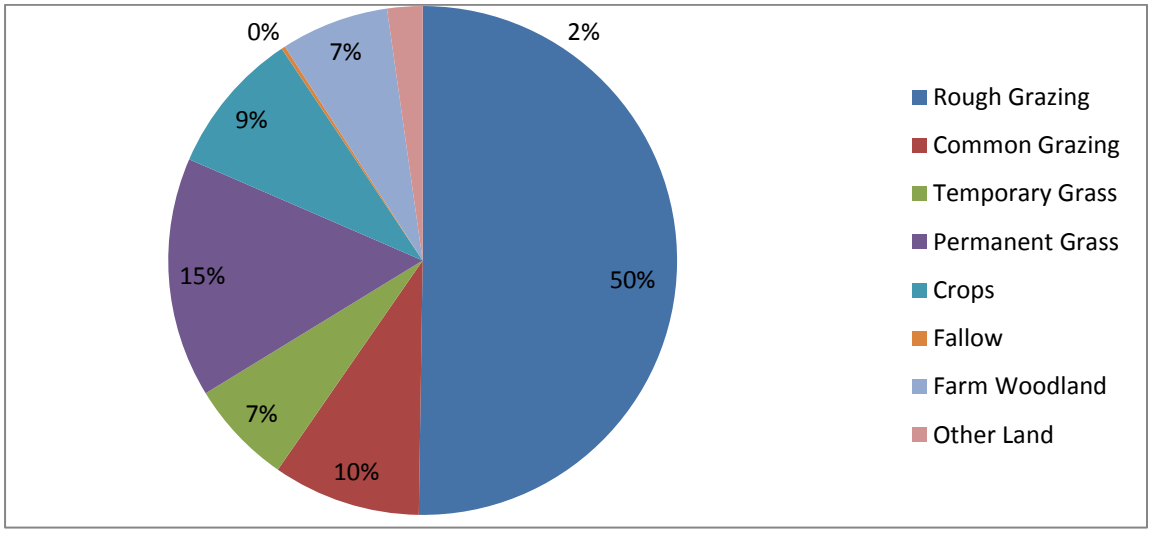
A significant investment in advice to farmers on environmental management and improvements in its accessibility would help to achieve much more from not only the SRDP, but improved compliance with legal obligations, for example under the Water Framework Directive and the EIA regulations.

2.1 Introduction and Context

Almost three-quarters of Scotland's land area is under agricultural use, totalling 6.21 million hectares. Of this, most is under grass, with the majority of this classified as rough grazing (see Figure 1). Eighty-six per cent of the agricultural area (5.34 million hectares) falls under the Less Favoured Area (LFA) designation, of which two thirds is made up of rough grazing holdings[1]. The more fertile, lowland areas, where cereals are cultivated and more intensive livestock and dairy production is carried out, make up the 14 per cent of farmland that is not in the LFA which is located mainly along the eastern coast (Scottish Government, 2012e). Only 20 per cent of farmland is enclosed and this area has declined since the late 1990s with the area of land used for arable and horticulture falling by 14 per cent between 1998 and 2007 (11 per cent in the lowlands and 25 per cent in the intermediate uplands and islands) while the area of improved grassland has increased by nine per cent.

[1] The remaining third of the LFA largely consists of grassland (20 per cent) and woodland (7 per cent). Only a small proportion of LFA is cropland with two thirds of this being cultivated for fodder crops

Figure 1: Breakdown of Scotland's agricultural area



Source: Scottish Government, 2012e

The way that this agricultural land is managed is critical for achieving a whole range of environmental outcomes. Ensuring appropriate levels of livestock grazing is particularly important in Scotland to avoid both overgrazing and undergrazing as both have potentially negative impacts on the environment. In areas where arable production takes place, key issues include soil erosion and threats to water quality, with the priority being to encourage improvements in the management of nutrient inputs and soils.

A number of policies are in place which can be used to influence land management and either require or incentivise actions that are environmentally beneficial, either through maintaining existing good management or by engendering a change in farm practices. This chapter focusses on those policies that have the potential to have the greatest traction in relation to agriculture in Scotland and where the Scottish Government has the responsibility or power to design and structure the way they are implemented. It considers the implementation of elements of the Common Agricultural Policy (CAP), specifically cross-compliance, the Less Favoured Area Support Scheme (LFASS) and the agri-environment measure. Outside the CAP, consideration is also given to the Water Framework Directive and the EIA Directive (Agriculture) in Scotland and the degree to which they are delivering the necessary scale of environmental outcomes to meet Scotland's environmental objectives and targets in practice.

2.2 Environmental trends associated with agriculture

Evidence from several sources suggests that in general, since the 1990s, the state of the agricultural environment in Scotland is improving. However, such broad assessments do not necessarily present an accurate reflection of the situation, either because they mask what is happening in particular locations, within specific farming systems or in relation to particular species. As a result, taken in isolation they paint an overly positive picture, concealing the existence of significant local environmental problems.

This can be illustrated by trends for both the farmland bird index[2] and water quality.

Farmland birds: Despite the data indicating that farmland and upland birds are thriving, the reality is that there is significant cause for concern in relation to a substantial range of species, with almost half of those on the index in decline.

Although the overall trend for the farmland bird index in Scotland since 1994 shows an overall increase of 19 per cent in bird numbers when averaged across the 27 species that are included within the index, this masks declines in 12 species as well as an overall decline of eight per cent between 2009 and 2010 (SNH, 2012a). Farmland species showing the greatest declines between 1994 and 2010 are lapwing (-52 per cent), rook (-34 per cent) and kestrel (-67 per cent). In relation to upland birds, the index has remained stable over this period. However this masks declines in eight of the 16 species on the index, with the meadow pipit, the golden plover and the dipper experiencing over 30 per cent decline and the black grouse and the curlew having declined by more than 40 per cent (SNH, 2012a). The healthy picture provided in the aggregated data for the farmland bird index is influenced by some notable successes in increasing numbers of particular species, such as the corncrake (+158 per cent), goldfinch (+261 per cent) and great tit (+116 per cent). In the case of the corncrake this has been the result of proactive and targeted action. In addition, the index does not take account of some farmland species that have declined to such an extent that insufficient numbers remain to provide statistically significant sampling sizes. These include species such as grey partridge, tree sparrow and corn bunting.

The declines are thought to be linked to changes in land management in both the lowlands and the uplands leading to a loss of landscape diversity and breeding habitat, increased pressure from predation and increased commercial forestry (Amar *et al*, 2011). Indeed, it only takes a small change in the rate of fledgling success and adult survival to make a difference in the trends of many species. There is concern that the woodland expansion policy, with a target to increase the total woodland area by 100,000 hectares by 2022 could exacerbate this trend unless woodland creation is located carefully to avoid negative biodiversity impacts (WEAG, 2012).

Water quality: Evidence shows that overall the quality of Scotland's water bodies has improved significantly over the last 20 years[3]. However, significant problems remain in some areas and are due largely to nutrient run off from agricultural land and high carbon concentrations associated with carbon loss from soils. For example, in 2010, 63 per cent of Scotland's water bodies were classified as being in good or better status (Critchlow-Watton, 2011). However, this varies in different parts of the country. For example, the Scotland river basin district (RBD) currently has 34 per cent of its water bodies in less than good (ie moderate, poor or bad) condition, whereas for the Solway Tweed river basin district this figure is 53 per cent. Indeed, 18 per cent of water bodies have less than good status as a result of diffuse pollution from agriculture (16 per cent in the Scotland RBD and as many as 39 per cent in the Solway Tweed RBD) (SWD(2012)379/final[4]). This is a key issue that will

[2] Index of Abundance for Scottish Terrestrial Breeding Birds, 1994 to 2010: see http://www.snh.gov.uk/docs/B1051218.pdf
[3] http://www.environment.scotland.gov.uk/our_environment/water.aspx
[4] http://ec.europa.eu/environment/water/water-framework/pdf/CWD-2012-379_EN-Vol3_UK.pdf

need to be addressed if the Water Framework Directive targets for 2015[5] for these two areas are to be met (see section 1.3.3 below).

The recent update of the natural capital asset (NCA) index for Scotland[6] shows that the overall stock of natural capital in three agricultural habitats (moorland, grassland and cropland) is still below the levels seen at the turn of the century (Scottish Natural Heritage, 2012b). For heather moorlands, this decline was linked to issues such as bird of prey persecutions, encroachment of bracken, a reduction in net carbon sequestration in peatlands and loss of plant biodiversity. The index suggests that there has been a partial recovery in the stock of natural capital associated with grassland after a decline over the first half of the last decade, which had been associated with an increase in the conversion of grassland to arable use. More recently the grassland area seems to be increasing again.

While there has been an increase in the proportion of designated sites in favourable condition (from 71.4 per cent in 2005 to 77 per cent in 2012) and bird populations in these areas have risen accordingly, there have been reductions in most other measures of natural capital, such as species richness. The situation in relation to cropland is mixed. Despite improvements in natural capital between 2000 and 2005, resulting from rising crop yields, accompanied by reduced fertiliser usage, an increase in the area managed under agri-environment schemes, as well as increases in bird and butterfly populations, from 2005 onwards natural capital on cropland has declined steadily. This is reported as being due to a combination of factors, including the reduction in the area of set-aside, fodder crops and mixed farming, falling livestock grazing, an increase in non-native invasive species, a decline in the species richness of improved grasslands, along with loss of hedgerow length and quality (SNH, 2012b).

The key environmental trends associated with agricultural land management, as identified in the literature, are set out in Table 1.

Table 1: Trends for a selection of environmental issues on Scottish agricultural land

Environmental issue	Overall trend	Specific issues	Source
Farmland biodiversity	+ / -	• Overall increase of Scottish Terrestrial Breeding farmland birds since 1994, although decrease since 2008 but significant declines over period for 12 of the 27 species. • No change in overall upland bird index since 1994 but significant declines in 8 of the 16 species. • Butterfly index: there has been a 58 per cent decline in specialist butterfly numbers (6 species) since 1979, although from 2000 this seems to have stabilised	• SNH, 2012a; http://www.snh.gov.uk/docs/B1051218.pdf • SNH, 2012c; http://www.snh.gov.uk/docs/B424909.pdf
Agricultural landscapes	+/-	• Change in landscape composition since 1998 - decline of arable and horticultural land (13.6 per cent), 9 per cent increase of improved grassland. Also 7.9 per cent	• Countryside Survey, 2007, chapter 5

[5] 2015 targets for the proportion of water bodies in good or better condition are: Scotland RBD – 71per cent and Solway Tweed RBD – 52 per cent

[6] This takes into account the provision of a range of ecosystem services (such as fresh water, pollination and soil formation) on seven broad habitats in Scotland

		increase in acid grassland (largely located in the uplands) over same time period (mainly from other upland habitats, dwarf shrub heath and coniferous woodland) • Decline in the quantity and quality of boundary and linear features between 1998 and 2007, with negative implications for farmland biodiversity. Species richness in vegetation associated with boundary features declined by 13 per cent over the same period. Examples of decreases include: o The length of managed hedgerows fell by 7 per cent. Only 36 per cent were classified as being in good structural condition. On arable land, only 6 per cent were managed. o The length of woody linear features decreased by 5 per cent. o The length of walls in upland areas decreased but to a lesser extent. The reduced number of landscape features and their lack of management has had an impact on associated biodiversity.	
Water quality	+ / - but significant problems associated with agriculture	• 63 per cent of Scotland's water bodies were classified as being in good or better status in 2010 – but 18 per cent of water bodies are in less than good status as a result of diffuse pollution from agriculture – a particular issue in the NE and SW. • More than 80 per cent of Scotland's groundwater is in good condition – but significant problems remain in some areas, with agriculture a key cause. • Almost three-quarters of lochs are good or high quality, although excessive nutrients from agricultural land are still a cause of concern. • Nitrate concentrations in water have declined since 1993, but a noticeable proportion are still above limits set out in NVZs: o The proportion of monitoring sites with concentrations of nitrate below 0.3 mg N/l has increased from 32 per cent in 2003 to 41 per cent in 2011 (considered as natural or background levels). o The percentage of sites with average nitrate concentrations ≥2.5 mg N/l has declined since 1997 (25 per cent) and 2011 was the lowest level recorded of 15.6 per cent. A small percentage of sites, however, still have a nitrate concentration of >7.5 mg N/l. • Carbon concentrations in many water bodies have doubled between 1989 and 2009, due to carbon loss from soils – causes are still debated and may include greater acidity levels in soils, climatic factors such as temperature increases and different rainfall patterns, changes in land management. This is costly for water companies who have to remove it to avoid 'brown' drinking water	• Critchlow-Watton, 2011 • Natural Scotland, Scottish Government, 2012a; • Scottish Government, 2012c • IUCN Commission of Inquiry on Peatlands • Natural Scotland, Scottish Government, 2009a; • Scottish Environment Protection Agency, 2009

Water availability	+/-	• Not major issues at the national scale. Low levels of irrigation and water abstraction for agriculture (1.8 per cent of all agricultural holdings). However, where it is used, water sources are facing increased pressure • Despite this, agricultural irrigation is preventing 4 per cent of rivers in the Scotland RBD achieving good ecological and chemical status.	• Scottish Government, 2012c
Soil functionality	-/(+)	• Generally high levels of soil organic matter (SOM) due to large areas of peatland (average is 72 t/ha) but the average carbon content for arable soils is 47 t/ha. • Concerns that insufficient attention is being paid to maintaining SOM to avoid diffuse pollution, raising GHG emissions and flood risk due to greater chance of water run off. • Doubling of carbon losses from soil to water bodies since 1989 (see water quality). • Greater levels of soil compaction expected due to wetter weather in the future. • Soil erosion caused by overgrazing in uplands. • Anticipated increases in soil losses in eastern arable areas in the future. • Increased application of sewage sludge between 2004-2008 – not only by area but also tonnes of sludge/ha (4,097 tonnes over 818 ha (2004) to 3,969 tonnes over 3,969 ha (2008)).	• Countryside Survey, 2007; • Scottish Government, 2012c; • Dobbie et al, 2011; • Scottish Environment Protection Agency, 2009
Climate change mitigation	+	• Greenhouse gas emissions associated with agriculture have fallen by 27 per cent since 1990 and 2.6 per cent since 2009 due to reduced livestock numbers and arable conversion to grassland – in 2010 the agriculture and related land use sector accounted for 18.8 per cent of total emissions (10.5 $MtCO_2e$). • Increased carbon losses from soils.	• Natural Scotland, Scottish Government, 2012a; Committee on Climate Change, 2012; • Dobbie et al, 2011
Resilience to flooding	-	• Increased carbon losses from soils likely to increase runoff and increase flood risk in the future.	• Dobbie et al, 2011

Source: Own table, based on literature reviewed.

At a national level the Scottish Government has issued five strategic objectives accompanied by 50 indicators to monitor progress towards achieving sustainable economic growth through actions taken by the Scottish Government[7]. In terms of achieving environmental outcomes in agriculture, the 'Greener' objective[8] and environment national outcome[9] are most relevant with just five indicators of significance to agriculture. The Government's own appraisal of progress on these national indicators in recent years is shown in Table 2.

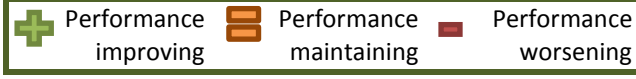
[7] http://www.scotland.gov.uk/About/Performance/scotPerforms

[8] The 'Greener' objective aims to 'improve Scotland's natural and built environment and the sustainable use and enjoyment of it and facilitate the transition to a low carbon economy'. http://www.scotland.gov.uk/About/Performance/scotPerforms/objectives/greener

[9] The environment national outcome seeks to protect and enhance natural assets across all sectors. http://www.scotland.gov.uk/About/Performance/scotPerforms/outcome/environment

Table 2: Scottish Government National Indicators

National indicator	Trend
Improve the state of Scotland's historic sites (2009-2011)	
Increase people's use of Scotland's outdoors (2006-2011)	
Improve the condition of protected nature sites (2007-2012)	
Increase the abundance of terrestrial breeding birds: Biodiversity (2006-2010)	
Reduce Scotland's carbon footprint (2006-2009)	



Source: Own table. Data accessed from: http://www.scotland.gov.uk/About/Performance/scotPerforms/indicator

2.3 Performance of policies in delivering environmental outcomes on farmland

The most significant policy in place with the capacity to influence the delivery of environmental outcomes on agricultural land is the CAP, particularly elements of the Scotland Rural Development Programme (SRDP) and cross compliance. The Water Framework Directive (WFD) and the EIA Directive (Agriculture) also play an important role. The series of sections below consider the extent to which these policies are delivering the environmental improvements needed in Scotland in practice. They consider the following policies in turn:

- The Scotland Rural Development Programme as a whole, including agri-environment and less favoured area payments,
- Cross compliance under the CAP,
- Implementation of the Water Framework Directive on farmland,
- Implementation of the EIA Directive on farmland.

2.3.1 CAP: Scotland Rural Development Programme

The Scotland Rural Development Programme (SRDP) is an important policy mechanism for facilitating the delivery of environmental benefits through agriculture. Three of its five key objectives (see Box A-1 in Annex 1) are related to the environment, with a focus on biodiversity and landscape, water quality and climate change. The structure of the SRDP is quite different to the majority of RDPs in other parts of the EU. Its design was intended to facilitate an integrated approach to the selection of measures across the three axes and Leader (see Box A-1 in Annex 1). However, in practice this has not been achieved for a range of reasons which are explored in more detail below.

In terms of the support provided to deliver environmental benefits in relation to agricultural land, it is the Rural Development Contracts, comprising both the Land Managers Options (LMO) and the Rural Priority (RP) schemes, alongside the Less Favoured Area Support Scheme (LFASS) that have the greatest potential, although other schemes may also play a role. Here, the overall budgetary allocation to different measures is examined first, followed by the environmental performance of the agri-environment measure and the LFASS, concluding with a brief look at a selection of other schemes that have the potential to deliver environmental benefits.

2.4 SRDP budget allocation and expenditure (2007-13)

The SRDP for 2007-13 has a budget of €1.37 billion (of which €0.68 billion is the EU contribution). In terms of the allocation of the budget between measures, 31 per cent of the total public budget programmed for 2007-2013 was allocated to the LFASS, with a further 18 per cent allocated to the agri-environment measure (via the LMO and RP schemes)[10]. When broken down by Axis, 72 per cent of total public programme expenditure was allocated to Axis 2 (environment), 12 per cent to Axis 1 (competitiveness), 10 per cent to Axis 3 and five per cent to the Leader approach.

Table 3 shows that Scotland's allocation of RDP funding for the agri-environment measure is below the EU average, with only eight other Member States allocating a lower proportion of their overall RDP budget to this measure. In contrast, Scotland allocates a relatively high proportion of its RDP budget to the LFA measure, even compared with other Member States with similar proportions of LFA relative to total agricultural area in their territories (such as Spain, Slovenia, Portugal and Ireland, which all have over 75 per cent of their rural land designated as LFA). Only Finland, with 95 per cent of its agricultural area designated as LFA, allocates a greater share of the RDP budget to the LFA measures (43 per cent) – see also LFASS section below.

Table 3: Budgetary breakdown of rural development measures in different EU countries

% total RDP public expenditure programmed	LFA measures (211, 212)	Agri-Environment measure (214)
0 – 20 %	BE, BG, CY, CZ, DK, EE, DE, GR, HU, IT, LT, LI, MT, NL, PT, PL, RO, ES, SW, UK	BG, GR, LT, LI, MT, PL, RO, SK, ES **Scotland**
21-30%	AT, FR, IE, LU, SK, SL	BE, CY, CZ, DK, EE, FR, DE, HU IT, LU, NL, PT, SL
31-40%	**Scotland**	FI
41-50%	FI	AT, IE, SW
51-70%		UK

By the end of December 2011, Scotland had spent 55.6 per cent of its programmed expenditure for the whole seven year period (€0.76 billion), slightly more than the EU average of 47.6 per cent. However, the pattern of expenditure is uneven, with considerable

[10] All financial figures quoted here are based on official financial indicator reporting data received from the ENRD Contact Point.

concentration on a few measures, such as the farm modernisation measure (where more than 100 per cent of the originally programmed funds have been spent) and the LFASS, where expenditure is extremely straightforward. Expenditure on the agri-environment measure is below the EU average at 40 per cent (EU average: 59 per cent) as is expenditure on a whole range of other measures (ENRD, 2012).

There is a range of reasons for this. Firstly, the SRDP experienced a slow start (EKOS *et al*, 2011; RSPB, 2011). The implementation of an ambitious integrated programme, although good in theory, has been beset with problems in terms of the practical implementation, with complicated application processes either taking a long time from inception to an agreement being signed, or putting off applicants altogether. More recently there has also been an issue with recipients of funding, particularly for significant capital investments, being unable to draw down the money because they have not been able to raise the private financing needed to match the SRDP contribution (pers comm SRUC, SNH and SEPA). Table A-4 in Annex 1 sets out the most recent expenditure figures, which illustrate that it is only since 2011 that the SRDP has really started operating at its full financial potential.

The original demand led nature of the SRDP meant that it was difficult to manage the budget to keep within the proposed allocations for different measures and the balance of EU/national funds[11].

Indeed, in order to manage the budget and the proportions of expenditure committed under different Axes, application windows, ie specific time periods, were introduced, with separate application windows for competitiveness and capital grants (Axis 1), agri-environment (Axis 2) and rural economy grants (Axis 3). Although this has enabled the Scottish Government to steer the allocation of the budget more effectively, it has effectively struck the death knell for the integrated ambitions of the programme. It would appear to mean that it is now essentially impossible to submit an integrated application for different measures combined within a single contract, as had been the intention originally.

An examination of the budget's distribution by region, using data until the end of 2010, shows that Grampian, the North East Peninsular, the Northern Isles and the lowland regions receive the largest proportion of SRDP funding overall. These are largely areas with the highest economic land value. Much smaller proportions are spent in the Highlands and Western Isles, more extensively farmed areas with high proportions of farm land of High Nature Value, often on the edge of economic viability, despite receiving payments for being in the LFA (RSPB, 2011).

Implementation of the agri-environment measure - Land Manager Options and Rural Priorities

In Scotland, the agri-environment measure is delivered via Rural Development Contracts (RDCs), both through the LMO and RP schemes. Both fund more than environmental

[11] As a result, a series of modifications has been put to the Commission over the past five years, largely to seek to change the budget allocations between different measures and to change co-financing rates to ensure that the full EU allocation is drawn down. By October 2012, 11 modifications had been submitted to the Commission – an average of two per year - see Programme Monitoring Committee minutes at: http://www.scotland.gov.uk/Topics/farmingrural/SRDP/PMC

management - the LMO scheme offers a general menu of basic economic, environmental and social measures open to all land managers and the RP scheme is competitive and provides funding for specific environmental projects, managing habitats, delivering biodiversity benefits (including funding for managing SSSIs and Natura sites), forestry, managing water and soils, enhancing landscape features, renewable energy measures, access provision, as well as farm diversification, support for rural communities and business improvement projects. Payments under RDCs are tapered to limit the amount of funding received by an individual holding. Applicants have a free choice of options and do not have to include agri-environment options in their application. The range of agri-environment options that are available to farmers is set out in Table A-3 in Annex 1.

Bearing in mind the fact that much of Scotland is upland grazing, there is perhaps a surprisingly high proportion of options under the LMO scheme that mainly address farmland in the lowlands (five out of 11 of the environmental options, three of which are specifically for arable), with four appropriate for upland livestock farms and two for woodland (Keenleyside *et al*, 2012). One of the reasons for this is perhaps the availability of support via the LFASS (see below), with the main source of agri-environment funding for upland areas coming from the discretionary RP scheme.

From the agri-environment options available under both the LMO and the RP scheme, the focus of the options seems to be more on landscape and biodiversity objectives than it does on resource protection (water, soils) or climate objectives, although this may change in the future. Of course, it should be noted that within the RDCs, other measures, such as some of the capital investment measures, for improvements to manure and slurry storage for example, can help achieve these goals. In addition, a number of the areas highlighted by the voluntary initiative 'Farming for a Better Climate' can be achieved through funding from a range of measures within the SRDP, although it is unclear from the evidence, the extent to which this is the case in practice[12].

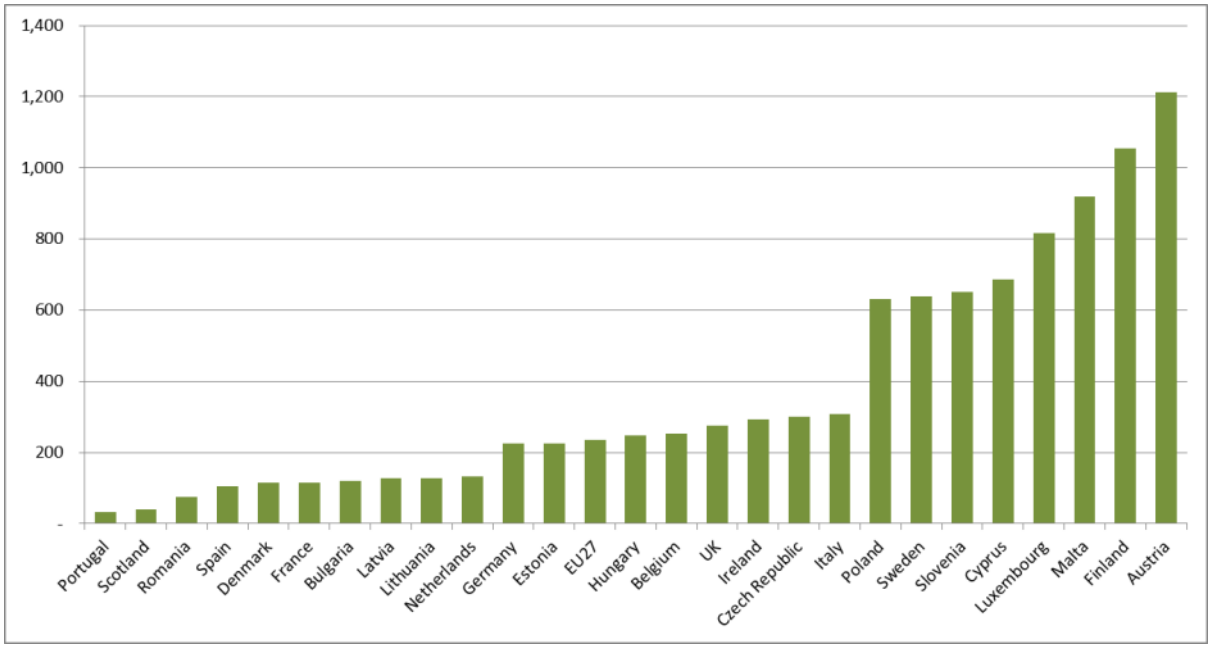
It is worth remembering the limited funding available for agri-environment in Scotland. The total programmed expenditure for the agri-environment measure for the whole programming period is €247.6 million. This amounts to an average of €35.4 million/year, although this has not been profiled equally over all seven years, given the slow start to the programme. Indeed the limited size of the budget becomes even more apparent when calculated by hectare of UAA and compared with the same figures for other Member States.

Scotland's agri-environment budget is equivalent to €39.9 per hectare averaged over the total UAA, with only one Member State, Portugal, having a smaller budget to hectare of UAA with €32.4/ha. Figure 2 shows the range of agri-environment budget/hectare figures for all Member States, including the average for the EU-27 (€235/ha). Scotland has a relatively small rural development allocation, which has been augmented via modulation and a large area of low intensity agriculture where it would be expected that payments would be smaller. However, there are several other European countries with sizeable areas

[12] The 'farming for a better climate' initiative outlines five key areas for climate change mitigation in agriculture: 'Using energy and fuels efficiently; Developing renewable energy; Locking carbon into soil and vegetation; Optimising the application of fertilisers and manures; and Optimising livestock management and storage of waste' (Scottish Government, 2011b)

of HNV farmland as well. Effective targeting is needed, therefore, to ensure that the limited funding available is spent on areas which can deliver the most added value and going beyond what is required by regulations and cross compliance standards of Good Agricultural and Environmental Condition (GAEC).

Figure 2: Agri-environment budget divided by total UAA for the EU-27 (€/ha)



Source: ENRD, 2012

To date, there is a lack of published evidence and evaluations assessing the environmental outcomes or impacts achieved through the RDCs. This lack of evidence on the implementation, targeting and environmental effectiveness of the LMO and RP schemes makes it very difficult to assess the degree to which biodiversity or other environmental objectives are being met in practice. A three year environmental evaluation is currently underway and focusses on the biodiversity impacts of the LMO and RP schemes in a range of different catchments[13]. A summary of the results of the first year field surveys highlights the biodiversity value of upland and semi-natural areas, when compared with lowland arable areas and the importance of agri-environment funding for 'maintaining the active management of these areas' (Environment Systems and Thomson Ecology, 2013). Initial results also indicate that the LMO and RP schemes are creating 'a more varied landscape … with arable and improved fields containing more variation and habitat blocks after the options have been established… [and] a good range of bird, insect and other species were noted…'. In addition, Scotland's Rural College (SRUC) has reviewed the costs and benefits of the implementation of biodiversity measures in Scotland. This should provide an indication of what has been delivered in terms of biodiversity as a precursor to assessing the cost-effectiveness of measures (pers. comm. SRUC).

[13] The evaluation, 'Measuring the Natural Heritage Outcomes Resulting from the Biodiversity Measures in the 2007-2013 Scotland Rural Development Programme' is being carried out by Environment Systems and Thomson Ecology.

Given the absence of any formal evaluation studies, any interpretation of the environmental outcomes of the scheme can therefore only be based on a qualitative assessment based on the types and distribution of option uptake and how these have changed over the programme period.

In terms of uptake of the agri-environment elements of the LMO and RP schemes, the target for the SRDP is to bring an additional 2,020,000 hectares of land and 4,545 holdings under agri-environment agreements by the end of 2013. This would mean almost a third of Scottish farmland under agri-environment management. However, at the time of the mid-term evaluation in 2009, the recorded number of holdings and the total area under agreement using the agri-environment measure were very far below these targets. The area under agreement accounted for only two per cent of the area set as a target at the start of the programming period, or 0.66 per cent of Scotland's utilised agricultural area (UAA) (see Table 7). Both these figures are extremely low compared to most other Member States (the average area under agreement being 24 per cent of UAA).

It is very difficult to establish the number of additional LMO and RP agreements that have been signed and the area covered since 2010 in order to update these figures. However, information from the PMC meeting in August 2012 showed that 170 agreements for the maintenance of organic farming had been signed since its introduction in 2011, covering 8,460 hectares. Since 2011, expenditure under the SRDP has increased significantly, and RP expenditure figures show a significant proportion of funding allocation to the agri-environment measure (see Table 4), which would suggest that uptake of the agri-environment scheme has increased considerably, but by how much is unclear.

Table 4: Output indicators for the agri-environment measure in Scotland (December 2009)

Measure	Output Indicator title	Total achieved at Dec 2009	Target	% target achieved
214	No of farm holdings/holdings or other land managers receiving support	471	4,545	10.4
	Total area under agri-environment support (ha)	41,415	2,020,000	2.05
	Physical area under agri-environment support (ha)	No data	20,200	-
	Total no of contractors	559	1,807	30.9

Source: EKOS *et al*, 2010

Despite this poor performance against the targets, amongst those agreements that have been signed, agri-environment options feature to a greater extent in LMO agreements than any other measure. Under the LMO scheme in 2010, 23 per cent of expenditure was focussed on agri-environment activity and 34 per cent of agreements contained agri-environment options. For the RP scheme, 2012 figures showed that 36 per cent of the budget is allocated to agri-environment options[14]. Under the RP scheme, the seven most

[14] Within the LMO the other measures with significant uptake are 132 (food quality schemes) and 323 (conservation of rural heritage) with 17 per cent uptake each. Modernisation of agricultural holdings has the fourth greatest uptake with 14 per cent. Uptake for the remaining measures is: infrastructure development (5%); animal welfare (5%); afforestation of non-agricultural land (5%); afforestation of agricultural land (5%); forest-environment (4%); vocational training (3%);

popular scheme actions (ie those which feature in the most number of cases) are all agri-environment measures, with woodland creation and business development the next most popular[15]. Annex 2 provides information on expenditure under the RP scheme by measure and Axis up to October 2012.

Considering RP scheme expenditure by region up to October 2012, the Highlands (£102 million) and the Grampian region (£95 million) are the two regions that have the most funding allocated to them under approved RP contracts (see Table A-4 in Annex 1). However, when regional expenditure is considered in relation to the agricultural area, a different picture emerges, with below average payments in the Highlands (£48/hectare) and above average payments in Grampian (£135/hectare)[16]. In fact, the majority of SRDP spend is focussed in the south and the east. Although this does not necessarily reflect the distribution of environmental expenditure per region, a recent report by the RSPB suggests that this distribution also reflects agri-environment expenditure (RSPB, 2011). Part of the reason for the high level of funding and high level of payments per hectare is the fact that farmers employed agents to help them source funding and complete applications (RSPB, 2011).

The SRDP Mid-term evaluation (MTE) concluded that 'the LMO and RP schemes are logically coherent, but have not to date delivered evidenced transformative change. At this stage it is not possible to assert whether this is a function of scheme design or lack of evidence caused by the associated field evaluation challenges.' In reality, it is likely to be a function of both these issues, as highlighted by feedback from other stakeholders. For example, the RSPB has argued that the RP scheme is insufficiently targeted, leading to a 'scattered and diluted environmental benefit' and that there needs to be some re-balancing between the LMO (and LFASS) and the RP scheme to improve the delivery of environmental benefits from these schemes in order to relieve the pressure on the RP scheme (RSPB, 2011).

In relation to prioritising actions for biodiversity, two key issues stand out:

- First is that, due to the limited budget, the focus of expenditure tends to be on farms within designated sites (SSSIs and Natura 2000 areas in particular) where the government has clear targets to meet. This means that it is extremely difficult to extend support for environmental land management into the wider countryside, for example to support HNV farming systems more generally (SRUC, pers.comm.).

- Second there are issues with the availability of advice to land managers (see also below). Whereas SEPA is increasingly focussing on advice as a means of changing farmers' behaviour in relation to diffuse water pollution and has advisers proactively speaking to farmers in the 14 'priority catchments', this level of advisory activity is not taking place

tourism activities (3%); improving the economic value of forests (2%). The share of support accessed via the RP scheme is more heavily weighted between just three measures, agri-environment (36 per cent), modernisation of agricultural holdings (25 per cent) and afforestation of non-agricultural land (22 per cent) with the remaining 16 measures receiving between 0 and 5 per cent each.

[15] The seven most popular actions are: RP21421A - Water Margins - Enhance biodiversity; RP21433A - Hedgerows - 3 years for biodiversity benefits; RP21418 - Management of Wetland; RP21414 - Management of Species Rich Grassland; RP21402 - Wild Bird Seed Mix/Unharvested Crop; RP21403 - Mown Grassland for Wildlife (figures from October 2012 PMC update).

[16] Average payment is £86/hectare (see A-4 in Annex 1)

for biodiversity issues. Although advice is available to farmers on a fee basis, they are only able to claim back a fixed cost against the total fee charged by the adviser and because biodiversity advice tends to take longer to provide on average than advice on resource protection issues, and so is more costly, this tends to be less financially attractive to farmers (SRUC pers. comm.).

The main issues with delivery of the programme as identified in evaluations of the SRDP to date (Cook, 2009; EKOS *et al*, 2010; RSPB, 2011) include: little targeting of schemes to areas of greatest environmental need, beyond a focus on designated sites; limited area of land under agreement meaning that the scale of delivery is insufficient to deliver the landscape scale benefits needed; varying ability of agents to deliver specialist advice and a reluctance by them to ask specialists for the necessary information; lack of aftercare, which is not a formal requirement of the scheme. A range of potential solutions relating to these issues are being put forward for discussion in relation to the design of the SRDP for 2014-2020 and are not repeated here.

The need for the LMO and RP schemes to incentivise a greater uptake of sustainable management practices is backed up by a survey carried out in 2010 on current trends in Scottish arable production methods, which shows that there is still some way to go to ensure that the majority of farmers apply sustainable management techniques on their holdings. Information on the proportion of land under different agricultural practices in set out in Table 5.

Table 5: Trends in Scottish agricultural practices (2010)

Agricultural practice	Trend
Reduced tillage	Only carried out on 11 per cent of arable areas with the remaining area undergoing inversion tillage
Winter cover	44 per cent of arable areas have autumn/winter cover crops, 39 per cent have stubble and 15 per cent have bare soils (the remaining two per cent have intermediate cover crops)
Crop rotation	79 per cent of arable holdings have no crop rotation system
Manure and slurry application	37.2 per cent of holdings applied manure or slurry, of which only 14.5 per cent of manure users and 8.6 per cent of slurry users applied it immediately
Manure and slurry storage	Only 23.1 per cent of holdings had storage facilities for manure and just 11.9 per cent for slurry
Landscape boundaries	37.8 per cent of holdings maintain hedges; 14.4 per cent maintain tree lines; and 30.8 per cent maintain stone walls. In the last three years, 8.3 per cent established hedges; 9.6 per cent established tree lines; and 4.2 per cent established stone walls.

Source: Own table compiled with data from the Scottish Government, 2012c

NB The sample used to inform this survey represents 4,400 holdings (~6,000 were contacted) of the 34,000 holdings recognised in the 2010 Farm Structure Survey. The responses are weighted according to the ratio of holdings in the sample and complete dataset. The numbers of holdings provided in the table above were calculated in the report using weighting factors and were then rounded.

Information provision and advice for agri-environment management

Evaluations of the operation of agri-environment schemes in many parts of the EU have shown that outcomes from voluntary measures can be improved by both the tailoring of schemes to priority areas or issues, and accompanying them with the provision of good quality and accessible guidance and advice to land managers. Evaluations of agri-environment schemes in the UK and Germany have shown that farmers valued feedback and recognition of their achievements and that this is particularly important when benefits are not necessarily observable to the non-expert (see Poláková *et al*, 2011; Keenleyside et al, 2012).

In Scotland, significant issues with the provision of advice were raised in relation to the LMO scheme by those surveyed for the mid-term evaluation (EKOS *et al*, 2010). Feedback from applicants suggested that the information provided needed to be made simpler and clearer and that the online information was not sufficiently accessible. Indeed, only two per cent of applicants had heard about the LMO scheme via the Scottish Government website, with the highest proportion having heard about the scheme through an advisor (19 per cent). For the RP scheme, advisers (25 per cent) and the press (26 per cent) were the two most common sources of information about the scheme. Feedback from applicants suggested that the RP application process was too complex, lacked transparency and stated that the website was difficult to navigate. The need for more personal contact during the application process was also highlighted.

In terms of providing training in relation to the LMO and RP schemes, the mid-term evaluation showed that only three per cent of respondents had opted for training under their LMO scheme and the figure was even lower for the RP scheme at two per cent. If this is indicative of all RDC beneficiaries, then this is a cause of some concern. More recently, SEPA have invested heavily in advice provision in 14 priority catchments as a means of changing farmers' management practices to prevent diffuse water pollution as a means of meeting Scotland's targets under the Water Framework Directive (WFD). This includes providing advice on seeking funding via the SRDP, both for agri-environment activities as well as capital investments. Although SRUC has funding from the Scottish Government to provide advice to farmers in relation to biodiversity, this is demand led as there is a charge to the farmer and therefore the advice is not necessarily getting to those farms where it would be most beneficial.

This is clearly an area where improvements are needed for the 2014-2020 period. There are a number of interesting examples of different approaches to providing advice in other Member States (see Box 1 and Box 2). In a number of countries, the participation in an agri-environment scheme is conditional upon attending training events (for example Estonia, Germany).

Box 1: Advice for the setting-up of farm level nature management plans in Germany

Optimising the nature conservation efforts of a farm is a complicated process. It involves respecting the legislative restrictions - both conservation and other types of legislation, choosing from the menu of agri-environment scheme practices and realising the specific potential and overcoming the issues of individual farms. In Germany (Rheinland-Pfalz[1], Lower Saxony and nationwide[2]) farmers are supported in their planning for nature conservation, mostly under agri-environment agreements, at the farm level.

Through communication between farmers and environmental advisors and ecologists an inventory of the farm holding is produced which identifies the most relevant agri-environment practices available and tailors these to the individual needs of the farm. In Rheinland-Pfalz, a consultant for the state environment advisory service and one from the farming advisory service, supported under measure 323, carry out the work together. In addition to this initial advice, the farmers participating in the agri-environment scheme must participate in at least two training courses in a five-year period. In Lower Saxony advisors at the county level, supported under measure 114, provide general environmental and farm specific advice for participation in the contractual nature conservation scheme.

Planning nature-relevant measures at the farm level together with farmer helps to deliver the right level of environmental management, as well as raising trust and awareness amongst farmers about conservation priorities and agri-environment programmes. Indicators and monitoring show that there is greater acceptance of measures where a conservation plan has been drawn up and better conservation results. The conservation advisors give feedback to farmers and to administrations at least once a year.

This type of approach relies on flexible measures that can be tailored to the needs of individual farms and regions as well as accessible schemes. It is also important to ensure that those individuals providing the advice are trusted by the farmer and this can take time to establish. This level of advice is also labour intensive, both for the farmer and the advisors. The farm-level planning takes around two days of work for both parties.

[1] www.partnerbetrieb-naturschutz.rlp.de/ [2] www.kulturlandplan.de/

Source: ENRD (2013)

Box 2: Advisory services for nutrient management practices in Sweden

In Sweden the agricultural sector is responsible for reducing nitrogen and phosphorus emissions in order to comply with the national environmental quality objectives introduced in 2000. To help guide this process, the project 'Focus on Nutrients' has been introduced by the Swedish Board of Agriculture in collaboration with the Federation of Swedish Farmers, county authorities and agricultural advisory organisations. The project, financed with both national and EU funds, takes the form of an advisory service which adopts innovative training and advisory approaches in order to implement cost-effective environmental and climate measures at farm level.

Training is provided to both farmers (at regional level) and advisors (at national level). Communication tools such as websites and advertisements also help to contribute to the dissemination of good nutrient management practices and help improve awareness of related legislation. The advice programme is voluntary, free of charge and individually tailored to farms that have more than 50 hectares of land or 25 livestock units. The programme involves a start-up visit by qualified advisors to identify particular practices to be adopted by the farmer.

'Focus on Nutrients' has become a well-established concept among the farming community and currently has more than 8,000 members. Since the beginning of the project in 2001, 40,000 farm visits have been carried out by 250 advisors in the effort to reduce nutrient losses. Nine out of ten farmers implement the measures proposed and the majority of farmers state that they have become more environmentally aware and that the process has positively affected profitability. Results show that farms have become more resource efficient, decreasing nitrogen and phosphorus leaching by 800 and 30 tonnes per year respectively and that there has been good cooperation between all types of farmers (livestock, arable, organic and traditional) and different organisations.

The example provided demonstrates that changing farmers' attitudes and practices need not be difficult. It requires time and convincing explanations about the importance and positive effects of the proposed measures - not only for the environment, but also for farmers' businesses. It is also essential that the advice relies on repeated voluntary visits and that each farmer's achievements are monitored and communicated.

Source: ENRD (2013)

Less Favoured Area Support Scheme

Scotland, with a much higher proportion of LFA land than most EU countries, allocates a major share of the RDP budget to LFA support (31 per cent). This compares to the EU average of 22 per cent. Even when compared to other Member States with similar proportions of their UAA designated as LFA, the proportion of spend allocated to LFA support is high as shown in Table 6. This measure has been given a central role in the SRDP. All land within the LFA is eligible for the LFASS (target uptake is approximately 71 per cent of the area).

Table 6: LFA Support as a proportion of total RDP programmed expenditure in selected Member States

Member State	Proportion of UAA designated as LFA	% RDP programmed expenditure (measure 211 – mountain areas)	% RDP programmed expenditure (measure 212 – intermediate areas)	% RDP programmed expenditure (211+212)
Spain	82	3.6	2.8	**6.4**
Portugal	92	14.7	1.9	**16.6**
Slovenia	92	20.1	3.9	**24**
Ireland	78	-	26.7	**26.7**
Scotland	86	-	31	**31**
Finland	95	24.1	19.2	**43.3**

Source: ENRD, 2012

The scheme has been subject to a number of revisions during the current programming period, with the latest changes applying from 2011. At the time of the mid-term evaluation, payments had been made to all holdings (13,050) and 96 per cent of the area targeted (3.24 million hectares out of a target of 3.37 million hectares).

In terms of the type of land that receives support under the LFASS, 75 per cent is classified as rough grazing, with only three per cent arable. Although the LFASS does not have any explicit environmental objectives or options, it is an important form of support in upland areas to support High Nature Value (HNV) farming systems. In these areas, the payments can provide a means of stabilising incomes on farms, many of which are on the edge of economic viability and consequently where the land may be at risk of insufficient management or abandonment.

However, the sizeable areas of HNV farmland are not necessarily where support is in fact targeted. One of the criticisms of the LFASS has been that it 'results in higher levels of support going to the more productive and least disadvantaged areas in the LFA; this is counter to the spirit and intentions of the EU regulations and fails to provide adequate support to the most economically vulnerable and environmentally important farm and crofts within the current LFA' (RSPB, 2012). This assessment is based on the distribution of funding prior to 2010, but is likely to remain valid, despite the 2011 changes in payment rates, as set out in Table A-5 in Annex 1 (SNH pers. comm.).

The changes in payment rates have only been revised upwards for 'standard areas', ie the more productive parts of the LFA with better land. Although greater increases in payments have been provided for those farming on the poorest quality land (38 per cent increase) than on more productive land (5 per cent), these changes simply mean that the least

productive land in 'more productive' areas end up with the lion's share of the funding (ie those in the North East and the South West) rather than farms in the North West which are on the brink of viability. New minimum stocking density thresholds for each grazing category were also included in the revised rules to ensure as many land managers in extensively grazed areas as possible could access the scheme. A modest but positive change that should benefit HNV farming systems is that, in recognition of the costs associated with running small farms, especially in outlying areas, a minimum payment of £385 is now available to everyone eligible for LFASS. Farmers receive either £385 or their calculated LFASS payment, whichever is the greater. No analysis is available to demonstrate how these revised payment rates for standard areas on more disadvantaged land will affect this regional distribution.

Expenditure and uptake of other measures within the SRDP

Beyond the agri-environment and LFA measures, the share of realised expenditure for rural development land management (Axis 2) measures (where the main focus is on annual payments for farmland and forestry) is comparatively lower in Scotland than the EU-27 average to the end of 2011. Overall uptake rates in this part of the programme have been disappointing. Indeed most of the Axis 2 measures that have been applied in Scotland (with the exception of the LFA, non-productive investments and afforestation of agricultural land measures) have realised less than 45 per cent of programmed expenditure, despite being five years into the seven year expenditure period. Disbursement of planned funding has progressed at a faster rate for Axis 1 and Axis 3 measures, as demonstrated by the significantly higher proportion of spend on farm modernisation (>100 per cent of the amount originally programmed) (ENRD, 2012).

Of course, many of the measures under Axis 1 and Axis 3 could be used to deliver environmental benefits, such as advice provision, capital investments on farms, farm diversification, tourism activities, and so on. However, there is no systematic publicly available information on the extent to which these measures are used for environmental purposes in Scotland. One area that experts highlight as having received significant expenditure is on capital grants to install slurry stores on livestock farms to help reduce diffuse water pollution and new livestock sheds to avoid poaching of the ground in winter (pers. comm. SEPA, SNH, SRUC) (See Box 3).

Box 3: Slurry Stores

The need for investment in slurry storage is considerable, as there continue to be significant issues with farmers spreading excess slurry at the wrong time of the year but, on the other hand, such investments can eat into a limited rural development budget, meaning less funding available for other purposes. There is an argument that such costs should be borne by the farm business to avoid non-compliance with environmental regulations under the polluter pays principle rather than by the public purse. However, the costs of new storage facilities is proving difficult for many farmers to absorb – even finding the 50 per cent of private funding where the remainder is funded through the SRDP. Lack of adequate storage is leading to continued environmental pressures, particularly on water quality.

The Skills Development Scheme (SDS) is the most popular route for applicants to access support for training. Although uptake is extremely low (only 4.6 per cent of programmed expenditure had been spent by the end of 2011[17]), applicants can also access funds for training via their RP and LMO agreements. However, the majority (65 per cent) of the grants awarded are focussed on competitiveness in agriculture with just 11 per cent for environment and climate change (EKOS *et al*, 2010). One of the reasons for low uptake by farmers is likely to be the fact that there is little publicity concerning this scheme and word of mouth appears to be the key way in which it is heard about. For those who have accessed funding via the scheme, feedback suggests that it is simple and accessible (EKOS *et al*, 2010).

2.4.1 CAP: Cross compliance

Under CAP rules, cross compliance is made up of 18 Statutory Management Requirements (SMRs), which require compliance with a series of EU Directives as transposed into national legislation and a series of 19 standards of Good Agricultural and Environmental Condition (GAEC) which the Scottish Government has the discretion to design in keeping with the framework established by the CAP regulations[18]. Of the 18 SMRs, six are environmental in nature. Annex 4 sets out the SMRs and GAECs that are applicable in Scotland.

Evidence shows that one of the major issues with cross compliance in the EU as a whole is that, while the GAEC standards may look demanding in environmental terms on paper, the degree to which they are implemented in practice and subsequently enforced is extremely variable. Without proper implementation the standards may be relatively ineffective (Alliance Environment, 2007). There is no obligation on Member States to evaluate the implementation or environmental impact of cross-compliance and as a result there is a paucity of information in the public domain on the extent to which cross-compliance is raising adherence with legislative requirements (in the case of the SMRs) or improving the adoption of sustainable land management practices (in the case of GAEC standards).

Published data on breaches of cross compliance conditions by farmers receiving direct payments can provide one source of information on the degree of adherence with the requirements at a national level. However, the usefulness of such data assumes that when breaches are found by inspectors visiting farms, these are notified to the relevant authority and that action is taken subsequently to rectify the non-compliance. With a one per cent inspection requirement of all farms per annum, it should also be noted that the breaches that are found can only be treated as indicative of the scale of the issues that also need to be addressed in the other 99 per cent of the countryside. However, a low number of breaches does not necessarily equate to a lack of environmental problems on the ground.

The number of reported breaches of environmental SMRs in Scotland is set out in Table 7 and a table showing breaches as a proportion of inspections per SMR/GAEC is provided in Annex 5. This shows that overall the number of breaches notified has declined since 2008. However there is a worrying increase in the number of breaches notified for non-compliance with the Nitrates Directive (from five in 2010 to 17 in 2011). This would suggest that there is a greater issue with adherence to the Nitrates Directive than previous

[17] This compares with average realised expenditure under this measure for the EU-27 of 32 per cent.
[18] Annex IV of Council Regulation 73/2009

monitoring figures would suggest. Fourteen per cent of Scotland is designated as a Nitrate Vulnerable Zone (NVZ)[19]. Recent monitoring results have shown that the permitted nitrate limits was exceeded at seven monitoring sites within the NVZs (and 13 outside NVZs), with the highest concentration of sites exceeding the limits located in the NVZs in Moray and Aberdeenshire / Banff and Buchan and Strathmore and Fife (Scottish Environment Protection Agency, 2012).

The higher number of breaches in 2011 related to the Nitrates Directive is likely also to be due to the catchment walks recently carried out by SEPA along the five metre riparian zone of all main tributaries in the 14 priority catchments in Scotland. During these, any breaches with cross-compliance that were found, relating to either SMRs or GAEC standards, were notified to the Scottish Government (pers. comm., SEPA). The small number of breaches detected for the biodiversity SMRs and some of the GAEC standards may also be linked to the relative difficulty with which the breach can be detected by the inspection agency. This is likely to vary considerably between standards.

Table 7: Breaches of environmental SMRs and GAEC standards in Scotland (2008-2011)

	2008	2009	2010	2011
Number of environment SMR breaches				
SMR1 - Conservation of wild birds	2	2	0	0
SMR2 - Protection of groundwater against pollution	37	13	8	5
SMR3 - The use of sewage sludge in agriculture	0	0	1	0
SMR4 - Protection of water in Nitrate Vulnerable Zones (NVZ)	4	2	5	17
SMR5 - Conservation of Flora and Fauna	0	0	0	1
SMR9 - Restrictions on the use of plant protection products	21	12	5	3
Total	**64**	**29**	**19**	**26**
Number of GAEC breaches				
GAEC - Set aside management	1	-	n/a	n/a
GAEC1 - Post harvest management of land	-	-	-	-
GAEC2 - Wind erosion	-	-	-	-
GAEC3 - Soil capping	-	-	-	-
GAEC4 - Erosion caused by livestock	1	-	-	-
GAEC5 - Maintenance of function field drainage systems	-	-	-	-
GAEC6 - Muirburn code	-	-	-	-
GAEC7 - Arable crop rotation standards	-	-	1	-
GAEC8 - Arable Stubble management	-	-	-	-
GAEC9 - Appropriate machinery use	-	-	-	-
GAEC10 - Undergrazing	-	1	-	-
GAEC11 - Overgrazing	-	-	-	-
GAEC12 - Ploughing pasture of a high environmental/archaeological value	1	-	1	-

[19] Scottish Statutory Instruments (2008) Environmental Protection, Agriculture, Water. The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008, N0298, http://www.legislation.gov.uk/ssi/2008/298/pdfs/ssi_20080298_en.pdf

GAEC13 - Protection of rough grazings/semi natural areas	6	2	-	-
GAEC14 - Application of lime and fertiliser on rough grazings/semi natural areas	1	1	-	-
GAEC15 - Field Boundaries	2	5	2	2
GAEC16 - Non-production landscape features	-	1	-	-
GAEC17 – Historic Features	-	1	-	-
GAEC18 - Encroachment of unwanted vegetation	1	1	-	-
GAEC19 - Abstraction of water for irrigation	n/a	n/a	-	2
Total	**13**	**12**	**4**	**4**

NB: Changes to the GAEC standards were introduced in 2009 as a result of the CAP Health Check and the introduction of Council Regulation 73/2009

Sources:
2008/2009 figures:
http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/Schemes/SFPS/stats0809
2010 figures: http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/Schemes/SFPS/XCstats2010
2011 figures:
http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/Schemes/SFPS/XCstats2010/2011XCInspStatistics

It is difficult to compare breaches with the situation in other Member States, partly because to be comparable, information is needed on the number of breaches as a proportion of inspections for each SMR/GAEC standard. This information is not readily available for many Member States. The reporting performance of many governments on this topic is extremely poor and the comparability of data between Member States is problematic as each one reports information in a different manner (European Court of Auditors, 2008; BirdLife, 2009).

A recent report from Sweden, however, has assessed the environmental impact of cross-compliance using figures from 2005-2009 (Jordbruksverket, 2011). In relation to SMRs, the greatest levels of non-compliance have been in relation to SMR 4 (Nitrates Directive). These averaged a level of 10.8 per cent of all breaches over the period. No breaches were reported in relation to the biodiversity SMRs or sewage sludge (SMRs 1, 3 and 5) but this was thought to be due to the 'limited number of agricultural practices involving sewage sludge, and partly also due to the great difficulty of objectively assessing and inspecting the requirements around wild birds and habitat/Natura 2000'(Jordbruksverket, 2011). The SMRs involving groundwater and plant protection products showed very few instances of non-compliance. In relation to the GAEC standards, non-compliance was associated with three standards in particular: no growth of unwanted vegetation (both on pasture and arable land) and pasture management, with breaches averaging 22 per cent on pasture land. In England and Northern Ireland, it is again SMR4 where the highest number of breaches are found. While numbers of breaches have declined in England since 2008, in Northern Ireland they have increased (229 in 2008/09 and 361 in 2009/10)[20]. As in Sweden, a much higher level of breaches is found with GAEC standards, than is the case in Scotland, even taking into account the inspection sample. For example in England there were 141 breaches in 2008,

[20] http://www.doeni.gov.uk/niea/compliance_and_enforcement_report_2008_to_2010.pdf

increasing to 274 in 2011. In the absence of other evidence, this would suggest that a significant number of breaches with GAEC standards in Scotland could well be going unreported.

Accessing advice and guidance on cross compliance as a farmer in Scotland is not straightforward. Despite numerous updates being issued online[21], these have to be accessed individually (10 updates in 20 different documents) and there has been no consolidated guidance document produced since 2007. During the MTE there was significant feedback about the internet being a poor source of information for many applicants. The SRUC has a contract with the Scottish Government to provide advice on cross compliance to farmers. The Cross Compliance Electronic Information System (cCELIS) provides a summary of cross compliance standards in Scotland[22] via an online presentation and associated quiz and is intended to be used in conjunction with the guidance provided by the Scottish Government. This falls a long way short of a one-stop shop providing support and advice to farmers on cross compliance.

The presentations provide the basic information on what is required under both SMRs and GAECs, with slides providing links to other organisations' websites for further information and the disparate range of guidance documents on the Scottish Government's website forming the formal guidance for farmers. However, accessing the cCELIS website is not easy. The only way of doing so is either using the exact weblink or searching for the service via a web search engine. It is not possible to locate it directly from SRUC's web pages as the relevant links are not signposted. Although it is not the purpose of this report to make recommendations, there seems a strong case to rectify this as a matter of urgency.

An assessment of the mandatory inclusion of information on cross compliance as part of the Farm Advisory System (FAS) for the EU-27 showed that such advice has been one of the main reasons for farmers' increased awareness of environmental issues related to their activities (water, soil and biodiversity). This applied to farmers who received advice about the issues involved and about their obligations, although it remains unclear whether or not overall compliance with regulations has also increased (ADE, 2009). It is therefore worth investing in good quality advisory materials and services and this is an area where considerable improvement would seem desirable in Scotland.

2.4.2 Implementation of the Water Framework Directive

There are two river basin districts in Scotland: the Scotland river basin district (Natural Scotland, Scottish Government, 2009a) and the Solway Tweed river basin district (Natural Scotland, Scottish Government, 2009b). The latter covers the southern area bordering England whilst the former constitutes the remaining area. River basin management plans (RBMPs) were introduced for these areas in 2009 following a seven year drafting and

[21] Cross Compliance Guidance Updates: http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/Schemes/Crosscompliancesection/CComplianceupdates

[22] http://www.sruc.ac.uk/info/120425/cross_compliance-ccelis

consultation period[23]. There was a public consultation on the two RBMPs which was open until February 2013.

A recent assessment of EU river basins shows that between 30 and 50 per cent of Scottish rivers and lakes are in 'less than good' ecological status. Within this category, the status can be broken down into 'moderate, poor and bad' status as shown in Table 8. To date in the EU-27 (plus Norway), 121 of 174 River Basin Management Plans (RBMPs) have been adopted and reported upon. The overall figures show that 55 per cent of the total number of classified surface water bodies in Europe have less than good (ie moderate, poor or bad) ecological status. This shows that although there is some way to go to meet the required objectives, Scotland is performing better than average and indeed is far from the worst. Some river basin districts in the Netherlands, Belgium and Northern Germany have more than 90 per cent of their rivers and lakes in less than good ecological status. Nonetheless, given the relatively low population density in Scotland a relatively high level of water quality might be expected. Agriculture remains one of the main pressures that needs to be addressed to achieve good ecological status, with diffuse pollution being the most pressing issue.

Table 8: Ecological Status of natural surface water bodies in Scotland's river basin districts

	Scotland RBMP (UK01)	Solway Tweed RBMP (UK02)
Status		
High	17.6	2
Good	48.3	45.1
Moderate	17.6	37.3
Poor	10.9	12.6
Bad	5.5	3
Proportion of water bodies with issues related to agriculture		
Diffuse Pollution	15.94	38.9
Point source pollution	10.35	13.08
Abstraction	17.08	10.15

Source: European Commission, 2012

Introduced in 2008 under the Water Environment (Controlled Activities) Regulations (CAR), and subsequently consolidated in 2011, a series of General Binding Rules (GBRs) are in place in Scotland which farmers must adhere to. The GBRs consist of a set of mandatory rules covering activities of low risk to the water environment and compliance with these is required, but does not require prior authorisation or a licence.

The Diffuse Pollution Management Advisory Group (DPMAG) for Scotland is a legal entity under the CAR. Chaired by SEPA and involving a wide range of stakeholders, it has been set up to focus on improving water quality in the 14 priority catchments with a particular focus on addressing the problems of diffuse pollution. The aim is to achieve full compliance with all GBRs by 2015 in all priority catchments. A series of catchment walks has been carried out since 2010, under which the five metre riparian zone for main tributaries in the priority catchments were checked for compliance with the GBRs. Over 6,000 kilometres were

[23] http://www.sepa.org.uk/water/river_basin_planning/early_basin_planning_work.aspx

walked and approximately 5,200 instances of non-compliance with GBRs were found, most commonly these related to livestock access to water courses and cultivation within two metres of the water course. The results are summarised in Annex 5. Having identified the issues of non-compliance, SEPA is now working with land managers in the priority catchments, and other DPMAG members such as the National Farmers Union of Scotland (NFUS), to promote and ensure compliance with the regulations, through awareness raising activities as well as one to one interaction with those land managers where issues had been identified. These individual visits involve a risk assessment of the whole area farmed by the farmer (not just the riparian strip inspected during the catchment walk), the identification of any issues of non-compliance with GBRs as well as the provision of advice on good practice to avoid such breaches in the future and information on options where financial support is available, such as via the SRDP. Up to three follow up visits are scheduled to check that the issues have been resolved. If after this, the farmer is still non-compliant then SEPA will go down the route of enforcement proceedings (pers. comm., SEPA). Progress to date in three catchments is shown in Table 9.

Table 9: Progress with addressing diffuse pollution in three of the 14 priority catchments

	Ayr	Eye Water	Ugie
1:1 Visits carried out	276	61	420
Return visits required	235	39	180
Number of revisits carried out	70	34	172
Number where remedial work has been started or completed	61	18	128
Number on which no work has started	0	16 (but all awaiting outcomes of SRDP applications)	46 (although 27 awaiting outcomes of SRDP applications)

Source: DPAG November Meeting minutes and pers. comm., SEPA http://www.sepa.org.uk/water/river_basin_planning/diffuse_pollution_mag.aspx#meetings

These figures suggest that the approach being taken is leading to significant improvements in compliance with GBRs and therefore in reducing diffuse pollution. The approach appears to have gained significant buy-in from farmers and some are taking action faster than had initially been anticipated. The fact that they are given a chance to change their practices before any enforcement penalties are applied makes a difference (pers. comm. SEPA). However, as mentioned above, it should be stressed that should non-compliance with cross compliance requirements be found, then these are notified to the Scottish Government immediately.

This process is also raising awareness amongst this group of farmers about the funding available under the SRDP, with the most common options suggested being payments for buffer strips (beyond the compulsory two metres) and capital grants, particularly for slurry storage. There has been a particularly high uptake of the funding available for capital investments. However, it may be more difficult in the future to access such funding with caps put on the total level of investment per applicant and overall funding constraints placed on the programme as it comes to the end of the programming period. The DPMAG

has noted that the SRDP as a whole is not well designed in relation to water quality issues and efforts are being made to improve this for the 2014-2020 period.

2.4.3 Implementation of the EIA Directive (Agriculture)

The EU Environmental Impact Assessment legislation requires Member States to act to minimise environmental damage from agricultural developments and other 'projects' in rural areas including the restructuring of agricultural land and conversion of uncultivated or semi-natural habitats to intensive agricultural management. If implemented well, this should provide a strong legal underpinning to complement land management options within Pillar 1 and Pillar 2 of the CAP. However, the degree to which this particular safeguard provides an effective mechanism to minimise the impacts of projects in all cases is dependent on the way in which the EIA Directive is implemented on the ground. This has been shown to be very variable between countries. Indeed a range of stakeholders has found the frameworks and criteria introduced by Member States for screening whether or not a full environmental assessment of projects for restructuring or intensifying agricultural land is needed to be generally weak. Effectively the criteria exempt most such projects and so the impact is not assessed (COWI, 2009; IEEP, 2010; Beaufoy *et al*, 2011). The thresholds used in all four UK regions and Ireland are set out in Annex 7. Despite the fact that it is a legal requirement under the directive to ensure that a register of all screening applications and subsequent decisions are available to the public domain, it is surprisingly difficult to access such information. The only information outside the UK which it was possible to access reasonably easily was for the Republic of Ireland.

In Scotland, legislation governing EIA procedures for projects regarding the use of uncultivated land and semi-natural areas for intensive agricultural purposes has been in place since 2002. This was extended in 2006 to cover procedures for projects for the large scale restructuring of rural land holdings under the EIA (Agriculture) (Scotland) Regulations 2006 (Scottish Executive Environment and Rural Affairs Department, 2006).

The performance of the EIA Directive Agriculture is difficult to judge. Between 2006 and 2012, there were only 30 screening applications made in Scotland and the maximum number of applications made in any one year has been six. In some areas, no applications have been made over the whole period (these are: Ayr, Benbecula, Elgin, Hamilton, Kirkwall, Oban, Perth and Stornaway). The applications made related to permission to perform drainage, ploughing or seeding actions on grasslands (including unimproved grasslands, permanent grasslands, semi-natural grasslands), wetlands, moorland and heathland. Over this period, only four applications have not been approved and required an Environmental Statement. There are no details on whether or not the projects were allowed subsequently. The number of applications is surprisingly low, compared with the other UK countries (England: 504; Wales: 234; Northern Ireland 63) and the Republic of Ireland, where 144 screening applications were received just for 2011 and 2012 (see Table 16 for UK figures). It is unclear why this should be the case when changes in the intensity of land use are taking place and when there are no scale thresholds for restructuring projects in sensitive areas. This means that any restructuring, however minor, should in theory come forward for approval. However, as a proportion of total screening applications, Scotland has approved a lower proportion (87 per cent) than England (96.6 per cent), Wales (92.3 per cent) and

Ireland (92.4 per cent). Northern Ireland in contrast has only approved 65 per cent of all screening applications.

Without any firm information on whether or not actual restructuring or intensification of land use that falls within the scope of the EIA regulations in Scotland it is difficult to ascertain the performance of the regulations beyond recognising that the number of cases is surprisingly low. A guidance document for farmers is available, although it is fairly legalistic in nature compared with the more farmer friendly guidance documents provided in Ireland and other parts of the UK. It has not been possible to ascertain the degree to which the availability or otherwise of advice is having an impact on awareness of the EIA regulations and the need to apply for screening decisions before certain activities are carried out. However, it would seem likely that it would have some effect on farmer awareness and behaviour.

Table 10: Number of screening applications and Environmental Statements Required in UK regions under the EIA Directive (Agriculture)

	2006	2007	2008	2009	2010	2011	Total
Scotland							
Conversion: number of applications (ES[1] required)	4 (1)	6 (0)	6 (1)	1 (0)	3 (0)	4 (2)	24 (4)
Restructuring: number of applications (ES required)		1 (0)				5 (0)	6 (0)
Out of scope (conversion and restructuring)	1	1		1	1		
England							
Conversion: number of applications (ES required)	9 (0)	118 (7)	87 (2)	66 (2)	84 (3)	140 (3)	504 (17)
Restructuring: number of applications (ES required)		1 (0)					1 (0)
Out of scope (conversion and restructuring)	No Information						
Wales							
Conversion: number of applications (ES required)	13 (1)	18 (0)	41 (2)	19 (2)	57 (4)	46 (8)	194 (17)
Restructuring: number of applications (ES required)	2 (0)	1 (0)	2 (0)	2 (0)		18 (1)	25 (1)
Conversion and restructuring: number of applications (ES required)	1 (0)	4 (0)	1 (0)	3(0)	5(0)	1(0)	15 (0)
Out of scope (conversion and restructuring)	No information						
Northern Ireland							
Conversion: number of applications (ES required)	12 (4)	5 (0)	1 (1)	3 (1)	8 (3)	4 (4)	33 (13)
Restructuring: number of applications (ES required)	11 (5)	10 (1)	1 (1)	2 (0)	1 (0)		25 (7)
Conversion and restructuring: number of applications (ES required)	1		3 (2)			1	5 (2)
Out of scope (conversion and restructuring)	12	8		1	1		

[1] ES = Environmental Statement

Sources:
http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/Environment/16808/register
http://wales.gov.uk/topics/environmentcountryside/consmanagement/conservationbiodiversity/eiahome/eiadocs/110328publicregister/;jsessionid=2B8FD81F1FB6CEACF006F5505D88C92F?lang=en
http://www.naturalengland.org.uk/Images/eia-publicregister_tcm6-6275.pdf
http://www.dardni.gov.uk/index/countryside/impact-on-the-environment/eia-decision-page.htm

2.5 Final Reflections

Scotland's agricultural land supports a large diversity of habitats and species, a high proportion of High Nature Value farming systems and has a significant proportion of carbon rich soils. Nonetheless, considerable environmental pressures associated with farm management persist. These arise:

- As a result of unsustainable agricultural management practices in the lowlands and some upland areas, as well as the continued decline in the viability of some of the most environmental valuable farming systems, particularly in the north west of the country.

- Considerable issues of diffuse water pollution remain, although these are being addressed through an ambitious programme of problem identification, the provision of information and one to one farmer advice, led by SEPA.

- Breaches of the Nitrates Directive (evident from cross-compliance inspections) continue to be a cause for concern, although it is hoped that this will also improve through the targeted work to address diffuse pollution by SEPA and other stakeholders.

By contrast, the SRDP, despite its ambitious integrated design, does not appear to have delivered its full potential with respect to the environment. The slow start, the complicated application processes, the numerous programme modifications, combined with a lack of easily accessible advice have all combined to mean that uptake of environmental measures was exceptionally low until 2010 and has only really taken off in the past year or so.

This has meant that environmental evaluations of agri-environment expenditure only started in 2012, with little information available in the public domain against which to assess success. In addition, the programme budget is skewed heavily towards LFA support, to a much greater extent than other EU countries with similar proportions of their agricultural area designated as LFA. This might be beneficial if the funding were focussed at those farming systems in the LFA that were the most economically vulnerable (such as the HNV farming systems in the north-west). However, the evidence suggests that this is not the case, with funding benefitting more productive farms to a greater degree.

Although information of the application of the EIA directive in other EU Member States is difficult to access, it would appear that an extremely low number of screening applications come forward in Scotland relating to farming activities compared with Ireland and the other parts of the UK. This is worth further investigation, especially to find out the extent to which farmers are aware of their obligations under these regulations.

Advice for farmers on environmental issues is a cross-cutting issue that has been highlighted as needing further attention in the future in relation to most of the policies reviewed here. Issues experienced by agreement holders with accessing advice were highlighted in the most recent evaluation of the DRDP. Information on cross-compliance is not consolidated in one place, rather contained in multiple documents and accessing the electronic advisory system (cCELIS) is not entirely straightforward. The value of investing in advice is clear from the current DPMAG initiative, managed by SEPA, to reduce diffuse pollution, where action on the ground is happening even faster than had initially been anticipated.

In the light of this experience, the design of the SRDP for the next programming period is crucial. There is an opportunity to ensure that sustainable land management practices are promoted to reduce environmental impacts in some areas and maintain environmentally beneficial practices in others. This is especially important at a time of budgeting constraints and a changing climate, with anticipated increases in temperatures and greater rainfall potentially leading to an expansion in the area of land suitable for agricultural production further west from the existing concentrations in the east, with concomitant implications for the environment.

3 ESTABLISHING THE NETWORK OF MARINE PROTECTED AREAS

Key messages

The Scottish Government is committed to developing an ecologically coherent network of MPAs. To achieve this aim it established a series of robust and environmentally sound principles to network development and site designation. In practice the Scottish Government's delivery of the MPA designation process has not compared favourably against some of these principles. For example, this study identified instances where:

- science, which was supposed to be the primary consideration in the selection of sites, was made secondary to or superseded by socio-economic considerations;
- a lack of scientific evidence was employed as a reason for postponing MPA site selection for certain species of national importance; and
- the presence of existing marine spatial protection measures have been favoured for site designation at the expense of other areas of greater ecological value.

Comparing Scotland to other countries, it appears to be following the poor example set by the English and Welsh offshore MPA project. This is very disappointing, particularly considering that the internationally important seabird colonies and other unique and valuable populations of cetaceans and other species in Scotland's seas mean that it should be amongst the global leaders in marine biodiversity protection.

Resource constraints have clearly impacted the ambition of the Scottish Government's MPA network, undermining the delivery of the promising aspirations outlined in their Site Selection Guidelines and delaying the development of the network. This focus on the capital costs of MPAs is short-sighted, and fails to account for the long term benefits which they are expected to bring.

3.1 Introduction

The Scottish Government has committed to a clean, healthy, safe, productive and biologically diverse marine and coastal environment that meets the long term needs of people and nature (HM Government *et al*, 2010). It recognises that site protection is an integral part of achieving this goal. Furthermore it is committed to establishing a network of MPAs under several EU and international policy frameworks, including the Marine Strategy Framework Directive (MSFD) (2008/56/EC), the Birds (2009/147/EC) and Habitats Directives (92/43/EC), the Convention on Biological Diversity, the World Summit on Sustainable Development in 2002, and the OSPAR Convention on the protection of the marine environment in the North East Atlantic.

In 2010 Scotland enacted the Marine (Scotland) Act, which, alongside the UK Marine and Coastal Access Act (enacted in 2009), provides the Scottish Government with new powers and duties to designate MPAs in order to protect features of importance to Scotland. The Marine (Scotland) Act includes provisions to designate MPAs inside 12 nautical miles (territorial waters) for the protection of biodiversity and geodiversity, christened Nature Conservation MPAs. Likewise, the UK Marine and Coastal Access Act includes equivalent provisions, devolving responsibility to Scottish Ministers for the designation of Nature Conservation MPAs in offshore waters (within the Scottish Exclusive Economic Zone). Also central to the new legislation is a system of marine planning, which is vital to ensure that developments at sea happen sustainably, within environmental limits.

Both the Scottish and the UK Marine Act were applauded by environmental NGOs which had long awaited and campaigned for the legislation. Remaining aware of the need for robust implementation and management, there was an expectation from the NGO community that the new legislation would help the UK to become a potential world leader in marine conservation (RSPB Scotland, 2010). The Marine (Scotland) Act was described as heralding a new dawn for the management of Scotland's seas (Scottish Environment Link, 2010).

This chapter considers how the Scottish Government has approached the delivery of its ambitions to establish an ecologically coherent network of MPAs in the period to the end of 2012. The MPA network was still in the site designation phase at this point and running behind schedule with new MPAs not expected to be in place before the end of 2013, therefore the focus of the research has been on the early stages and the site designation process. Judgements on the ecological coherence of the proposed network clearly would be premature. Rather, this analysis will attempt to examine the processes in place and the degree to which their implementation adheres to the principles of site selection set out by the Scottish Government. The analysis also includes a brief comparison of Scotland's progress with other countries in the North East Atlantic region.

3.2 The Marine (Scotland) Act - Implementation principles and processes

The Scottish MPA project is being led by Marine Scotland, in partnership with the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH) and others. The selection of Nature Conservation MPAs in Scotland is guided by Site Selection and Development Guidelines (Marine Scotland *et al*, 2011). These Guidelines explain the relevant steps that will be taken to select possible locations and form proposals for MPAs, as well as set out certain principles which the site selection process is expected to follow.

The aim of the MPA network is to safeguard marine features (either biodiversity or geodiversity) in Scottish waters and to facilitate their recovery. Additionally, a functioning network in Scottish seas is supposed to contribute towards UK and North East Atlantic MPA networks. Importantly, the agencies involved are not taking a target-based approach to the development of the network, ie there are no targets for coverage, either of an area of the sea or of protected features. Instead the size and composition of the MPAs is supposed to be developed through a scientific process, with the engagement of stakeholders, following the Site Selection Guidelines (Marine Scotland *et al*, 2011). However there are milestones for the development of the network which have been established by other national and international commitments. These include delivering an MPA network by 2012 (CBD); reporting on progress of an MPA network by 2013 (MSFD); and delivering a well-managed network of sites by 2016 (MSFD). In addition there is no preconceived management regime; management goals will be set on a site by site basis (Marine Scotland *et al*, 2011).

The reasons for not taking a target-based approach, or a one-size-fits-all management approach, are valid. For example, meeting a coverage target does not guarantee the protection of ecosystem services or the potential of MPAs to support people (The Nature Conservancy *et al*, 2012). In light of the approach taken, however, the principles and criteria within the Site Selection Guidelines become even more critical to the success of the network. The Site Selection Guidelines list nine general principles governing the selection of Nature Conservation MPAs (see Box 4) and eight principles to guide the development of the MPA network as a whole (Box 5). The latter are taken from a ministerial statement on the creation of the network (see Annex 4 of the Site Selection Guidelines). These principles were well received by the environmental community, as will be discussed in the following sections.

Box 4: General principles applying to MPA site selection (Marine Scotland *et al*, 2011)

a. Nature Conservation MPAs will be developed through a scientific process involving engagement with stakeholders. Science will be the primary consideration in the selection of sites with socio-economics being considered when the ecological coherence of a network has been met.

b. The presence of MPA search features will underpin the selection of Nature Conservation MPAs and areas containing multiple features will be given priority (section 4). Ecologically and geomorphologically functional units, and the processes which underpin these features, will be taken into account through boundary setting and in subsequent management.

c. The size of a Nature Conservation MPA will depend on the rationale for identifying it, the features it is designed to protect, and the requirements for management of activities.

d. Nature Conservation MPAs are only one of the measures available to protect Scotland's seas. They will be

used where they are the most appropriate mechanism.

e. Management of MPAs should be integrated with wider marine management. By providing the framework within which all marine management will occur, marine planning will help ensure better integration between the needs of Nature Conservation MPAs and those of surrounding areas.

f. In most situations, existing sectoral measures (such as fishery management measures) or marine planning are expected to be sufficient. Additional powers such as Marine Conservation Orders will be available where necessary to support management of activities affecting MPAs.

g. The best available scientific information will be used to select and manage Nature Conservation MPAs. Lack of scientific certainty should not be used as a reason for postponing MPA selection or taking action where there is a threat of damage to areas in the network.

h. As our understanding improves, and/or the environment changes, there may be a need to select additional new Nature Conservation MPAs, alter boundaries, and/or remove designations particularly in the longer term in response to climate change.

i. Nature Conservation MPAs will be subject to a range of protection levels, depending on the conservation objectives, management requirements of the MPA protected features for which they are designated and socio-economic factors. There will be an assumption of multiple-use of a site. However, activities which are not compatible with the conservation objectives of a Nature Conservation MPA will be restricted.

Box 5: Principles applying to MPA network development (Marine Scotland *et al*, 2011)

i. The MPA network should be capable of delivering Scotland's MPA commitments, including national and international priorities for marine nature conservation.

ii. The purpose of the MPA network will be to deliver benefits for marine natural features and to support wider ecosystem function within the context of a three-pillar approach. The network should safeguard marine features (relating to both biodiversity and geodiversity) in Scottish waters and, through sound management, deliver recovery where practical.

iii. The MPA network will include marine natural features considered as priorities for area-based protection in Scottish waters. It will include features considered to be key and threatened and/or declining, and/or representing the range of features within Scotland's seas.

iv. Individual sites will be considered for their merit in contributing to ecological coherence of the network, but where possible preference will be given to the selection of areas with multiple features, including those of interest for both biodiversity and geodiversity. Functional units and processes which underpin these features (for ecology, geology and geomorphology) will be taken into account through boundary setting and management.

v. Network development will take account of the distinctive biogeographical differences of our seas. The proportion of each feature included within the MPA network will vary to reflect factors such as the importance of the feature and the element of risk to its survival in Scottish waters

vi. The MPA network will consist of a range of different types of protected areas, including European Marine Sites and Nature Conservation MPAs designated under section 79(1) of the Marine (Scotland) Act and section 116 of the Marine and Coastal Access Act. Other types of area-based measures which offer protection to marine features may be recognised as contributing to Scotland's MPA network. The same scientific assessment process applied to Nature Conservation MPAs will be used to evaluate the contribution these areas could make to national priorities.

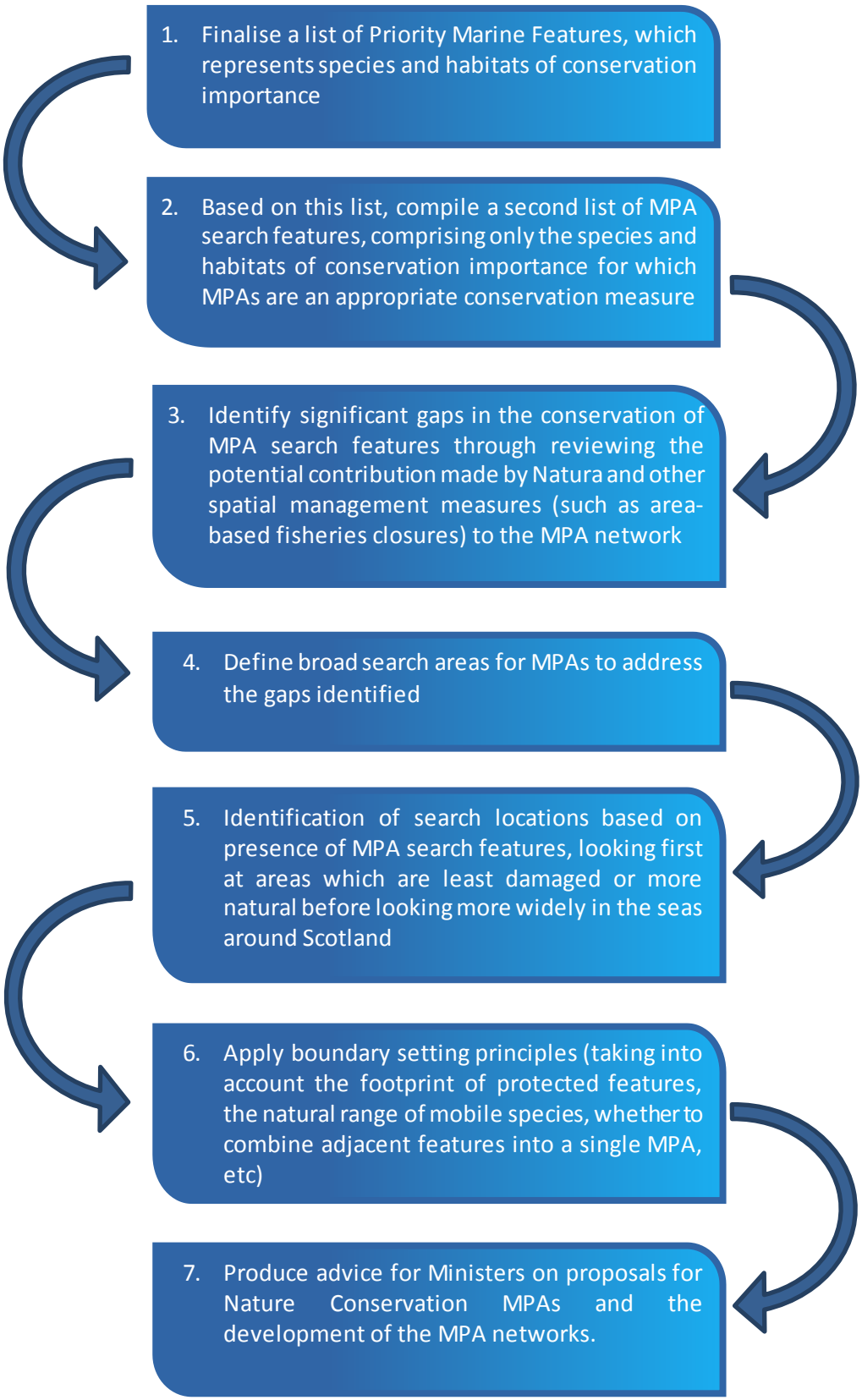
vii. MPAs forming part of the network will be managed so as to deliver long-term protection to the marine natural features they contain. An MPA network will contribute to Government objectives on the environment, which in turn will help achieve broader objectives, including sustainable economic growth.

viii. Significant progress towards identifying Nature Conservation MPAs to complete the network will have been made by the end of 2012.

The Guidelines explain, step by step, the processes which the agencies are following to implement these principles and to propose MPA sites. The user must master these steps which are intended to be transparent and to enable participatory decision making, which should of course be welcomed. However, from Priority Marine Features to MPA search Features, and broad search areas to search locations, they amount to a complex and confusing minefield of new terminology, acronyms and process to anyone not working very closely with the MPA project. Figure 3 represents the steps being taken to identify Nature Conservation MPAs. This figure combines a number of figures from the Site Selection Guidelines and attempts to bring greater clarity to what is a relatively complex process.

Although not the primary focus of this analysis, it is worth noting the emphasis placed on stakeholder engagement during the site designation process (see Box 4, Principle A, for example). The main means by which this was engineered was through the use of workshops, of which there have been five, spread over regular intervals. These focussed on engaging national and international level organisations, or marine specialists, with an interest in the conservation and sustainable use of the marine environment. Another route of influence for stakeholders is the opportunity to submit proposals for Nature Conservation MPAs for the inclusion in the network, to be considered alongside those proposed by the statutory agencies. According to the Site Selection Guidelines these third party proposals are subject to the same assessment procedures as those proposed by SNH and JNCC (Marine Scotland *et al*, 2011).

Figure 3: Process for identifying Nature Conservation MPAs (adapted from Marine Scotland et al, 2011)



3.3 Implementation

Scrutinising the Scottish Government's delivery of all of the principles in the MPA site designation process would require a lengthy study. Therefore the focus of this analysis has been on a selection of some of the most prominent issues. These concern the prioritisation of socio-economic interests over scientific evidence in the choice of potential sites; the issue of data paucity and its impacts on delaying decision making; and concerns over the reliance on existing spatial management measures instead of proposing new Nature Conservation MPAs. These issues are illustrated with examples of various marine species and habitats, using evidence from the literature as well as communication with stakeholders and decision makers, including Marine Scotland, to inform the conclusions.

3.3.1 Science and socio-economics

The first general principle applying to Nature Conservation MPAs is that:

'(a) Nature Conservation MPAs will be developed through a scientific process involving engagement with stakeholders. Science will be the primary consideration in the selection of sites with socio-economics being considered when ecological coherence of a network has been met.'

The guidelines elaborate this approach, stating that socio-economic factors may be considered in the selection of sites once the ecological requirements of the MPA network have been met, in order to choose between two or more alternative potential areas which meet the scientific guidelines equally (Marine Scotland *et al*, 2011). Considering that in general socio-economic concerns are more often than not prioritised over environmental ones, this is a highly significant principle. It is also unusual to enshrine such a principle into environmental policy processes. Scottish Environment LINK has stressed its support for this approach, expressing its understanding that 'socio-economic factors should only be considered in exceptional circumstances during the designation stages where two or more areas could make an equivalent contribution to the network' (Scottish Environment Link, 2011).

Predictably, during the site designation process there have been occasions where, for certain features, multiple sites were judged equally appropriate. Consequently socio-economic factors were taken into consideration to choose which site to pursue further. However, environmental NGOs have raised concerns that the Scottish Government has not applied this principle consistently over the course of the site designation process. This challenge relates specifically to the selecting of sites for the protection of sandeels.

Sandeels are a highly important species in the North Sea food web, and it is critical to maintain their abundance at a high enough level to provide food for a number of predator species, including seabirds, fish and cetaceans. Due to their low mobility and dependence on well flushed sands, sandeels may be vulnerable to local depletion from fishing or other pressures. However their low mobility also means that spatial measures with fishing restrictions are the ideal tool to conserve them. Hence two species of sandeel (*Ammodytes marinus and A. tobianus*) were identified as search features in Scottish seas (ie species of conservation importance for which MPAs are an appropriate conservation measure).

The Scottish Government identified five broad areas where sandeels were assessed as a potential driver in the identification of new MPA search locations[24]. According to Marine Scotland itself, the most important area in terms of historical landings and as a foraging area for marine predators is the Firth of Forth banks (Marine Scotland, 2012a). However, certain stakeholders voiced concerns about the overlap of this area with the Forth Banks Round 3 Windfarm Zone and an area used for scallop dredging to the North-west of the search location, which led Marine Scotland to consider alternative sites instead (Marine Scotland, 2012b). Clearly by prioritising these objections of a socio-economic nature, Marine Scotland contravened its own principle of 'science first'.

A hunt for alternative sites to the Firth of Forth was made under the assurance that only sites offering the same or greater ecological value would be explored as alternatives (Marine Scotland, 2012b). However, Scottish Environment LINK contests the claim that Turbot Bank, the alternative site suggested, is of equivalent value. Firstly, the Firth of Forth Banks Complex was identified as a Least Damaged/ More Natural area, whereas Turbot Bank was not (Chaniotis *et al*, 2011) (JNCC *et al*, 2011). This indicates that Turbot Bank has been exposed to more pressure, which implies that the sites are not ecologically equivalent. Furthermore, according to Marine Scotland's Stage 5 assessment of offshore sands and gravels, the Firth of Forth Banks Complex has the highest number of different types of offshore sands and gravels present in the Greater North Sea OSPAR Region (Marine Scotland, 2012c). In contrast, Turbot Bank contains a moderate number of sands and gravels (Marine Scotland, 2012c). The Firth of Forth is identified by Marine Scotland as the most important area in the region in terms of historical fisheries landings and as a foraging area for marine predators whereas Turbot Bank is described as 'not especially important to breeding seabirds or cetaceans' (Marine Scotland, 2012a). More conclusively, SNH and JNCC concluded after reviewing the evidence base for the Turbot Bank and the Norwegian Boundary sediment plain (which was suggested as a 'science-based alternative' site to protect ocean quahog aggregations) that these alternatives do not make equivalent contributions to the network to that made by the Firth of Forth Banks Complex (Scottish Natural Heritage and Joint Nature Conservation Committee, 2012). SNH and JNCC state that 'the lesser evidence base for the two alternatives, and the lack of diversity indicated on the basis of predictive data, has led to our conclusion that they are of lower biodiversity and geodiversity conservation value than the Firth of Forth Banks Complex MPA proposal' (Scottish Natural Heritage & Joint Nature Conservation Committee, 2012).

In this case not only did Marine Scotland contravene the principle of 'science first' by letting socio-economics lead the site designation process, but its choice of sites of equivalent ecological value has been undermined. As a result the Firth of Forth was not included as a site to conserve sandeels in the report presented to the Scottish Parliament in December 2012, despite it being renowned for high concentrations of the species and it being the JNCC's preferred proposal to go forward for designation.

[24] Cellar Head off Lewis, West of Orkney, Mousa and Beddam Voe, Turbot Bank, and Firth of Forth banks (Marine Scotland, 2012a).

3.3.2 Data gaps and delays

The marine environment is notoriously poorly understood. From the outset of the Scottish MPA project, a lack of data and knowledge of marine species, habitats and ecological processes was recognised as a potential barrier to timely decision making. These concerns prompted the inclusion of the following principle within the site selection guidelines:

'(g.) The best available scientific information will be used to select and manage Nature Conservation MPAs. Lack of scientific certainty should not be used as a reason for postponing MPA selection or taking action where there is a threat of damage to areas in the network.'

Although it does not explicitly mention the precautionary principle, this principle falls within essentially the same concept thereby enabling policy makers to make discretionary decisions in situations where there is the possibility of harm or when extensive scientific knowledge on the matter is lacking. The application of the precautionary principle is a statutory requirement in European law (Article 191 of the Lisbon Treaty) and at the UK level the Government adopted the principle within the UK Strategy for Sustainable Development. In Scotland, the National Planning Policy Guideline (NPPG 14) on the Natural Heritage states 'the Government is committed to the application of the precautionary principle where there are good scientific grounds for judging that a development could cause significant irreversible damage to our natural heritage'. This principle is fully supported by members of the Scottish Environment LINK, who expressed their endorsement of its application to the designation and management of MPAs stating that 'using the best available scientific evidence and applying the precautionary principle where necessary will help to retain the credibility of this process and ensure its compatibility with the principles of sustainable development' (Scottish Environment Link, 2011).

However, despite the strong rhetoric within the Site Selection Guidelines, there is evidence relating to the selection of areas for the protection of certain species (including cetaceans, basking sharks and skate) to suggest that the delivery has not been as strong as could be expected in this regard. We chose to focus on cetaceans to illustrate this.

Because cetaceans are highly mobile in nature, SNH advise that MPAs be used to protect places used regularly for important life stages, including feeding, breeding, calving, raising young and socialising (Marine Scotland, 2012d). The Scottish Government included three species of cetaceans on the list of MPA search features: Risso's dolphin (*Grampus griseus*), White-beaked dolphin (*Lagenorhynchus albirostris*) and minke whale (*Balaenoptera acutorostrata*). Six MPA search locations were initially identified for cetaceans by Marine Scotland, three of which were recommended for further assessment in March 2012:

- Eye Peninsula to the Butt of Lewis for Risso's dolphin;
- Skye to Mull for minke whale;
- Southern Trench for both white beaked dolphins and minke whale.

However, Marine Scotland stated that although SNH found that there were sufficient data to identify these search locations, 'it was not clear whether there were sufficient data to

underpin a more detailed application of the MPA Selection Guidelines to support development of MPA proposals' (Marine Scotland, 2012d). It added that the decision would be made based on a review of available data and habitat modelling work which was first expected to be complete by the end of 2012 (Marine Scotland, 2012d), and later by April 2013 (Marine Scotland, 2012e). Following this, in June 2012, the Scottish Government published the preliminary results of an assessment of the contribution that the MPA search locations identified would make to the ecological coherence of the network. This was not the detailed assessment to determine whether MPA search locations should go forward as potential areas for MPAs that is referred to by Marine Scotland above. However, it did present preliminary results of an assessment of MPA search locations for mobile species, including the three cetacean search locations. It concluded that 'thirteen MPA search locations are considered likely to make a significant contribution to the MPA network for these species. Should these be recommended as MPA proposals and designated as Nature Conservation MPAs, the network would be considered to be adequate for five of the mobile species'[25] (Scottish Natural Heritage, 2012). However this conclusion came with the caveat that further research should be done, mainly habitat modelling but also modelling of prey species in the case of Risso's dolphin, to support the more detailed assessments required to develop the MPA proposals. Thus in the December 2012 report to Parliament, no MPAs were identified for minke whales, Risso's dolphins, and white-beaked dolphins, due to a reported lack of data.

Firstly, this is confusing for stakeholders, because it is difficult to understand why there are enough data to identify search locations, and enough data to make an assessment of these search locations as to their contribution to the network, yet there are insufficient data to support MPA proposal development. Moreover, the judgement made in this assessment was based on the best available scientific evidence, and if the principle that 'lack of scientific certainty should not be used as a reason for postponing MPA selection' is to be followed, then the decision should not be delayed pending further research. This conclusion appears to be supported by fresh evidence from the JNCC Joint Cetacean Protocol (Paxton *et al*, 2011), which, according to the Whale and Dolphin Conservation Society (WDCS), the Hebridean Whale and Dolphin Trust (HWDT), and the Cetacean Research and Rescue Unit (CRRU), further identifies the ecological connections to critical habitats and has results consistent to WDCS' own analysis. From their point of view there is no scientific reason to delay the decision to fully incorporate cetaceans into the Scottish MPA network.

Marine Scotland acknowledges that a paucity of good data was not supposed to be a barrier in the MPA designation process (Marine Scotland, personal communication). However, Marine Scotland also feels the data issue needs to be approached with a degree of common sense, considering that the scientific evidence needs to be strong enough to resist scrutiny by other ocean users. In its view, given that cetaceans are highly mobile, and ought to be protected not simply where they appear but in their feeding, breeding, courtship and nursery areas, more behavioural information is required than simply instances of appearance. A final argument is that a delay in establishing MPAs for these species is less significant anyway, due to the strong protection already afforded to all cetaceans as a result

[25] This includes minke whales and Risso's dolphins, but white-beaked dolphins were considered inadequately included within the network, due to evidence suggesting changing distribution on the west coast resulting from climate change.

of their listing on the European Protected Species list. Nevertheless, Marine Scotland offers the reassurance that since the three cetaceans are listed as search features in the Guidelines, MPAs will definitely be designated to protect them, as failure to do so would be a failure of implementation (Marine Scotland, personal communication).

3.3.3 Use of existing spatial measures

Prior to the Marine (Scotland) Act, marine site protection focussed on species and habitats of European importance listed in the relevant annexes of the EU Birds and Habitats Directives. Importantly, the network designation process allows other MPAs and area based measures to contribute to the network (see Figure 3, Step 3), which includes a host of other spatial measures including European Natura 2000 sites designated under the Birds and Habitats Directives, Sites of Special Scientific Interest and Ramsar sites with marine components, area-based fisheries restrictions, and safety exclusion zones around wave, tidal and offshore wind energy installations. The Site Selection Guidelines acknowledge that these spatial measures may be making a contribution to the ecological coherence of the network, and therefore argue for their contributions to be recognised, stating that:

'(vi.) The MPA network will consist of a range of different types of protected areas, including European Marine Sites and Nature Conservation MPAs designated under [...] the Marine (Scotland) Act and [...] the Marine and Coastal Access Act. Other types of area-based measures which offer protection to marine features may be recognised as contributing to Scotland's MPA network.'

The Selection Guidelines elaborate further, explaining fully the various types of areas that may be recognised as contributing to the network, and making clear that Natura 2000 sites containing features not listed under the Birds and Habitats Directives could require 'double-badging' in order to make plain their contribution over and above their original purpose.

European Marine sites and other types of area-based measures are established for different reasons. Consequently their objectives vary substantially from each other's, and from the objectives of Nature Conservation MPAs. This variation in fundamental purposes and aims should therefore affect the extent to which these existing spatial measures might contribute to the network. It also means that their possible contribution should be taken into consideration on a site by site basis. However it is reasonable to suggest that the value they do bring to the network be recognised. And considering the costs of managing MPAs, there is an efficiency argument in deriving whatever benefit possible from the protected areas already in operation.

Taking this concept from principle to process, the Scottish Government did two things. First, it left out all species which were already protected under Natura 2000 from the list of Nature Conservation MPA Search Features. Second, for those features which did qualify as MPA Search Features, it assessed to what extent they were already protected using existing spatial management (this corresponds to Step 3 in Figure 3). Only if there were considered to be 'significant gaps' in the conservation of MPA search features, did the Government then define broad search areas for the features in question (Step 4, Figure 3). In short, the site designation process applies this principle heavily, looking to existing protected areas before proceeding further. However, this approach has attracted criticism, not least from

environmental NGOs, due to concerns that it is leading to insufficient protection for certain marine species, including black guillemot and sandeels.

Black guillemot

Black guillemot (*Cepphus Grylle*) is the only bird species included on the MPA search feature list in Scotland. In the UK and Ireland its population is largely restricted to Scotland, particularly the North and West, with the majority of breeding individuals in the Northern Isles. Despite the importance of this species, in Scottish waters the only protected area measure for black guillemot at present comprises the designation of a small number of SSSIs, and these only extend to the low water mark. Because black guillemot are not migratory - indeed they are largely sedentary and do not venture far from the shore - they are not listed under Annex I of the Birds Directive. Consequently they are not included as a species for which SPAs can be classified. This gap in their protection lies behind the rationale for including the species on the list of MPA search features. SNH advised that MPAs be used to protect large aggregations, given that such sites would be used year round for feeding, breeding and maintenance behaviours (Marine Scotland, 2012f).

The approach taken by Marine Scotland to identify potential sites for black guillemot consisted of looking at existing sites, ie SSSIs and SPAs, to determine the degree to which they provide the coverage necessary to provide protection. Recognising that these areas had already been considered inadequate, it is made clear that for black guillemot to be protected within an SPA classified for other seabirds, the SPA would have to be overlaid with a new Nature Conservation MPA (ie be 'double badged') (Marine Scotland, 2012f). This approach resulted in three search locations being selected:

- East Caithness Cliffs (Eastern region): an existing SPA with a marine extension, underpinned by three SSSIs, covering approximately 2.6 per cent of the UK population;
- Papa Westray (North Region): an existing SPA, containing approximately 1.1 per cent of the UK population;
- Monarch Isles (West Region): an existing SPA and a SSSI, containing approximately 2.2 per cent of the UK population.

JNCC and SNH deemed that these existing SPAs would provide sufficient coverage because they reached the threshold needed of 1 per cent of the UK population. A threshold value of 1 per cent was chosen because that is the value used for other bird species in the designation of Natura 2000 sites, and was therefore consistent (Marine Scotland, personal communication). RSPB does not dispute the validity of these sites in particular, recognising their value and the fact that they are well distributed (Brydson, personal communication). However, RSPB does object to the lack of sites designated in the Northern Isles, where the vast majority of black guillemots are concentrated (approximately half of those breeding around Britain and Ireland do so around the Northern Isles (Arran Birding, 2007). By focussing the assessments on existing sites, it appears that the Scottish Government is trying to do the bare minimum (Brydson, personal communication), attempting to limit the overall footprint of MPAs rather than follow a scientifically robust approach to site selection.

Sandeels

Similar concerns over reliance on existing spatial management have been raised in relation to the choice of search locations for protecting sandeels. In particular with regard to the decision by Marine Scotland not to pursue the Firth of Forth Banks for the protection of sandeel due to the fisheries restriction area already in place there. The East Coast Scotland fisheries management area was established in 2000 (see Article 29a of Council Regulation No 850/98). It bans fishing for sandeels on most of the Firth of Forth sandeel grounds. It was put in place in light of the fact that the life strategy and growth rate of Scottish sandeels appear to make Scottish sandeel aggregations more vulnerable to collapse than those further south and east. Strictly speaking it is a temporary closure, though it requires re-opening criteria to be agreed between the UK and Denmark (Marine Scotland, 2012a).

In Scotland, sandeels are found in the East, North, West and South West MPA regions, but the majority of the Scottish sandeel population is located in the North Sea in the East MPA region (502 known records) (Scottish Natural Heritage, 2011). The North contains 155 records, the West 102 and then the South West 21 records (Scottish Natural Heritage, 2011). According to SNH, in the East MPA region, 417 point records and eight sandeel grounds are currently afforded protection by the East Coast of Scotland Sandeel Closure (Scottish Natural Heritage, 2011). In addition, a further 5 point records fall within SACs protected for the qualifying sandbanks feature (referring to the Firth of Tay and Eden Estuary SAC, and the Moray Firth SAC). Although the majority of sandeels fall within the East MPA region, they are not considered to be a priority there because the protection afforded by these other spatial measures is considered adequate by the agencies (Marine Scotland, 2012a; Scottish Natural Heritage, 2011).

However, RSPB argues that the fisheries closure only provides protection from a specific targeted form of exploitation, sandeel fishing, and no other forms of exploitation such as other forms of fishing or other potentially threatening activities. Additionally, RSPB argues that it fails to match the degree of protection afforded by MPAs as the fisheries closure is only temporary and fails to 'future-proof' against any threats that might emerge down the line. Marine Scotland disagrees and argues that any development in the Firth of Forth would require environmental assessment in any case. Furthermore, because there are SPAs nearby protecting seabird species, and due to the close relationship between sandeels and foraging seabirds, any development that would affect sandeels would affect the seabirds within these SPAs, and would thereby afford protection by association (Marine Scotland, personal communication). Whilst acknowledging that any licensing of new developments or industries on the site would require an Environmental Impact Assessment, RSPB does not have confidence in this procedure to guarantee the sandeels protection. Indeed it argues that without an MPA designation with conservation objectives for sandeels, and sands and gravels, no mechanism will exist at the project level to identify the relative nature conservation importance of this species or the habitat, or any requirements to maintain or recover it (Brydson, personal communication). RSPB highlights the fact that an obligation to undertake an environmental assessment does not equate to an obligation to protect or recover a particular species or habitat as a nature conservation designation would do (Brydson, personal communication). According to Marine Scotland, by designating areas to protect offshore sands and gravels it is effectively protecting sandeels, due to the close association between the species and its habitat, coarse sandy sediment. The hope that seabirds, cetaceans and other predators will be sufficiently protected as a consequence of

the protection of sands and gravels, and their association with sandeels does however, appear to be an approach entailing significant hazards, which introduces a greater degree of uncertainty, particularly given the lack of robust data on the ecological relationships.

3.4 Comparing Scotland to other countries

Comparing progress on MPA's between countries is problematic. MPA coverage is the primary indicator used for assessing progress in reaching international MPA commitments. This includes coverage as a percentage of national waters, although absolute coverage (in km^2) and the number of MPAs designated are also used. Depending on which of these indicators is used the picture can be quite different. Figure 4 presents the most recent absolute coverage data for OSPAR MPAs (OSPAR Commission, 2012). Unfortunately these data are available for the UK as a whole instead of Scotland separately. The UK comes second behind Norway in terms of total coverage in km^2, though it leads the way in terms of offshore coverage. It is also a significant way ahead of Germany in third place and the other contracting parties behind that. However, Germany has a relatively small marine area under its jurisdiction compared with the UK, so a direct comparison is not appropriate. Figure 5 presents coverage of OSPAR MPAs as a percentage of national waters. Because of the much larger size of the UK and Norway's waters, they slip down to fifth and sixth place respectively, behind Germany, Denmark, the Netherlands and Sweden which have relatively smaller national seas and a greater proportion of their waters under protection. The other fundamental factor eclipsed by the area based metrics is that they do not capture the ecological importance of a particular area. The required or desired coverage of MPAs will depend entirely on the ecological importance of a country's waters.

Figure 4: Absolute MPA coverage in OSPAR Contracting Parties' national waters (as of 31 December 2011)

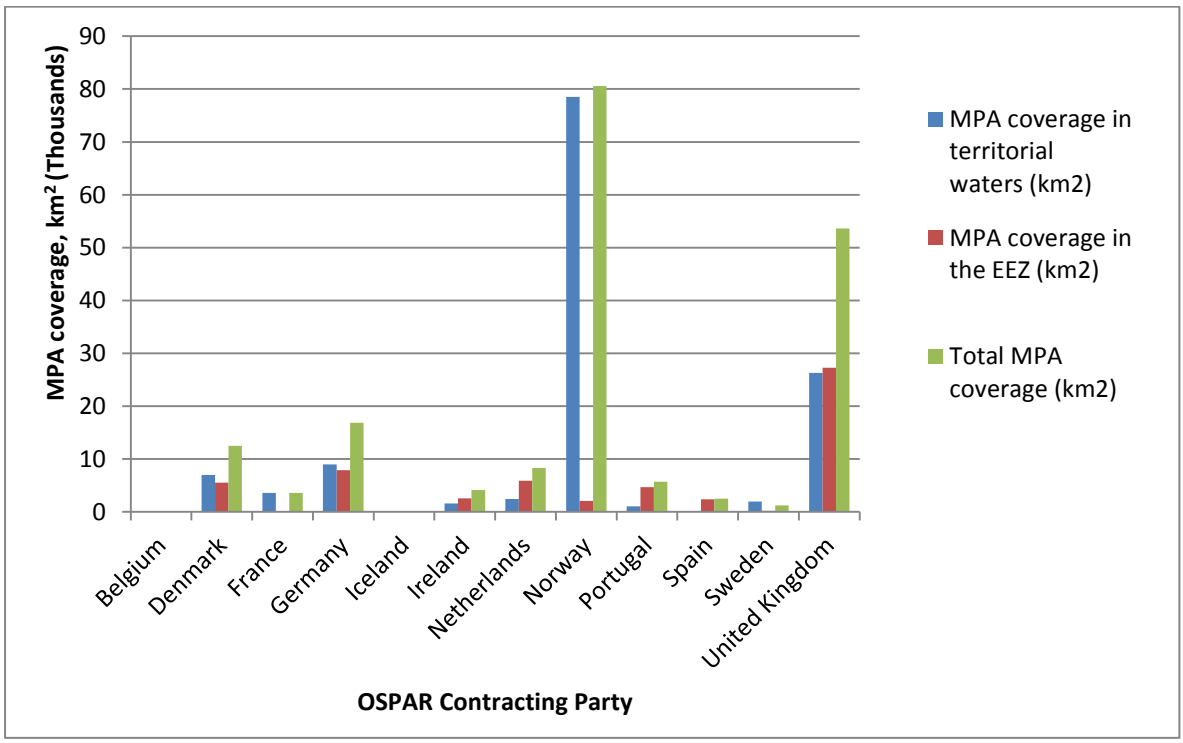
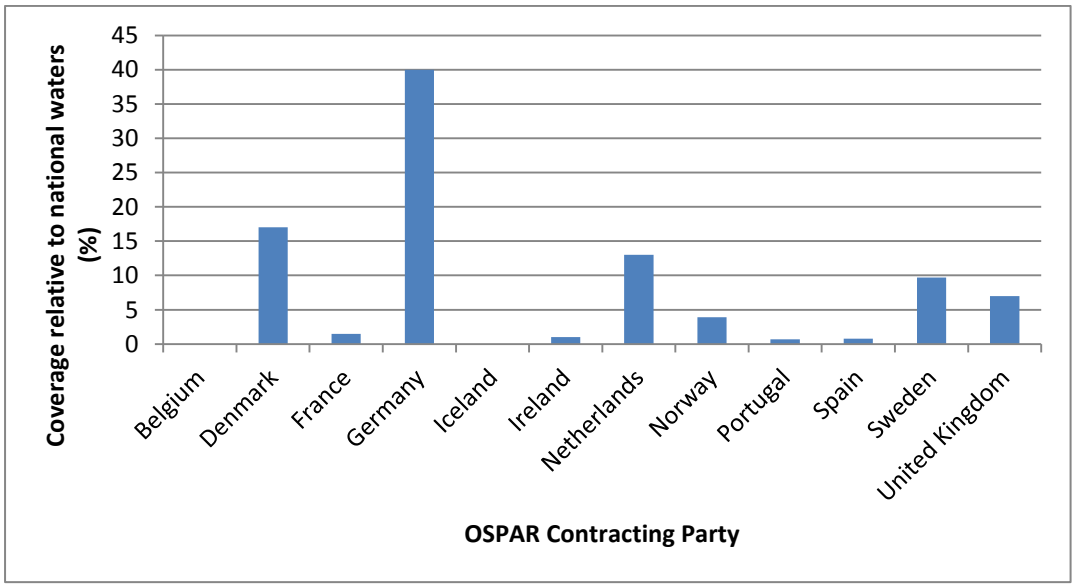


Figure 5: Relative MPA coverage in OSPAR Contracting Parties' in national waters (as of 31 December 2011)



The data presented in Figure 4 and Figure 5 are provided by Contracting Parties in the process of nominating their MPAs to the OSPAR Commission and subsequently to the OSPAR database of Marine Protected Areas, they therefore represent OSPAR MPAs. However, there is significant overlap between OSPAR MPAs and Natura 2000 sites. Indeed, almost all of the MPAs so far reported to OSPAR by EU Member States largely overlap existing Natura 2000 sites (OSPAR Commission, 2012). The exceptions to this are nominations for four sites by Portugal in the Azores, which are not included in the Natura 2000 network, and for the others, smaller Natura 2000 sites are nested within a larger OSPAR MPA. In addition, France and Spain each reported MPAs to OSPAR in 2008 that have not (yet) been established as Natura 2000 sites. Thus in practice there is not a clear distinction between MPAs designated under different regimes, due to the common practice of 'double badging'. More importantly, given that the marine geographical scope of the OSPAR Network is larger than the EU marine area, and that the ecological criteria for MPA selection within OSPAR are broader than the relevant species and habitats listed in the EU Directives, it can be inferred that as long as nominations are mostly limited to existing Natura 2000 sites then it is unlikely that the OSPAR Network's ecological goals will be met (OSPAR Commission, 2012).

Another possible comparison to make is between the Scottish MPA project and the English and Welsh offshore MPA project[26]. At the outset, it is important to note that the two projects are at different stages of the site designation process, with the English and Welsh offshore project further ahead than the Scottish project. In September 2011 Defra published recommendations for 127 MPAs within English and Welsh offshore waters. These recommended that MPAs should be established, together accounting for approximately 15 per cent of the project area. This compares to 12 per cent of the total marine area

[26] The English and Welsh project covers English inshore and offshore waters and Welsh offshore waters only.

recommended for designation by the Scottish MPA project in December 2012[27]. However, in 2012 the UK government announced that it planned to take a phased in approach to the designation process, choosing to consult the public on the potential designation of only 31 out of the 127 recommended MPAs. The other zones were rejected on the grounds that the scientific evidence in support of them was 'not up to scratch' (Carrington, 2012). Other MPAs may be created in the future but no definite timetable for this has been published. Unsurprisingly this has angered NGOs such as the Wildlife Trusts and the Marine Conservation Society (Carrington, 2012; The Wildlife Trusts, 2013). A report by the UK Science and Technology Committee (2013) on the process to select Marine Conservation Zones described it as 'complicated and protracted', arguing that it 'highlights the Government's lack of focus'. Despite the Marine and Coastal Access Act having been passed with strong support from the public and Parliament, it has taken three years to reach a point where 31 zones are being consulted on for designation at an unspecified time, with management measures yet to be decided (Science and Technology Committee, 2013). The report concludes that 'uncertainties caused by these delays and the lack of clarity in this process create anxiety and risks undermining public support for the project' (Science and Technology Committee, 2013). The UK Fisheries Minister, Richard Benyon, also made reference to the need to appease industries such as fisheries and aggregate extraction (Carrington, 2012), which suggests that socio-economic concerns have intervened in the site designation process in the English and Welsh offshore waters also.

This evidence shows that the English and Welsh offshore MPA project and the Scottish project have both have suffered from delays, in particular delays caused by (at least on the surface of it) from a paucity of data. As discussed, there are also indications that socio-economic concerns have had a significant role in influencing the designation of sites in English and Welsh offshore waters, as was observed in the Scottish MPA project. The fact that the Scottish MPA project is comparable to the English and Welsh MPA project is disappointing. First, the English and Welsh offshore project has been criticised strongly for a number of reasons, and should certainly not represent a benchmark for good marine governance. Second, and more importantly, the English and Welsh offshore waters are a poor comparison with those of Scotland, given Scotland's unparalleled marine biodiversity in the North East Atlantic. Scotland holds 90 per cent of the UK's grey seal colonies, and 80 per cent of the UK's population of harbour seals (Baxter *et al,* 2011). It also holds internationally important numbers of 24 species of breeding seabirds, with over 80 per cent of the UK's populations of Northern fulmar, European and Leach's storm-petrel, Northern gannet, European shag, Arctic and Great skua, Mew and Great black-backed gull, Arctic tern, Black and Common guillemot, and Atlantic puffin (Baxter *et al*, 2011).

3.5 Final Reflections

This chapter has scrutinised the Scottish Government's delivery of MPA site designation, focusing on three of the more prominent issues, comparing delivery against the Government's own principles for sound process.

[27] The 33 proposed nature conservation MPAs cover 50,503.56 km^2, 12 per cent of the total Scottish sea area which measures 420,863 km^2.

By analysing the process involved in selecting sites to protect sandeels, a priority feature of great importance to the North Sea food web, it became apparent that socio-economic interests had intervened in the science-led process. Despite being a site renowned for its sandeel population, the Firth of Forth was not put forward as a potential site to protect the species (only to protect sands and gravels). Marine Scotland was very open about the reasons for this: certain stakeholders were opposed to it on socio-economic grounds. This is an obvious breach of the principle of putting science first in the search for sites to protect priority species, with socio-economic concerns only supposed to be considered when ecological coherence of the network has been met, and calls into question the scientific basis of the MPA selection process. In addition, the process was undermined further when Marine Scotland attempted to find alternative sites, to the Firth of Forth, by introducing the new concept of 'science-based alternatives'. They were unsuccessful at identifying any sites of equal ecological value.

Another principle which was brought under question within this analysis was the principle that 'a lack of scientific certainty should not be used as a reason for postponing MPA selection, or taking action when there is a threat of damage to areas in the network'. This principle was not respected either, with delays to site selection ensuing as a result of insufficient data being available for cetaceans. The basking shark and common skate have not yet had MPAs identified to protect them for the same reason. For basking sharks a provisional reassessment of the underpinning data is planned for April 2013, with completion not expected until April 2014 (Marine Scotland, 2012e). For the common skate the delay is even longer: the findings of the field work will not be assessed until the first review of the MPA network in 2018! Marine Scotland has given an assurance that sites will be designated for these features eventually, and there is a clear timetable in place for the collection of data to support the assessments. This is a reassurance that the search for more data will not be prolonged indefinitely. However, this is not sufficient if in the meantime there is a threat of damage to these species, and there is no guarantee that the goalposts for data requirements will not be shifted again.

In addition, it is important to consider these delays in the broader context of the delays to the MPA establishment process in its entirety, as well as delays to the new system of marine planning (the National Marine Plan). The new MPAs were originally expected to be in place by 2012. In actuality, the proposed areas were only presented to Parliament at the end of 2012, and the public consultation on the proposals will only start in the summer of 2013. In practice, the sites will not be established until the end of 2013 or even 2014, and even later than that for the species for which there have been delays due to data paucity. This delay to the MPA network of at least a year comes alongside a two year delay in the publication of the National Marine Plan, the aim of which is to manage the increasing demands for the use of the marine environment, encourage economic development of marine industries and incorporate environmental protection into marine decision making. Originally due to be published in 2012, the National Marine Plan will only be consulted on in Summer 2014. In the meantime, large scale renewable energy and aquaculture industries are progressing. Consequently, there is a significant risk of inappropriate development reaching an advanced stage before the National Marine Plan changes.

Given the complexity of the site designation process and arguments over technical details of ecological coherence, data sufficiency, etc, it is easy to lose sight of the bigger picture.

However one issue which becomes apparent and appears to underlie the main concerns over site designation is a lack of resources.

Marine Scotland has a very small team dedicated to MPAs, with three to four members of staff working on implementing Nature Conservation MPAs, the Marine Plan and Natura 2000. JNCC and SNH are under similar constraints. Unfortunately this lack of resources appears to have negatively affected the stakeholder engagement process. Although Marine Scotland found that the workshop engagement model was a good way of getting feedback, and useful in that it let stakeholders hear each other's views, the reaction from certain stakeholders was less positive. According to RSPB, the workshop model meant that requests and queries to Marine Scotland were often put off until the next scheduled workshop, which hampered efforts to engage in the process in the meantime. In addition, once the workshop was in operation, the structure of 'break out groups' meant that it was difficult to respond to all the information provided (Brydson, personal communication). Moreover, a large amount of material for the workshops was typically provided at the last minute, making it difficult for stakeholders to read and digest the information, or to formulate a response. According to Marine Scotland, although it was not the intention to provide large amounts of information just days before the workshops, a lack of resources meant that it was a challenge to process so much information, write it in a non-technical style, address comments from the statutory agencies, and still get it out to the public in good time (Marine Scotland, personal communication).

More to the point, resource constraints have clearly impacted the ambition of the Scottish Government's MPA network, and undermined the delivery of the promising aspirations outlined in the Site Selection Guidelines and elsewhere. Marine Scotland conceded that the foreseen budget for managing sites once they are designated was a major influence on the approach taken, and the factor limiting the number of sites that could be designated (Marine Scotland, personal communication). This brings us to the other prominent issue of concern that has become apparent over the course of this study: the overzealous application of the principle that other area based measures may be recognised as contributing to the MPA network. The danger in this case being that other spatial management measures may not provide sufficient protection for certain marine species. This has been illustrated using the examples of the black guillemot and sandeels, where arguably the 'best' sites for these species have not been selected because existing spatial measures were deemed to provide sufficient coverage. It is important to note that these two features are not exceptions: of the 33 MPA proposals and four search locations submitted to the Parliament for consideration, 20 are based on existing spatial management measures (Marine Scotland, 2012e).

Marine Scotland admitted that it was reluctant to create too many MPAs out of the fear of not being able to manage them properly, being wary of the risk of creating so called 'paper parks' (Marine Scotland, personal communication). This evidence corroborates LINK's suspicions that the Scottish Government has been attempting to limit the overall footprint of MPAs. Thus, although the Scottish Government set out not to take a target-based approach out of a fear that it would be arbitrary and unscientific, in reality the coverage has been determined more by socio-economic considerations. This refers both to listening to socio-economic objections in certain specific site designation decisions as illustrated in the Firth of Forth, and, more fundamentally, through the budgetary limitations on

administrative resources and future site management, thereby incentivising a reliance on existing spatial measures.

This focus on the capital costs of MPAs is short-sighted, and fails to account for the long term benefits which they are expected to bring. It appears that the ecological criteria and principles ambitiously set out at the start of the project have effectively been diluted within the stages of process. A recently published independent report commissioned by Scottish Environment LINK estimates that the economic benefits derived from MPAs, through mitigation against extreme weather impacts, boosting fisheries production and securing Scotland's tourism appeal, could be worth up to £10 billion to the Scottish economy (González-Álvarez *et al*, 2012). This figure, which is a conservative estimate, demonstrates the importance of this opportunity and the risk involved in not investing sufficiently in the conservation and restoration of Scottish seas.

4 RESPONDING TO CLIMATE CHANGE

Key messages

Scotland has the most ambitious legal targets for mitigating climate change to be found in Europe. A number of measures have been implemented by the Scottish Government in order to begin meeting these targets whilst others are still at an early stage of development. In some sectors there has been encouraging progress, particularly in relation to the development of wind power and some other forms of renewable energy. However, failures to meet emissions reductions targets in both 2010 and 2011 have raised considerable concerns as to whether it will be possible to meet future annual targets, including the target to reduce GHGs by 42 per cent of 1990 levels by 2020.

- The current strategy is reliant on anticipated support from reinforced EU emission reduction targets for 2020. However, these now seem less likely to materialise in the near future, putting a larger onus on domestic measures to meet the Scottish targets. The UK Government's opposition to binding EU targets for renewable energy in 2030 will add further uncertainty.

- In several sectors there is a case for more active and larger scale deployment of measures on the demand side which are not yet being put in place.

- In the housing and transport sectors particularly, uptake of some initiatives is rather low and projected public expenditure on policies identified as necessary to meet targets is falling short of the required level.

- In the transport sector, the challenge of achieving modal shift needs more attention given the trajectory of emissions; more active support for cycling is one avenue which the Government could pursue.

- In the housing sector, energy efficiency standards for new buildings could be more ambitious and closer to European leaders, as set out in the Sullivan Report.

- Further action on waste management, where Scotland lags behind many other European countries, also could contribute to meeting climate targets.

- There is a major opportunity to expand the rate of peatland restoration as a means of pursuing both mitigation and adaptation objectives as well as wider environmental benefits.

4.1 Introduction

Climate issues have received considerable political attention in Scotland in recent years. However, although there has been a willingness to set goals that are ambitious relative to those in many other parts of Europe, there is a risk that Scotland will fail to meet those targets without effective policy delivery. The recent publication of the Second Progress Report by the Committee on Climate Change (CCC) confirms some of the uncertainties about whether Scotland can meet future reduction targets, based on existing and prospective emissions trends. It had been hoped that Scotland's Second Report on Proposals and Policies (RPP2), published in June 2013, would address a number of prevailing concerns regarding funding levels and effective climate policy delivery. Scottish parliamentarians themselves acknowledged that, as well as setting ambitious reduction targets, Scotland would need a robust RPP2 which both implements all relevant proposals and policies and demonstrates how greater domestic reductions would be achieved within the current EU emissions reduction target of 20 per cent by 2020 (Scottish Parliament, 2013). In this chapter of this report, these concerns are considered, including the question of whether RPP2 is sufficiently robust to meet Scotland's ambitious targets.

The success of the renewable energy industry in Scotland is often heralded and the increase in supply over the last decade has been impressive. Given the considerable potential of Scotland's offshore wind and tidal resources in particular, the development of this infrastructure has been identified as a priority. However, looking beyond the potential for renewable electricity to offset greenhouse gas (GHG) emissions, the current doubts over the future of the EU Emissions Trading System (EU-ETS) and the lack of compelling evidence that the EU will adopt a 30 per cent target for emission reductions by 2020, raises concerns about meeting the current targets in Scotland.

In their recent second progress report on Scotland, the CCC argued that 'meeting targets to 2020 requires that the EU moves to a 30 per cent target for 2020, and tightens the EU-ETS cap accordingly. Without this, even implementing all of the proposed policies will not be enough to meet targets on current projections' (CCC 2013). This seems to be an increasingly insecure basis for Scottish policy. Efforts within the European Union to tighten the EU-ETS cap have not won political support on the required scale. If there is too much reliance on a more ambitious EU target and tighter ETS cap without further domestic abatement from the 'non-traded sectors' such as transport, buildings and land use, Scotland risks a failure to

meet future emissions reduction targets. The increase in emissions from the non-traded sectors, primarily attributable to the residential sector from 2009-2010 and to land use change from 2010-2011, suggests that there is a particular opportunity and need to improve the delivery of abatement policies and measures in these areas. Following the structure of the RPP2, this report differentiates between the non-traded sectors and traded sectors, with the latter referring to installations captured by the EU-ETS such as electricity generation and industrial processes, amounting to almost 100 installations in Scotland.

Recent trends, notably the increase of emissions in 2010 over 2009, confirm the importance of the non-traded sectors for the overall trajectory of emissions in Scotland. They will be the primary focus of this chapter. We have evaluated both RPP2 and its predecessor, the Report on Proposals and Policies, published in March 2011 (RPP1) and have compared the abatement potential as identified in these key reports to current funding plans outlined in the Scottish Budget and Spending Review 2011 and Draft Budget 2012-2013 (known hereafter as the SBSR). Public expenditure is a key part of a balanced response in a number of areas, bearing in mind the capital investment often needed to help reduce emissions and the potential for carbon lock-in unless the right infrastructure is in place.

In this exercise, the text available in RPP2 is compared against the analysis provided in RPP1 and the targets, proposals and policies set out in both documents are assessed against the Government's delivery on these targets. Certain sectors also are examined in a European context to provide further context. Given that the Scottish Adaptation Programme is not scheduled for release until later in 2013, to replace the existing Adaptation Framework, we have not considered progress on adaptation other than briefly in the context of peatland restoration, which is an issue of particular importance given Scotland's exceptional natural heritage.

4.2 The Scottish Emissions Profile

Scotland has 'world leading statutory targets' to reduce GHGs by 42 per cent of 1990 levels by 2020, and 80 per cent by 2050 as part of the Climate Change (Scotland) Act 2009 (known hereafter as the 'Act') (Scottish Government, 2011a). Although the UK has the same 80 per cent reduction target for 2050 under the Climate Change Act 2008, the Scottish target for 2020 is more ambitious than that for the UK as a whole, which is to reduce GHG emissions by 34 per cent of 1990 levels. The Scottish target also includes emissions from international aviation and shipping, which is not the case for the UK target. The Act outlines targets for 2020 and 2050, while secondary legislation serves to determine annual emissions reduction targets for 2010 to 2022, and 2023 to 2027 respectively (CCC, 2012).

While total GHG emissions fell by approximately 29.6 per cent between 1990 and 2011 (Scottish Government, 2013b) recently released statistics set out in Table 11 show that the emissions failed to reach the legislated reduction targets in both 2010 and 2011. The rise in emissions between 2009 and 2010 can be attributed primarily to a 15 per cent increase in residential sector emissions (Aether and Ricardo-AEA, 2013) combined with higher levels of electricity generation from coal fired power stations, both of which were caused by below average seasonal temperatures in 2010 in the months from January to March and from October to December. The subsequent 21 per cent decrease in emissions in the residential sector between 2010 and 2011, in part due to higher temperatures in 2011, which was on

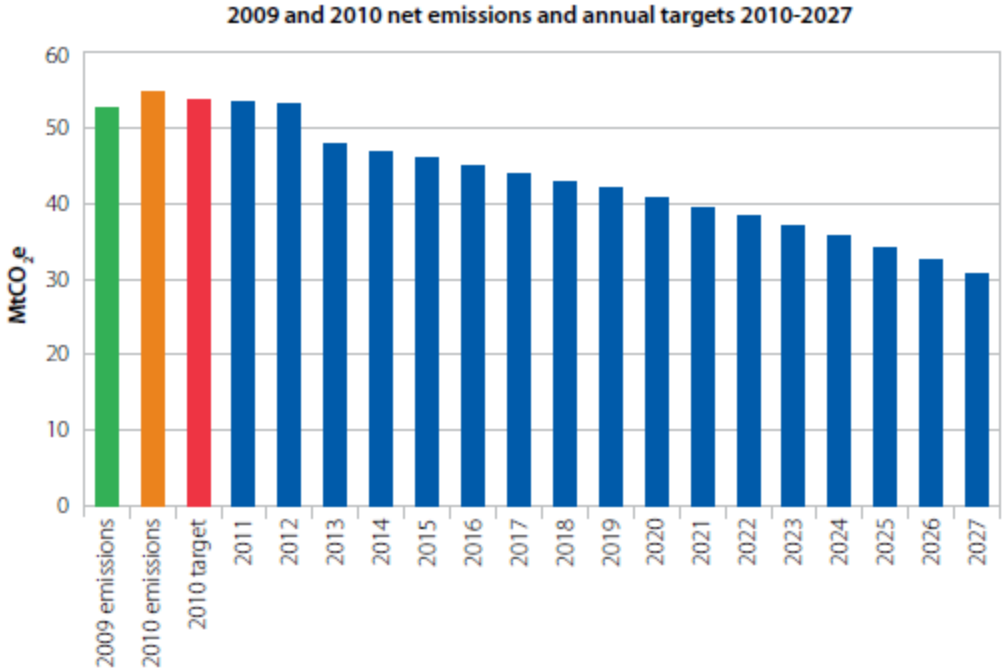
average 1.5°C warmer than 2010, reversed the pattern of fossil fuel consumption seen in 2010 and reduced emissions between 2010 and 2011 overall (Scottish Government, 2013).

Table 11: 2010 and 2011 Adjusted Emissions Levels Against Targets

	Targeted Emissions ($MtCO_2e$)	Adjusted Actual Emissions ($MtCO_2e$)
1990 baseline	N/A	72.900
2009	N/A	53.687
2010	53.652	54.714
2011	53.404	54.252

Scotland's failure to meet its reduction targets in 2010 and 2011 indicates the possibility that future targets could be missed. This possibility is further illustrated in Figure 6 below which shows that total emissions in 2011 will need to be reduced by approximately 14 $MtCO_2e$ by 2020 and by 24 $MtCO_2e$ in 2027 to meet the projected targets.

Figure 6: Emissions Levels and Projected Annual Targets

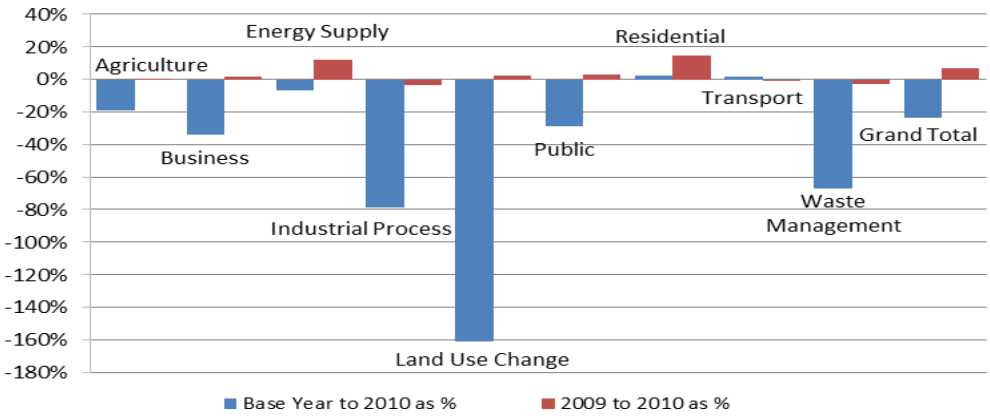


Source: CCC, 2013

National Atmospheric Emissions Inventory (NAEI) data available for 2010 and 2011 provides a sectoral breakdown of changes in Scottish emissions levels from 2009 to 2010 and from 2010 to 2011. Figure 7 and 8 below demonstrate that the pattern of change from 2009 to 2010 and from 2010 to 2011 remains consistent in some sectors (agriculture, waste management) whilst other sectors show a noticeable difference from year to year (land use

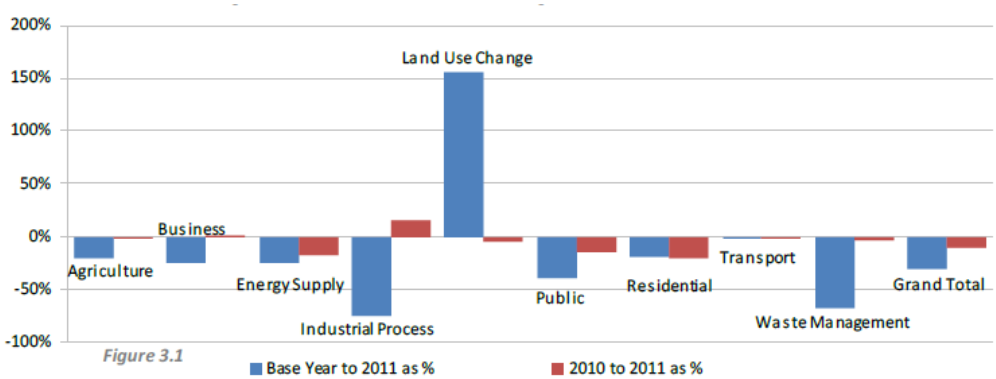
change, residential, energy supply). In both 2010 and 2011, total emissions fell in several sectors. However, Figure 7 shows that in 2010, emissions increased in certain sectors; moreover, in the case of both the energy supply and residential sectors, increases exceeded total reductions for the 1990-2010 period.[28] This pattern is not repeated in 2011, where decreases are seen across all sectors with the exception of industrial process. The very substantial overall reduction in land use emissions levels over the 1990-2010 period followed by the substantial increase seen in the 1990-2011 period can be explained by a revision in the methodology used to calculate nitrous oxide emissions associated with land use conversion to cropland.

Figure 7: Percentage changes in Scotland's emissions levels from 2009-2010 vs. Emissions from 1990-2010



Source: Source AEA and Aether, 2012

Figure 8: Percentage changes in Scotland's emissions levels from 2010-2011 vs. Emissions from 1990-2011



Source: Aether and Ricardo-AEA, 2013

Nevertheless, there are numerous complicating factors to consider in extrapolating future emissions trends for the non-traded sectors. A cold winter and fluctuations in weather

[28] The blue columns represent the percentage change from 1990-2010, while the red columns refer to the percentage change between 2009 and 2010 only.

conditions have led to a greater demand for household energy use, particularly for heating. The increase in residential energy use signalled in Figure 7 coincided with an exceptionally cold winter in 2010, emphasising the need to implement more demand side measures in residential buildings (Scottish Government, 2013). The decrease in transport emissions between 2010 and 2011 is likely to be short-lived and outpaced by emissions associated with the projected expansion of transport infrastructure. Total vehicle kilometres travelled in road transport are forecast to increase by 27 per cent from 2005 to 2022; and demand for flights are expected to increase emissions from aviation by 70 per cent between 2006 and 2022 (Atkins, 2009). If this or even a smaller level of growth occurs, there will be a need for commensurately greater action in other sectors.

Energy supply still comprises the largest percentage share of emissions and is a result of both on-site combustion and fuel extraction (AEA and Aether, 2012). However, a large proportion of demand for energy (and the resulting combustion of fossil fuels) is attributed to energy use from residential, commercial and institutional buildings, business and transport. While direct emissions from electricity generation can be mitigated largely by means of technical measures and a limited number of scalable investments by a few actors, notably through investment in renewables and carbon capture and storage (CCS), addressing indirect emissions from electricity based fossil fuel combustion requires more demand side management measures which are difficult to achieve without significant support from government policy.

In conclusion, the more vigorous implementation of policies and measures in the group of non-traded sectors that have an impact on energy and fossil fuel demand at the consumer level requires further consideration. Nonetheless, uncertainty surrounding the EU's capacity to increase the effectiveness of the EU-ETS remains. This is underlined by a low carbon price and the prolonged debate over the political acceptability of the European Commission's relatively short term 'backloading' proposal by which 900 million carbon allowances are to be withheld from auction with the intention of re-balancing supply and reducing allowance price volatility.

Notwithstanding the difficulty of decoupling emission levels from fluctuations in economic activity, there are numerous benefits associated with additional abatement in the non-traded sectors. Demand side management and associated infrastructure in both housing and urban transport offer a more permanent solution in terms of reducing the demand for fossil fuels, and should give rise to a range of other societal and environmental benefits. Decreasing reliance on road transport could improve local air quality and noise levels, while increasing the uptake of home insulation could reduce levels of fuel poverty among the vulnerable segments of the population. Fuel poverty remains a more severe problem in Scotland than in many other countries, with 28 per cent of Scottish households classified as fuel poor in 2010 as opposed to a UK average of 19 per cent of households (CCC, 2013).

Indeed, the potential to drive emissions reductions more from the bottom-up, based on policy to change individual behaviour as part of Scotland's transformation to a low carbon society, is the basis for the Scottish Government's 'Behaviours Framework' initiative (Scottish Government, 2013a). The emphasis on individual responsibility and the potential to reduce energy demand is consistent with the need to implement policies and measures that target individual consumers more than in the past. It points to less reliance on

emissions trading and probably more emphasis on other market based instruments such as taxes, charges and subsidies, some of which are designed more directly to influence consumer behaviour. However, government leadership is still required to create the necessary impetus.

At the very least, demand side measures that involve civil society, should be implemented vigorously to complement the implementation of more top down regulatory approaches and infrastructure investment. There are numerous examples of approaches that have reduced the demand for personal vehicle travel and household energy use throughout Europe. For example Switzerland, the Netherlands and Germany all have established successful car-sharing cooperatives operating on a national basis as a result of more active demand for emissions reducing initiatives. The scope for such programmes, whether facilitated through government funding or not, should be mapped out more systematically and their potential impact on greenhouse gas reductions assessed more fully. The current approach to policy, as set out in RPP1 and RPP2, lacks such clarity.

4.3 A Review of Proposals and Policies

There are a number of key documents and strategies forming the basis of Scotland's climate change policy and the primary means of delivery. While the Climate Change Act provides the legislative framework for both adaptation and mitigation policy, it legally mandates the Scottish Government to complete a thorough analysis of applicable climate change mitigation policies as part of its Report on Proposals and Policies. This analysis should determine whether Scotland will meet four key milestones which originally were outlined in the Climate Change Delivery Plan agreed in 2009. The milestones set out the transformational outcomes required in order to meet the 2050 target (Scottish Government, 2011), and form the basis of the aims put forward in both RPP1 and RPP2:

- Decarbonisation of the electricity generation sector by 2030;
- Decarbonisation of the heat sector by 2050, with significant progress by 2030;
- Decarbonisation of road transport by 2050, with significant progress by 2030;
- Carbon and the cost of carbon being placed at the centre of strategic and local decisions about rural land use.

Despite these aspirations, there is a gap of 14MT between emissions levels in 2010 and the projected target for 2020 as indicated in Figure 6. According to the information in RPP2, a total of roughly 4MT in abatement is expected to be achieved in residential buildings between 2013 and 2020 using a range of proposals and policies. To date however, only about 1MT of actual abatement is expected for this timeframe in consequence of policies already adopted; the remainder therefore will need to come from 'proposals' that have yet to be implemented. For transport, roughly 7MT of abatement is expected for the same period, but again only 3MT are confirmed because of active policies with the remainder outlined as 'proposals' (Scottish Government, 2013). This required level of abatement in the transport sector looks particularly challenging in light of both the slow progress made in reducing transport emissions between 1990 and 2011 and the proposed increases to the infrastructure budget described below.

Consequently, the proposals and policies outlined in both RPP1 for the 2010-2022 period, and in RPP2 for the 2023-2027 period are critical to the achievement of mitigation targets and are the primary focus here. The potential for effective policy delivery is reviewed below in five of the six sectors described in both RPP1 and RPP2. One key indicator of the probability of meeting these targets is the level of funding provided for abatement measures in line with the Scottish Budget and Spending Review (and the relevant aspects of funding available in the current 2013-2014 budget).

4.3.1 Energy

Table 12: Tracking performance in Scotland's energy sector

Development of Key Policy Deliverables from RPP1 to RPP2		Allocation in SBSR	Progress
RPP1	RPP2		
Full decarbonisation of electricity supply by 2030	Largely decarbonised electricity supply by 2030 with carbon intensity of 50gCo2/kWh of generation	£60 million capital budget to support development of offshore wind projects £70 million Scottish National Renewables Infrastructure Fund to leverage private sector investment £30 million invested since 2007 to support homes and small businesses with advice, grants and loans via Energy Saving Trust District Heating Loan Fund set up in 2011/12 to support development of district heating networks with a budget of £2.5 million	Deployment of CCS is central to achieving this aim, and little progress has been made here.
80% of electricity demand from renewable sources by 2020	At least 100% gross electricity consumption from renewables by 2020 with interim target of 50% by 2015		Electricity generation from renewables was 36.3% in 2011. Provisional figures for 2012 indicate that around 39% of Scotland's electricity needs were met by renewable sources.
11% of heat from renewable sources by 2020	11% of heat and 10% transport fuels from renewable sources by 2020		
12% reduction in total final energy consumption by 2020	12% reduction in total final energy consumption by 2020 from a 2005-2007 baseline		Data for 2010 showed a 1.2% increase in demand compared to 2009, but overall consumption still 6.2% lower than baseline
	Local and community ownership of at least 500 MW of renewable supply by 2020	Enhanced Community and Renewable Energy Scheme (CARES) offered	800 grants for community renewables worth £16 million allocated under CARES
CCS in demonstration at a conventional coal-fired power station by 2020 From 2009 all new coal-fired power stations to require CCS on minimum 300MW (net) capacity From 2020 all new coal-	500 MW of CCS demonstration plant to be operational by 2020 1600MW of CCS gas plant to be operational by 2027 Full retrofit across conventional power	No specific allocation in SBSR: intended to be funded through UK and EU budgets. However Peterhead CCS project was not put forward to receive NER300 funding therefore is now eligible for UK funding only.	Longannet coal fired power station intended to be first to implement CCS but this project did not succeed through the first competition. Peterhead gas fired power station is listed

fired power stations to require CCS on 100% of capacity	stations by 2025-2030 NB the Electricity Generation Policy Statement states that a minimum 2.5 GW of thermal generation will be progressively fitted with CCS		as one of two bidders to receive £1billion UK government funding. Final decision expected in 2015
Expected abatement of 3.0MtCO_2e if EU 2020 target for emissions reductions increased from 20% to 30%, and UK 2020 target for emissions reductions increased to from 34% to 42%		No specified allocation in the SBSR	Strong emphasis placed on the need for the increased target by CCC and in both RPP1 and RPP2. EU has not progressed to a more ambitious emissions reduction target for 2020

Both RPP1 and RPP2 outline the same non-binding targets for complete decarbonisation of the power sector by 2030; a target that will rely largely on both Scotland's ability to mobilise its very considerable renewable energy potential, and its deployment of an ambitious CCS programme. Only RPP2 includes the 50g carbon intensity target for the electricity supply industry.

Due to Scotland's wind resource and surrounding maritime zone, it possesses up to a quarter of Europe's offshore wind and tidal energy resources (The Offshore Valuation Group, 2010). Investment in energy supply is driven by a mixture of factors including the availability of capital, government policy on renewables, including feed-in tariffs and a clear planning and consent process. UK efforts to comply with the EU Renewable Energy Directive and the specific targets set for the UK, with a high share derived from Scotland, have underpinned a series of supportive policy changes at the UK and Scottish levels and have provided concrete assurance for investors. Nonetheless, in order to meet the 2020 target for electricity production from renewable sources in Scotland, an additional 1.1 GW of renewable capacity will need to be installed annually up to 2020, much more than has been achieved historically (CCC, 2013). This needs to be achieved within environmental constraints. These could become more challenging once developments move on beyond the lower impact and lower cost sites, in the offshore wind sector for example.

With the anticipated closure of both nuclear and coal fired stations, a significant role is planned for commercial scale CCS, particularly in the second half of the 2020s, following successful commercial scale demonstration of a plant by 2020. RPP1 makes initial statements about the potential of CCS in the transformation to low carbon power generation and the role it could play in complementing reductions from renewable energy technologies, and these statements are expanded at length in RPP2. Many stakeholders believe that Scotland stands to play an important role in CCS implementation, given existing geological storage expertise gained from oil and gas exploitation in the Central North Sea. (Scottish Enterprise, 2012)

However, progress has not been rapid, with delays throughout the UK and, indeed other European countries, in moving forward plants to the necessary commercial scale. This is despite funding being available at both the EU and national levels. The EU New Entrants Reserve (NER300) (where funding is obtained from the sale of 300 million emission allowances, and therefore the level of funding is contingent on the carbon price), although in principle rather sizable, has had limited impact in terms of leveraging the investment in CCS. While in principle around €1.5 billion has been made available at the EU level to help co-fund CCS and also innovative renewable energy projects under the first Call for Proposals through the NER300 in practice no viable proposals were put forward in the first round, and funds have largely been diverted into renewables. The Yorkshire-based White Rose project is the only CCS project to be proposed for second round funding. The UK CCS Commercialisation Competition has been subject to a series of unexpected delays (BusinessGreen, 2013a). The Department of Energy and Climate Change (DECC) announced in March 2013 that the 2,177 MW combined cycle gas turbine plant in Peterhead had been shortlisted as one of two preferred bidders for £1 billion capital funding offered for the commercialisation of CCS (the White Rose project being the second), with the final decision as to the recipient of the funding not to be announced until early 2015. The take up of CCS technology, which has been much slower than expected across Europe, calls into question the emphasis placed on CCS within the RPP2 (BusinessGreen, 2013b), and the possibility of large scale abatement in the late 2020s appears very challenging given that a standard CCS project demands a lead time of 5-10 years (GCCSI, 2013; DECC, 2013).

These known development delays have been apparent for some time but are not outlined in RPP2, and little detail is provided regarding a feasible forward strategy to take account of these developments. The text alludes to aspirational goals, stating that Scotland is well placed to 'take a lead on CCS', but it does not comment on the alternative abatement options should Scotland's bid to implement CCS fail within the currently envisaged timescale (Scottish Government, 2013). So, significant questions remain to be answered.

4.3.2 Homes and Communities

Table 13: Tracking performance in Scotland's homes and communities sector

Development of Key Policy Deliverables from RPP1 to RPP2		Allocation in SBSR	Progress
RRP1	RPP2		
At least 100,000 homes to have adopted individual or community renewable heat technology.	At least 100,000 homes to have adopted individual or community renewable heat technology for space or water heating.	£5 million Loan Fund for innovative district heating projects. £50 million Warm Homes Fund for investment in green energy projects, intended to attract further public and private finance.	A number of district heating systems have been installed but questions whether the scale of these is suited to a wider roll-out of the technology.
Every home to have loft and cavity wall insulation by 2020, where cost-effective and technically	Home Energy Efficiency Programmes for Scotland (HEEPS) Area Based Schemes	£79 million Scottish Government funding available to upgrade housing stock 2013-2014.	£3.5 million invested in boiler scrappage scheme to March 2013, now replaced by Green Homes

feasible. Every home with gas central heating to have an efficient boiler.	launched in April 2013 to take over from National Retrofit Programme.		Cashback Scheme. 546,000 solid wall properties remain un-insulated, although the overall proportion of insulated solid walls in Scotland (11%) is higher than GB average (2%).
Address fuel poverty.	Making sure that no one had to live in fuel poverty, as far as practicable, by 2016.	Part of £50 million funding for Warm Homes Fund will be allocated specifically to alleviating fuel poverty.	In 2010 28% of Scottish households were considered to be fuel poor, compared to 19% of households in UK. Scottish statistics for 2011 show this level slightly falling for July prices (to 25%) and slightly rising for October prices (to 29%).
Assess cost of implementing Sullivan Report recommendations in domestic building standards, including 60% reduction in emissions from 2007 levels by 2013 and net zero carbon buildings by 2016-2017.	Consulting on potential to cut new-build emissions by around 45% compared to 2007 standards in response to Sullivan Report recommendations.	Sullivan Report referred to in SBSR but no budget allocated.	The timeframes initially recommended in Sullivan Report have been progressively extended and proposed emissions reduction targets have been increased, thus arguably reducing the efficacy of the report's recommendations.

Emissions in the residential sector were 3 per cent greater in 2010 than in 1990, and this increase was one of the primary contributory factors to Scotland's failure to meet its 2010 emissions reductions target. Although Figure 8 demonstrates that this specific trend was reversed in 2011, the homes and communities sector remains an important element of the energy demand side and therefore a key area for action. A Plan B with a stronger role for domestic sector action is required urgently.

Emissions from the household subsector can be attributed almost entirely to household energy demand for heating and cooking (Scottish Government, 2013). Reducing demand for heating in particular will require the implementation of a combination of different household energy efficiency measures. Those implemented to date (CCC, 2012; CCC, 2013; Scottish Government, 2013c) include:

- The Scottish Government's Universal Home Insulation Scheme (UHIS), which replaced the Home Insulation Scheme (HIS) in 2010-2011. The UHIS has to date engaged with approximately 352,278 households. However, only 24.4 per cent of these engagements have been converted into assistance, with 86,237 of these households receiving new insulation measures as a result of the engagement.

- Around 39,300 boilers were upgraded under a £6 million Scottish Government boiler scrappage scheme (BSS), at a carbon reduction cost to the Scottish government of £311/tonne of CO_2. While the carbon reduction cost data of the boiler scrappage fund are calculated slightly differently to the same data for the UHIS, it is worth noting that the UHIS has a carbon reduction cost of £22/tonne of CO_2 ;

- The Scottish Government has funded a £1.9m district heating scheme which will provide nine community biomass heating systems for 280 homes as well as businesses and community facilities. Two district heating facilities have been funded to date. While this provides a useful basis on which to expand the use of district heating schemes in Scotland, it does not go far enough to bring Scotland closer to its target of 100,000 homes to have adopted individual or community renewable heat technology.

In relation to both the UHIS and the BSS described above, the Western Isles, Orkney Isles and Shetland Isles received noticeably higher levels of investment in comparison to other areas of Scotland, with over 65 per cent of households receiving assistance under either the BSS, UHIS, HIS or the Energy Assistance Package (EAP) compared to 40 per cent or less in all other areas (Scottish Government, 2013c). While there may be specific distribution or access reasons as to why this concentration took place in these areas, it is worth noting that the Home Energy Efficiency Programme for Scotland (HEEPS), which takes over from the separate BSS, UHIS, HIS and EAP measures, provides an opportunity to try to achieve a more balanced distribution across the regions.

The actual future abatement potential of new individual measures is not indicated in either RPP1 or RPP2. Where this is estimated, it is only provided for broader policies and programmes. Many new programmes such as HEEPS are in the early stages of development or implementation, and SMART metering has yet to be implemented more extensively throughout the UK. Until the abatement potential of certain new measures can be demonstrated, it is extremely difficult to determine whether the existing list of programmes will generate sufficient abatement.

The scale and rapidity of the progress here is critical. For example progress in rolling out new or upgraded district heating schemes in the UK is slower than hoped. Whilst projects in larger towns, such as the Wyndford Estate project in Glasgow providing low-cost, energy-efficient heating to 1,900 tenants, are important, many observers believe that investment in a larger number of new schemes is now needed as well and we should learn from the Scandinavian example, where existing small schemes are scaled up to suit larger numbers of people (ENDS, May 2013).

Consumer and household energy use behaviour is clearly a key parameter. The low rate of uptake for solid wall insulation for example, which has increased by only 2 per cent since 2007, indicates the challenges policy makers will face in terms of delivering successful policy in this sector. About 546,000 solid wall properties remain uninsulated (CCC, 2013). Although this challenge is expressly acknowledged in RPP2, and despite the existence of a number of supportive funds, RPP2 does not consider in any detail whether programmes implemented by OFGEM at the UK level apply satisfactorily to the particular requirements of Scottish households, especially homes which are defined as 'hard to treat' on the basis that they have solid walls or are off the gas grid. The Energy Companies Obligation for example, an

important measure to require energy suppliers to fund household energy efficiency measures for its low income and vulnerable households, does not apply to solid wall insulation (OFGEM, 2013; Scottish Parliament, 2013a).

Adequate financial support is widely understood to be critical to successful implementation of household energy efficiency measures. A recent review of the draft budget by the Parliamentary Committee on Economy, Energy and Tourism, questions whether existing budgetary allocations to address emissions from residential housing in particular, are in principle enough to address targets as outlined in the Act, particularly given the recent upsurge in emissions in 2010 (Scottish Parliament, 2012). The information provided in RPP1, when cross-referenced with that in the SBSR, confirms the potential budgetary shortfall.

The total financial cost of implementing fuel poverty and insulation programmes from 2011 to 2222, as set out in RPP1, was estimated to be £2,832 million in cash terms (Scottish Government, 2011a). It is difficult to draw any useful comparison between this estimated cost and the actual amount allocated to various policies and programmes in the SBSR from 2011 onwards, on the basis that the breakdown and description of policies and proposals used to implement the fuel poverty and insulation programmes is complex and there is crossover with UK-based funding. In the 2013-2014 Draft Budget the Scottish Government allocates £65 million to fuel poverty measures alone but in evidence to Parliament, the Cabinet Secretary proposed that £104 million would be allocated (Scottish Parliament, 2012). The SBSR states that a total of £59.5 million will be spent in budgets between 2012 and 2015 on the combined Warm Homes and Future Transport Funds, and separately commits £50 million to the Warm Homes Fund, but there is little clarity as to how these funds will be divided and which initiatives within the Warm Homes Fund will be the primary recipients. Notwithstanding this lack of clarity, it is evident that the amount allocated under the SBSR still does not get close to coinciding with that outlined in the RPP1. This is a concern given the crucial role of the sector in emissions reductions.

RPP1 sets out the intention to assess the cost of implementing recommendations arising from the Low Carbon Buildings Standards Strategy for Scotland (the Sullivan Report), issued in 2007 with the specific intention of moving Scotland towards Scandinavian levels of rigorous energy performance. The report proposes rapid changes and ambitious targets for implementation, aiming to put in place the best low carbon building standards within Europe. The recommendations on domestic building standards included a 60 per cent reduction in emissions from 2007 levels by 2013 and zero net carbon buildings, in terms of space and water heating, ventilation and light, by 2016-2017 (Sullivan, 2007).

RPP2 somewhat dilutes this intention by proposing instead to consult on the potential to cut emissions by 45 per cent from 2007 levels, without specifying a time frame for this action. Current evidence suggests that the original target dates set out in the Sullivan Report will be moved from 2013 to 2014, and both dates and targets for low carbon buildings may still be watered down further (Association for the Conservation of Energy, 2013), with potentially damaging effects on Scotland's ability to create benchmark standards in domestic building efficiency while reducing fuel poverty.

A report commissioned by the Scottish Building Standards Agency in 2007 which compares energy standards in building regulations in Denmark, Sweden, Finland, Norway and Scotland

concludes that although it is difficult to compare efficiencies on the basis that the Scandinavian countries maintain higher average internal temperatures and have lower average external temperatures, there are still margins for improvement in Scotland's building efficiency performance. The margins for improvement are demonstrated in a comparison between Swedish and Scottish levels of heat loss and airtightness, with the conclusion that if Swedish standards were to be adopted in Scotland, emissions could be reduced by 13-19 per cent (Scottish Building Standards Agency, 2007). This finding provides further evidence to indicate that the Sullivan Report recommendations should remain, as originally proposed, as a key contribution to helping Scotland to meet its ambitious emissions reduction agenda in the homes and communities sector.

4.3.3 Transport

The transport sector is key to successfully meeting emissions reductions targets in Scotland, yet is particularly challenging given that Scotland includes aviation and shipping emissions within the overall transport sector. Road transport is responsible for 88.5 per cent of transport sector emissions (Aether and Ricardo-AEA, 2013). Although this has fallen by 7 per cent since 1990 (CCC, 2013), there are concerns that proposed infrastructure investment will encourage increased road use and reverse this trend (Stop Climate Chaos Scotland, 2013).

Table 14: Tracking performance in Scotland's transport sector

Development of Key Policy Deliverables from RPP1 to RPP2		Allocation in SBSR	Progress
RRP1	RPP2		
Decarbonisation of road transport by 2050 with significant progress by 2030, including a mature market for low carbon cars with average efficiencies of 95g/CO_2/km.	Significant progress in decarbonisation of road transport through adoption of electric cars/vans and conversion to hybrid HGVs/buses, including significant modal shift and decarbonisation of rail and maritime travel.	Achieved through the combination of different funding schemes.	Transport emissions have shown minimal reduction, decreasing by 2% between 2010 and 2011, and by only 0.2% between 1990 and 2011.
Electric vehicle charging infrastructure in Scottish cities.	Electric vehicle charging infrastructure in Scottish cities.	Scottish Government match-funded DfT's Plugged-in-Places scheme with £9 million (not specified as part of SBSR). Increasing number of low carbon vehicles specified as an objective in the Future Transport Fund, part of the Scottish Futures Fund.	On-going installation of new charging facilities across Scotland, adding to 280 existing points. Scottish share of UK sales of electric vehicles increased from 6% in 2011 to 8% in 2012. This is a very small proportion of overall vehicle sales and cannot be relied on to deliver large scale emissions reductions.

Effective travel plans for workplaces of more than 30 employees.	Effective travel plans for workplaces of more than 30 employees.	£14.7 million allocated to assorted Smarter Choices, Smarter Places programmes in seven pilot areas from 2009-2012. No specific mention in the SBSR.	Smarter Choices Smarter Places Programme provides personalised travel planning to 50,000 households. Developing car clubs.
10% of journeys made by bicycle.	10% of journeys made by bicycle and in the longer term up to 20% of journeys by 'active travel' (with no further details given).	£10.4 million for cycling infrastructure for financial year 2013-2014.[29] Sustainable Communities Package and Climate Change Fund allocation.	Currently only 1% of journeys are made by bicycle, well below the stated target, with future funding uncertain. Cycling Action Plan for Scotland published June 2013 re-emphasising 10% target and setting out future measures. Measure by percentage of children receiving Bikeability Scotland cycle training?

The transport sector contributed 21.5 per cent of Scotland's total GHG emissions in 2011 (Aether and Ricardo-AEA, 2013). RRP1 proposes a number of milestones for emissions reduction by 2020 and looks for 'almost complete decarbonisation of road transport by 2050, with significant progress by 2030 through wholesale adoption of electric cars and vans, and significant decarbonisation of rail by 2050'. Attaining this goal will be challenging given that demand for carbon intensive travel continues and sectoral emissions have shown minimal reduction, decreasing by 2 per cent between 2010 and 2011, and by only 0.2 per cent between 1990 and 2011.

Given the emphasis on increased capital investment in infrastructure set out in the SBSR, much of which inevitably will facilitate increased transport usage, there is a need to consider closely the abatement potential of policies aimed more at behavioural change. Although behavioural change is addressed in RPP1 in terms of encouraging more cost-effective and fuel-efficient driving techniques, as well as modal shift to lower emissions transport methods such as cycling, these are not reflected in RPP2 except as a range of proposals with no clear indication as to how they will be translated into policy and within what timeframe (Stop Climate Chaos Scotland, 2013). Given that there are no stated reduction targets for transport, there is a risk that policy will fall short in terms of meeting longer term abatement objectives. As in the energy sector, the depth and quality of the information provided on new policies and proposals in RPP2 is not sufficient to outline the steps required fully to implement a low carbon policy.

[29] http://www.scottish.parliament.uk/S4_InfrastructureandCapitalInvestmentCommittee/Reports/tr12-BudgetReport.pdf

In theory, taking the example of road vehicles, the largest segment of transport energy use, decarbonisation could be achieved by adopting options from three categories. These constitute:

- options for decarbonising fuels;
- options for improving vehicular fuel efficiency; and
- options that aim to alter the way vehicles are used.

Transport economists contend that meeting national GHG targets is likely to require a mixture of abatement effort from all three categories, and that 'altering the way vehicles are used' probably will require both carrots and sticks, with targeted market based instruments incentivising behaviour change (Skinner, 2013). For example, the abatement potential of subsidised public transport infrastructure could increase if appropriately combined with road charging, given its potential to further incentivise modal shift among drivers of passenger vehicles (Atkins, 2009).

There is evidence available to indicate a commitment to the uptake of new technologies and some appropriate infrastructure is being prioritised. Progress is being made towards lower aggregate CO_2 emissions from new cars; however, this stems largely from EU legislation driving continuous improvements in vehicle efficiency. The potential for demand side measures in transport is scarcely acknowledged by the Scottish Government. Information provided by Scottish NGOs indicates that earlier drafts of RPP1 referred to the potential for demand side measures for the transport sector in particular, but these were subsequently removed.[30] This is despite both the successful implementation of road charging in cities such as Milan, Stockholm and London, and its proven capacity to reduce vehicular GHG emissions by 15-20 per cent, leading to a recommendation by the CCC that road charging 'should be seriously considered' (Skinner, 2013).

As with electricity generation and energy efficiency, the tone of the text in RPP2 is also mainly aspirational. Furthermore, the overview of abatement potential for key policies and measures for transport is far less detailed than that provided in RPP1. RPP1 offers a much clearer overview of the costs and abatement potential of various measures, and there is very little indication that the more recent document improves upon the previous analysis. Unlike in RPP1, for those proposals and policies that are described, no attempt has been made to attribute them to specific levels of government. Consequently, they are more tentative than would be desirable in a programme closer to the implementation stage. An opportunity to create policy that is more specifically Scottish still exists.

Scotland's abatement challenge in the transport sector is further complicated by the inclusion of emissions from aviation and shipping. RPP2 does not mention any proposals or policies aimed at either subsector. Furthermore, a comparison of the proposals and policies in RPP1 with the analysis in the SBSR suggests a lack of solid commitment to 'active travel', a term used to refer to forms of low carbon transport including cycling and walking. Cycling

[30] http://beta.stopclimatechaos.org/sites/default/files/sccs-briefing-rpp2-transport-final.pdf

represents only 1 per cent of all journey shares in Scotland contrasting with European leaders in the field such as the Netherlands and Denmark, with shares of 20-25 per cent (Transform Scotland, 2012). Investment in new facilities for cyclists in appropriate areas is one important way of increasing cycling.

While RPP1 indicates that improving cycling and walking infrastructure will require a total of £1,320 million between 2011 and 2022, both the SBSR and RPP2 appear to reduce this amount considerably. RPP2 sets out £50 million of Scottish Government support over a three year period for the improvement of infrastructure, and the SBSR allocates only £7.5 million for 'cycling, walking and safer routes' in the local government funding elements of the 2011-2012 budget. While it is difficult to equate the different elements of funding with the total set out in RPP1 (not least because the description of cost and spending categories differ in the RPP and SBSR respectively), it appears that there is a budget shortfall which draws attention to the mismatch between appropriate expenditure levels from a climate perspective and the available funding (although it does not suggest that investment in this mode of transport necessarily would be the most cost effective way to mitigate emissions from transport).

The implementing measures with mitigation potential could include a range from the development of infrastructure, to the publication of promotional material, to the initiation of awareness raising programmes.

Spending on 'concessionary fares and bus services' also decreases over the same time period from £255 million to £230 million (Scottish Government, 2011b), with implications for the provision of bus services, since infrastructure spending on concessionary fares actually increases.

Not all public spending for transport is decreasing, despite a real cut in the Scottish budget. The SBSR indicates that spending on 'motorways and trunk roads' will increase from £557 million in 2011-12 to £647.7 million in 2014-15 (Level 2 real terms at 2011-12 prices) (Scottish Government, 2011b). However, it is difficult to determine precisely what impact this change in expenditure will have on total emissions. New expenditure is aimed primarily at existing plans to expand transport infrastructure, and there is some indication that investment in smaller roads has been 'deferred'. A carbon assessment of spending for the draft 2013-2014 budgetary year indicates that expenditure of £562 million for the construction of new roads, and other transport infrastructure will result in an additional 0.25 MT of CO_2 emissions (Scottish Government, 2012). The balance is clearly towards increased emissions in this sector.

In summary, there is a lack of clarity in both RPP1 and RPP2 in terms of how the proposals and policies are likely to achieve the legislated emissions reductions targets. Although the milestones in both documents are in themselves sufficiently ambitious to deliver an abatement of 4MT by 2020 (CCC, 2013), slow progress in implementing policy (for example, in increasing the level of journeys made by bicycle) has thus far prevented effective emissions reduction. RPP2 emphasises the desire to introduce infrastructure for electric vehicles, but the low market share currently attributed to electric cars suggests that the abatement potential is over-emphasised and that in fact reducing traffic volume as a matter of urgency should perhaps be a more prominent element of the policy.

4.3.4 Waste

Although the contribution of the waste sector to the overall GHG emissions level in Scotland is low at only 4.46 per cent, it is the second highest sector for methane emissions, representing 37 per cent of Scotland's total methane emissions in 2011 (Aether and Ricardo-AEA, 2013). Scotland has made good progress in advancing a comprehensive waste management programme, although this is in part directed by European regulatory requirements.

Table 15: Tracking performance in Scotland's waste sector

<table>
<tr><th colspan="2">Development of Key Policy Deliverables from RPP1 to RPP2</th><th>Allocation in SBSR</th><th>Progress</th></tr>
<tr><td>RRP1</td><td>RPP2</td><td></td><td></td></tr>
<tr><td>Phased introduction of landfill bans for certain materials: food waste and dry recyclables from 2015 and all biodegradable waste by 2017.</td><td></td><td rowspan="3">£7 million invested in six anaerobic digestion (AD) and composting facilities through the large scale organics support programme delivered by Zero Waste Scotland.</td><td>Waste (Scotland) Regulations 2012 introduced to set out specific measures for processing of waste and recyclables.</td></tr>
<tr><td>Reduce the quantity of total waste to landfill to a maximum of 5% by 2025.</td><td rowspan="2">Objectives re-stated in RPP2 as in RPP1.</td><td>See below.</td></tr>
<tr><td>Recycle, compost or prepare for re-use waste in accordance with specified targets: 40% by 2010, 50% by 2013, 60% by 2020 and 70% by 2025.</td><td>2010 target of 40% was not reached: 38% of household waste was recycled, composted or reused.</td></tr>
<tr><td>Creation of Zero Waste Scotland as an umbrella programme/one stop shop for waste support services.</td><td></td><td>An estimated £26.4 million allocated for Zero Waste Scotland programme for each budget year from 2011-2015.</td><td>Zero Waste Scotland launched in June 2010.</td></tr>
<tr><td></td><td>Assessing opportunities for capturing gas from closed or inactive landfill sites.</td><td></td><td>Work ongoing.</td></tr>
</table>

The issue of managing methane emissions has been addressed to some extent in both RPP1 and RPP2 largely through policies intended more generally to reduce levels of waste to landfill. Slightly more extensive proposals set out in RPP2 address further exploration into the possibilities of capturing methane from closed or inactive landfill sites, and a report commissioned in 2010 for the Sustainable Development Commission Scotland concluded that around 3 per cent of Scotland's total heat and electricity demand could be met by energy from waste derived from biogas capture (Sustainable Development Commission

Scotland, 2010). Although capitalising on this potential would have the further benefit of reducing methane emissions, this has yet to be manifested in any more concrete policy.

Recent figures for municipal recycling rates indicate that Scotland missed its first target for recycling, re-using or composting, set for 40 per cent by 2010. An overall recycling and composting rate of 37.8 per cent places Scotland behind both England and Wales in terms of its recycling rates (WWF Scotland, 2011), and does not compare favourably with a number of other European countries. Table 16 indicates Scotland's position in relation to Austria and Germany, the leaders in the field of recycling municipal waste, and demonstrates that there is much progress to be made before Scotland can compete at this level. While there are no clear indications as to why Scotland's 40 per cent target was not reached, there is a disparity between the individual local authorities, with Fife recycling up to 54 per cent of waste, and the Shetland Isles recycling only 16.7 per cent (SEPA). It is evident from this that achieving a 40 per cent target is within Scotland's capabilities, and that the Zero Waste Programme could look in more detail as to how the policy to recycle higher percentages of municipal waste can be enforced more evenly across Scotland's local authorities.

Table 16: 2010 levels of recycling of municipal waste stated as a percentage of the generated amount

Country	Percentage municipal waste recycled in 16 European countries as at 2010
Austria	63
Germany	62
Belgium	58
Netherlands	51
Switzerland	51
Sweden	49
Luxembourg	47
Denmark	42
Norway	42
Wales	40.5*
England	39.7*
Scotland	37.8*
Ireland	36
Italy	36
France	35
Spain	33

Sources: Eurostat, 2013 * WWF Scotland, 2011

4.3.5 Agriculture and Land Use

Greenhouse gas emissions from agriculture and land use constitute 19 per cent of Scotland's emissions, with a downturn in agricultural emissions since 1990 explained partly by reductions in livestock numbers, and decreased use of nitrogen based fertilisers (see Figure 9 below). Such trends in agriculture can be observed in most other parts of Europe, although rates of deforestation and afforestation vary considerably.

Table 17: Tracking performance in Scotland's rural land use sector

Development of Key Policy Deliverables from RPP1 to RPP2		Allocation in SBSR	Progress
RRP1	RPP2		
To conclude research on behaviour change in agriculture and to develop indicators to measure progress by 2011.		No specified budgetary allocation in SBSR.	Farming for a Better Climate programme launched. Research paper on Agriculture and Climate Change: Evidence on Influencing Farmer Behaviours published in 2012.
Increase woodland planting rates to 10,000ha per year by 2015.	100,000 ha of new woodland by 2022, and agree subsequent targets after 2020.	Allocated £48 million in SBSR, supplemented by EU funding.	Forestry Commission Scotland (FCS) is continuing to promote this policy and deliver afforestation on the National Forest Estate. FCS is also investigating increasing use of Scottish timber used in construction
Support for anaerobic digestion as a means of processing animal wastes	A commitment to invest £6 million in Scotland's anaerobic digestion facilities	£7 million invested in six anaerobic digestion (AD) and composting facilities through the large scale organics support programme delivered by Zero Waste Scotland.	Funding now largely superseded by UK-wide Feed-in Tariffs and Renewable Heat Incentive
Undertake research to improve the data available regarding effectiveness of peatland restoration.	Working with Scottish Natural Heritage to develop a Peatland Plan, including work with other UK administrations to reduce use of peat in horticulture	£1.7 million funding awarded to the Peatland Plan from Green Stimulus Package	Work ongoing

RPP1 indicates that measures are needed to counter a potential growth in emissions from the land-use sector, and this is re-emphasised by the large increase in emissions attributable to land use change set out in Figure 9. In particular there is a need to increase rates of afforestation given its carbon sequestration potential. It outlines a policy to boost planting rates to 10,000ha per annum given the rapid annual decrease in planting since 1990. This position has been supported by other relevant interest groups including the Woodland Expansion Advisory Group (WEAG) (WEAG, 2012). The WEAG has also issued a number of recommendations regarding the location of new woodlands, stating foremost that planting on arable land should avoid conflicting with farm management requirements. Planting in protected areas should maximise the potential of native species to improve biodiversity and

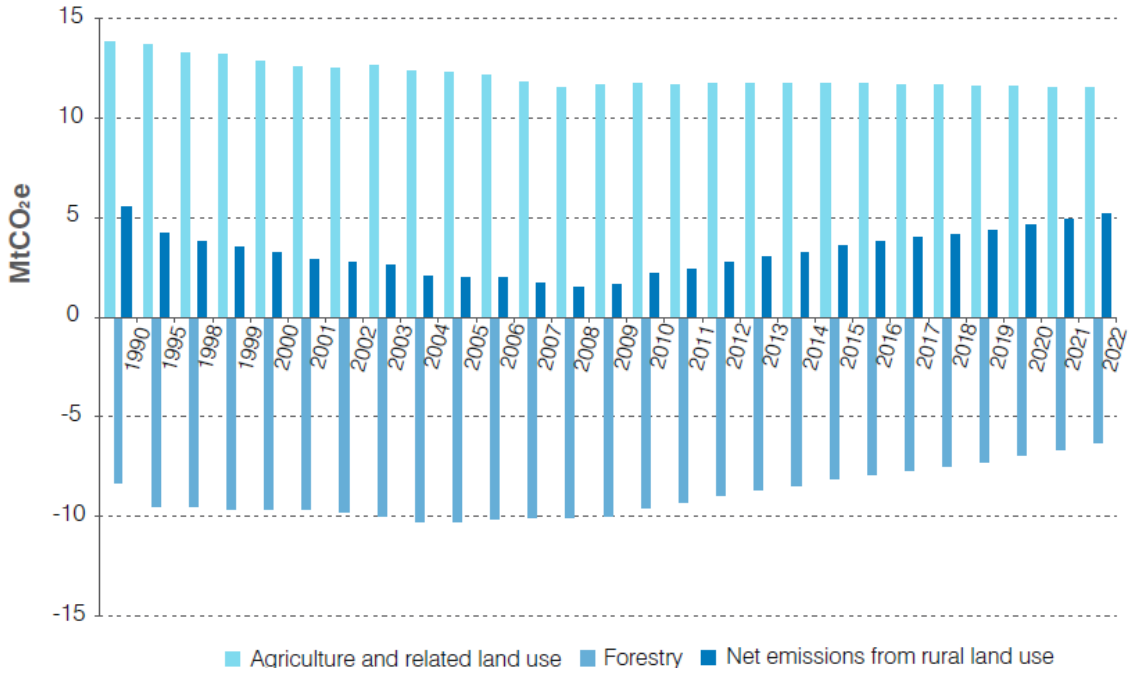
in certain regions to protect deer habitats. In addition, planting can be undertaken on derelict land in urban areas for soil remediation purposes (WEAG, 2012).

The siting of afforestation is also a sensitive issue with respect to biodiversity, landscape and the sustainable management of peatlands. This is well recognised and Forestry Commission Scotland has a policy not to plant on deep peat. Nonetheless re-stocking is not currently exempt in their guidelines and this should be noted. Large scale tree planting on peatland, as has occurred in the past, would not be an advisable route and may not result in any overall carbon gains as explained further in section 4.3.5.1.

Livestock numbers have declined for a number of reasons, including higher productivity in dairy cattle, and significant changes in incentives available through the Common Agricultural Policy. However, this trend cannot be guaranteed to continue, and if significant cuts in emissions are to be achieved this will require an active policy programme. RPP2 outlines a proposal to regulate and reduce nitrogen use via the adoption of best practice in application which needs to be converted to a more concrete policy in order to bring about the large abatement potential currently foreseen by the Scottish Government. Some responses to the call for evidence issued in tandem with the release of RPP2, namely those provided by the RSPB and Stop Climate Chaos Scotland, are extremely critical of the unconvincing commitments to reduce emissions in the form of 'proposals'. Stop Climate Chaos Scotland in particular has voiced concerns that policies and proposals rely too heavily on voluntary uptake, as is the case with much of the information emerging from the Farming for a Better Climate (FFBC) programme. Past experience of agricultural measures with environmental objectives has been mixed and sometimes disappointing, as discussed in Chapter 2.

Measurement of progress is more difficult than in many other sectors given the significant challenges of in situ emissions monitoring. In addition, it is difficult to monitor the uptake of climate related voluntary measures on farms given that emissions reporting is not required as part of a more comprehensive policy framework. Nonetheless, the Scottish Government included the FFBC initiative in RPP1 and RPP2, based purely on estimates of baseline emissions and uptake abatement measures. Despite on-going work in this area, there is no indication that a comprehensive monitoring programme is to be implemented in the near future.

Figure 9: Projected emissions and rates of sequestration in agriculture and land use



Source: RPP, 2012.

In the light of all these factors, it seems unwise to anticipate substantive emissions reduction from agriculture in the near future. Nonetheless, there is the opportunity to utilise the New Rural Development Programme incentives from 2014 onwards – if it is more targeted towards climate related issues rather than generic forms of support, eg for Less Favoured Areas, which has absorbed a large part of the budget in previous programmes (See Chapter 2)

The mitigation of GHGs from agriculture is considered in more detail in Chapter 2.

4.3.5.1 Peatlands: carbon sequestration and adaptation potential

Scotland's peatlands represent 4 per cent of the global total (Scottish Natural Heritage, 2005), and in the UK, 60 per cent of the national quota of deep peat soils and 80 per cent of the total blanket bog (SCCS, 2012). Thirty nine sites have been designated as 'Sites of Special Scientific Interest' (SSSIs) under the Wildlife and Countryside Act of 1981, and selected as a 'Wetland of International Importance under the Ramsar Convention' in 1999. Recent estimates available through the International Union for the Conservation of Nature (IUCN) indicate that there are roughly 400,000 ha of peatlands solely in the two Scottish counties of Caithness and Sutherland, including extensive areas of degraded peatlands that could be targeted for restoration (Bain *et al*, 2011). Wildlife habitats include those important for otters, water voles, red deer, mountain hares, hen harriers, waders and water fowl (Bain *et al*, 2011).

The benefits of well-targeted investment in the restoration of peatlands include increased long term carbon sequestration, carbon abatement and the protection of habitats. The potential of peatland restoration as a form of adaptation is underlined in Scotland's Climate Change Adaptation Framework Biodiversity and Ecosystem Resilience Action Plan, and it is

recommended as a potential adaptation measure by the Adaptation Sub-Committee of the Committee on Climate Change.

Peatlands projects implemented by the RSPB, Scottish Natural Heritage, the Forestry Commission and Plantlife as early as 2001, using £2.8 million in funding available through the EU's LIFE programme, demonstrated that peat restoration measures such as drainage blocking of raised water tables led to the recovery of vegetation, thereby preventing the loss of carbon. Blocking drainage in this way also prevented entry of dissolved organic carbon into groundwater and waterways, which turns water brown. By blocking drains, the costs associated with water treatment can be reduced whilst increasing the economic benefits associated with sequestration of carbon in soils and vegetation. (SCCS, 2012) The restoration of cultivated or agriculturally improved deep peat can provide a net economic benefit of up to £19,000 a hectare after 40 years even if the lowest shadow carbon price is considered (Tucker *et al*, forthcoming).

The scale of the Scottish resource represents a more significant contribution to the climate change response than would be anticipated in most parts of Europe. The total abatement potential of Scotland's peatlands is currently estimated at 1.6MT with a projected annual abatement potential of 0.2MTCO_2e by 2027 based on the restoration of 47,000 ha since 1990. If the scale of restoration were to increase by 21,000 ha/annum, the sequestration potential could be as high as 0.5 MTCO_2e by 2027 (RPP2, 2013). This number however, may be subject to revision given the novelty of this approach to abatement and the corresponding emissions quantification methodology (RPP2, 2013). A methodology to quantify GHG emissions from peatlands is being developed by the IPCC under the aegis of the UNFCCC negotiations in relation to Land Use, Land Use Change and Forestry (LULUCF). The accounting methodology resulting from negotiations at COP17 in Durban has created an opportunity for landowners to account for carbon sequestered from 1990 onwards by noting the total surface area and techniques used for the drainage of land (leading to emissions) or restoration (avoiding emissions) (IUCN, 2012). The impact of these activities can be reported by Parties to the Protocol on a voluntary basis.[31] This decision helps to provide the methodological foundation for carbon accounting from peatlands, thus facilitating future investment in restoration.

Nevertheless, there is significant room to improve the science related to the carbon accounting of peatlands. It is difficult to obtain the representative data set demonstrating the expected scale of carbon sequestration through the restoration of peat lands, given the lack of adequate biological monitoring of these and indeed most other ecosystems (IPCC, 2010). Work currently on-going as part of an IPCC task force on GHG emissions from wetlands and peatland restoration indicates the value of biological monitoring data in developing accurate emissions factors (IPCC, 2010). Biological monitoring data could also be used to help assess the ability of peatlands to respond to the impacts of climate change, and to contribute to adaptation goals. Utilising the full adaptation potential of peatlands however, requires more financial support for the biological monitoring of ecosystems to determine the extent to which they respond to climate change impacts, an activity subject to significant budget cuts over the past few years (Scottish Environment Link, 2012).

[31]. See: http://unfccc.int/resource/docs/2011/awg16/eng/l03a02.pdf

The release of RPP2 indicates an on-going commitment to Peatlands Restoration as part of a 'Peatland Plan', to be jointly implemented by the Scottish Government and Scottish Natural Heritage. Again, while the document indicates that £1.7 million per year will be allocated to peatlands restoration as part of the Scottish Government's Green Stimulus package, it does not provide a clear strategy for meeting the actual cost of an enhanced restoration programme. The document states that an enhanced programme would cost roughly £5 million per annum for a restoration programme of 6,500 ha per year. In the same document, the mitigation potential of the measure is described in relation to a sequestration rate of 0.5 $MTCO_2e$ per annum by 2027, a target which would be based on a restoration programme covering 21,000 ha per year. Clearly, existing financial support falls considerably short of the measure's actual potential. The conflicting statements provided in RPP2 suggest that the target for peatlands restoration is not fixed, and without a clearer commitment to a programme with concrete deliverables, existing restoration goals will be insufficient in terms of restoring peatlands.

4.3.6 General comments on the RPP1 and RPP2

Given the ambition of the carbon reduction targets and milestones addressed in RPP1 and RPP2 there is a commensurate challenge to put in place sufficient measures to ensure that there is a credible pathway to meeting the targets. The Committee on Climate Change has pointed out the extent to which progress in reducing emissions in the traded sector depends on the measures established within the EU as well as appropriate domestic policies. Given the current doubts about the ETS and the associated carbon price as well as the lack of progress towards setting a 30 per cent target for EU emission reductions by 2020 the case for a vigorous programme outside the traded sector is all the stronger. Whilst there is clearly encouraging progress in some areas, including increased investment in renewables and improving energy efficiency in new vehicles there are many others where momentum is more questionable or concerning. These include the speed with which commercial scale CCS is being developed and emissions are being reduced in the domestic sector and road transport. Despite the substantial fall in agricultural and land use emissions over time, robust policies to meet future targets are not yet in place in this sector.

There are several areas where public expenditure plans in sectors which are critical for meeting mitigation targets appear to be below the level required for the investment envisaged in RPP1. Whilst expenditure constraints are not unique to Scotland, this reality needs to be acknowledged and confronted with alternative measures being considered where appropriate. These seem likely to include greater use of demand side policy instruments as well as changes in investment priorities, for example in rural development programmes.

4.4 Final Reflections

This short review sets out the scale of ambition in Scotland regarding climate mitigation, emissions reduction, the range of initiatives being enacted and the importance of implementing a balanced combination of mitigation measures, particularly outside the electricity supply sector. Progress in some areas, particularly in building renewable generation capacity, has been impressive. Looking ahead, the need for action on demand side measures, including appropriate infrastructure and initiatives to encourage behaviour change, is becoming more pressing as emission reduction targets bite more sharply and the

anticipated level of support from EU measures has been delayed. These developments have increased the level of uncertainty and the onus on domestic measures to provide more momentum.

Key issues include:

- **The uncertain contribution from key EU policies**: the importance of the ETS as a driver in securing reductions in emissions from the traded sector in Scotland has been stressed by the Committee on Climate Change and others. However, at present there are two concerns: first, the low carbon price under the ETS, which has not seen any substantial increase despite an agreement within the EU to 'backload' 900 million allowances, and the failure within the EU to agree rapid measures to tighten the cap on emissions in the next few years. Second, the lack of clear progress towards an EU emissions reduction target of 30 per cent by 2020. Both of these points accentuate the need for robust measures outside the traded sector.

- **Supporting the RPP targets with sufficient measures in key sectors, including adequate public expenditure**: A review of spending priorities in each sector, as outlined in section 4.3 above, indicates that Scottish Government expenditure falls below that envisaged as necessary in the RPP in several areas. Where budgets cannot be increased, in order to ensure that reductions are delivered, it will become necessary either to take alternative measures or to reduce targets appropriately in order for the Scottish climate change agenda to retain credibility.

- **Planning the more rapid implementation of measures** in the non-traded sectors requires significant public sector intervention. For example the public sector has considerable control over some of the key aspects of infrastructure and education, including a major role in housing, agriculture and transport polices. New incentives could be introduced at a local level, both positive and negative, with road charging being a good example of this. Similarly, although good progress has been made in reducing emissions from wastes through a major reduction in landfill, this process could also be implemented more rapidly and with greater success through additional public sector intervention.

- **Carbon Capture and Storage**: Substantial reductions have been achieved in the energy supply sectors but continuing emissions reductions are heavily reliant on the use of CCS. This review points to deep uncertainties over not only the speed with which CCS can be deployed, but also the likelihood that it will be funded in Scotland at all in the near future. Without CCS in place it is questionable whether emissions targets will be met without a severe reduction in the reliance on fossil fuels. Policies need to be in place to ensure that a balanced programme of renewables is achieved while coal plants are closed and gas plants fitted with CCS (if and where possible) during the 2020s.

- **Transport:** RPP2 places heavy reliance on the contribution played by a mature market for low carbon cars, and the increased use of electric vehicles in reducing emissions attributable to the transport sector. While these are important elements of a long-term policy they should not be accorded undue weight in short-term policy. Focus on encouraging modal shift in order to reduce traffic volume should take priority over low-

carbon vehicle innovation, and the investment in infrastructure improvements set out in the SBSR calls into question whether enough emphasis is being placed on encouraging the broader uptake of alternative transport modes.

- **Waste:** Scotland has ambitious targets regarding the reduction of waste to landfill and the increase in the recycling of total waste. However Scotland still falls behind other European countries, as well as both England and Wales, in meeting these targets. Evidence suggests that local authority adoption of recycling standards is not uniform, and this is an issue that needs to be addressed in order to ensure Scotland meets future targets.

- **Homes and Communities:** Although there is clear evidence of substantial investment in policies to reduce domestic emissions, the effect of this investment is questionable with a range of initiatives (for example, the HIS scheme) resulting in a small proportion of households being assisted compared to the total number of households approached. In addition, there appears to be an uneven regional application of domestic retrofit measures, with certain areas benefitting significantly more than others. Scotland has set out its aim to set high energy efficiency standards for new buildings in accordance with the recommendations of the Sullivan Report, but there is a risk that these will be weakened, which in turn will weaken Scotland's ability to meet its future emissions reductions targets in this sector, without appropriate application and sufficient investment.

- **Agriculture and other land uses:** This is one of the priorities in the non-traded sector. Land use emissions decreased slightly in the 2010-2011 period. Although this was not significant relative to the scale of reductions over the 1990-2010 period, due to recalculations caused by a change of methodology in calculating nitrous oxide emissions, we now see a significant increase in emissions over the 1990-2011 period. Appropriate measures to increase carbon sequestration will therefore be required both in agriculture and forestry, with significant opportunities for peat restoration as well where co-benefits for adaption and biodiversity are also attractive. Stronger incentives will be needed to achieve the desired levels of appropriate afforestation. In the agriculture sector progress under the current rural development programme has been slower than planned and less successful in capturing some environmental outcomes than hoped, as discussed in Chapter 2. There is now an opportunity to refocus the forthcoming Rural Development Programme and to link it more strongly to climate objectives. This could also be one important strand in a strategy to improve the level of peatland restoration towards the annual target of 22,000 hectares that has been identified as desirable.

- Looking ahead, although adaptation is not the focus here, **there is an opportunity to link adaptation and mitigation targets**, and to enhance the case for greater funding allocations in addressing both issues. Further investment in fuel poverty alleviation measures, for example, could help address adaptation as well as mitigation. The Scottish Adaptation Programme must take the opportunity to review the role of adaptation measures within Scotland's broader climate change agenda and ensure that it is given appropriate prominence.

CONCLUSIONS

The policy areas discussed in this report are diverse but all are of importance for the future of the environment in Scotland and, in some cases, for Scotland's impact on the global climate. In each policy domain key priorities have been identified by the Government; **generally the objectives have been applauded, particularly with respect to climate mitigation**. What has been achieved in pursuing these objectives? There are both parallels and distinctive differences between the individual policy fields and the way in which goals are being delivered at a time when constraints on expenditure are a significant factor in Scotland, as they are elsewhere.

The three policies are at **different points in the evolutionary cycle**. **Climate policy** has broadened in scope and greatly increased in ambition in recent years, acquiring strategic importance in the Scottish economy, with even greater implications for the future. **Agri-environment and rural development policies** have been in place for more than two decades with periodic, sometimes substantive, changes being made to specific schemes. Major changes were made as part of the current Rural Development Programme which is now in its final year. By contrast, the establishment of Marine Protected Areas outside existing networks is more of a new venture and at an early stage of implementation.

Nonetheless there are **parallels between the different policies**. Climate policy has a foundation of concrete targets for reduced emissions at given dates. These are fixed in the upper bracket of what governments in Europe have set themselves at the present time. This is particularly so for the build-up of a renewable energy sector which is on a rapid growth trajectory. Aspirations for the new Marine Protected Areas also represent a major step forward and they are underpinned by principles which have been welcomed in environmental circles as being appropriate and in tune with ecological priorities. Some of the policies for the farmed environment also have relatively high aspirations and the design of an integrated farm level approach to social, environmental and economic measures in the rural development framework is forward looking.

However, **the mechanisms to deliver these ambitions have not been scaled up to the same extent, with some notable exceptions**. Most prominent of these exceptions is the rapid increase of renewable energy supply, where the undoubted efforts of the Scottish Government also have been reinforced by helpful external factors such as the targets set for the UK and other Member States under the EU Renewable Energy Directive. The shortfalls in other areas are of five principal kinds:

- **Financial resources and limitations on public expenditure** evidently are a constraint in several areas. This is evidenced by shortfalls in expenditure allocated to a number of sectors where new investment has been identified as important to meet climate goals,

for example in public transport and walking and cycling facilities. More demand side measures are needed to mitigate climate change, including the housing sector. Waste management measures, agriculture and forestry all could contribute more to mitigation and sequestration and there are well understood opportunities for larger scale peatland restoration. However, funding has been on a modest scale and does not appear to be on an upward trajectory. The capacity of public institutions facing more demanding delivery challenges also is affected by the level of expenditure and investment that can take place. Adequate staffing levels are essential.

- **Limitations in the number of staff available to implement certain aspects of the systems** that have been put in place at the scale required **have affected delivery of key policies**. This is apparent in the pressures imposed on Marine Scotland where a relatively small group of staff is responsible for taking forward a sophisticated process. This requires extended engagement with stakeholders and extensive use of scientific data which is not readily available in many cases, triggering the need for further investment of effort as well as research. Slow progress in the implementation of the agri-environment programmes may also reflect limitations in available staff, for example in relation to farm level advice. Well-conceived and directed advice is invaluable to enable environmental objectives to be met on the ground but has not been available at a sufficient scale in recent years. Where SEPA has invested in the staff resources needed for detailed work in sensitive water catchments, an increase in compliance and appropriate investment in pollution avoidance has been recorded.

- **Political will to pursue environmental priorities embodied in regulation is not always sustained in the face of economic interests**. In several areas these have a powerful role in influencing the direction of policy. The opposition of fishing and marine interests to the designation of certain marine habitats which met the scientific criteria for MPAs is a case in point. The authorities backed down and looked for alternative sites which might be less satisfactory and will engender delays. The surprisingly low level of apparent failures by farmers to meet cross compliance requirements on the environment raises similar issues.

  Given the evidence of non-compliance with the requirements of the Nitrate Directive revealed by catchment walks conducted by SEPA, it appears that the inspection regime for cross compliance has not been well tuned to all the realities on the ground since few infractions have been detected. The low level of EIA cases relating to developments on farms relative to those required in neighbouring countries, while not decisive, also points to **a 'light touch' approach** which many stakeholders confirm in conversation. In the same vein, an opportunity is being missed to support the considerable number of High Nature Value farms more vigorously through the LFA budget because of an apparent reluctance to shift resources, particularly to the North West, at the expense of well-established recipients who are often less valuable economically, and offer fewer public goods but carry political weight. A robust approach to supporting agreed goals through the enforcement of regulation and appropriate allocation of expenditure is key to effective delivery.

- **Where the resources required to deliver new initiatives have not been available or have proved difficult to mobilise, the relevant programmes have suffered**. In the case

of Marine Protected Areas, ambitions have been scaled back, so that the area protected will be smaller than originally envisaged in the next few years. In the Rural Development Programme the practicalities of operating the new integrated approach had not been fully anticipated. For example, farmers applying for support under the cross cutting rural development contracts had to apply for specific elements of the scheme quite separately as there were quite different and non-overlapping 'windows' to submit the forms, thereby inhibiting take up. Spending under the scheme was much lower than planned in the early years.

- In the case of **climate mitigation there is a heavy reliance on supply side measures and more reluctance to balance these with more active demand side initiatives**. While supply side measures are crucial and challenges such as slow progress on commercial scale CCS deployment need to be addressed, some rebalancing is required to put emission reductions in line with 2020 targets. This is all the more necessary given current uncertainties in the EU policy framework, such as the 2020 emission reduction targets which remain unchanged and the low carbon prices under the ETS, which are not contributing to the Government's strategy. Demand side measures, such as more stringent standards for energy efficiency in buildings take time to deliver results and delaying their introduction carries significant risks in relation to meeting national targets.

In some areas of policy Scotland's ambitions are now in the front rank of European countries. This is less the case, however, with respect to consistency of delivery. In Denmark for example, the commitment to building a green economy embraces wind and other renewables but extends far beyond it into other sectors of society. Investment in agri-environment measures is not as high in Scotland as in the great majority of other EU countries and the use of certain policy measures such as cross compliance and impact assessment procedures seems to be more limited than in other countries considered here. Expenditure levels are difficult to compare between countries but in the climate sphere they have been below what appears necessary in several sectors.

The opportunities remain huge and some of the rebalancing suggested in this report would not be particularly radical. It would, however, give substance to Scotland's growing aspirations as an environmental front runner.

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ANNEX 1 BACKGROUND INFORMATION ON THE SCOTLAND RURAL DEVELOPMENT PROGRAMME

Box A - 1 The Scotland Rural Development Programme: A brief summary

The Scotland Rural Development Programme (SRDP) is designed to achieve five key outcomes:
(1) Improved business viability;
(2) Enhanced biodiversity and landscape;
(3) Improved water quality;
(4) Tackling climate change; and
(5) Thriving rural communities

There are eight key components to the SRDP:
(1) Crofting Counties Agricultural Grant Scheme (CCAGS);
(2) Food Processing, Marketing and Co-operation Grant Scheme (FPMC);
(3) Forestry Commission Challenge Funds (CFs);
(4) The Leader initiative (Leader);
(5) Less Favoured Area Support Scheme (LFASS);
(6) Rural Development Contracts - Land Managers Options (LMOs);
(7) Rural Development Contracts - Rural Priorities (RP); and
(8) Skills Development Scheme (SDS).

The SRDP as a whole, and particularly the Rural Development Contracts, have been designed to take an integrated approach to the delivery of measures in rural areas across the three axes and Leader, offering menus of economic, environmental and social measures that are combined in a single contract across a holding, rather than a range of separate contracts for different measures.

A number of these schemes include an environmental focus, as follows:

- The RP and LMO schemes integrate environmental measures (from Axis 2), including agri-environment payments, with those that are economic (Axis 1) and social (Axis 3) in focus. The LMO scheme offers a menu of basic measures from the three axes for which all farmers are eligible. In contrast, the RPs offer a wider selection of measures of a more ambitious nature to which entry is competitive. Both the LMO and RP schemes, are intended to make SRDP measures more accessible to farmers by reducing the administrative burden and providing a 'one-stop-shop' for applicants. In addition to this, the RP scheme was originally intended to encourage a landscape scale approach to SRDP measures (EKOS et al, 2010). It is only via these schemes that applicants can access support from the agri-environment measure.
- The LFASS aims to support the maintenance of a viable rural community, to maintain the countryside and to 'maintain and promote sustainable farming systems that take account of environmental protection requirements'.
- The CCAGS objectives are to support production, reduce production costs, improve the quality of agricultural products, preserve the natural environment and promote rural diversification. Funding comes solely from the farm modernisation measure.
- The Skills Development Scheme (SDS) offers support to group skills development initiatives for land managers via farming and other land management industry bodies. There are four broad categories within the SDS that include training for: developing business skills; developing skills to manage the environment and climate change; to develop farming and forestry competitiveness; and food.

The SRDP has set a range of targets linked to the European Commission's standard set of indicators under the Common Monitoring and Evaluation Framework (CMEF). These relate to inter alia the number of holdings and areas under agri-environment agreements, (output indicators), the area of agricultural land which is contributing to achieving biodiversity, water, climate and soil outcomes as a result of Axis 2 measures (result indicators) and the maintenance of High Nature Value farming systems and the Farmland Bird Indicator (impact indicators). It is these targets, and associated national targets, against which the SRDP is evaluated formally.

Table A - 1: Actual and forecast expenditure for the SRDP 2007-13 (€ million)

	2007 Actual	2008 Actual	2009 Actual	2010 Actual	2011 Actual	2012 F'cast	2013 F'cast	2014 F'cast	TOTALS
EU Co-financing Rate	25%	29%	27%	50%	50%	63%	63%	63%	
Total Annual Spend (EU + National)	85.59	129.42	110.99	166.47	286.25	283.54	260.74	76.34	1,399.34
Total EU Drawdown (Budget)	51.08	86.04	105.43	108.61	109.99	109.41	108.69	0.00	679.24
Total EU Drawdown (Actual)	26.13	37.54	28.59	83.98	124.10	168.19	162.57	48.09	679.20
Proportion of total budget spent	6%	9%	8%	12%	20%	20%	19%	5%	100%

Source: PMC Meeting 9 October 2012, Finance Update Annex PMC/2012/96a http://www.scotland.gov.uk/Topics/farmingrural/SRDP/PMC/MeetingsHeld2012/FinanceAnnex9October2012

Table A - 2 shows the proposed budget for the final two years of the current programming period and its allocation between the different elements of the SRDP. Again this illustrates the fact that nearly one third of the budget is spent on LFA payments. It is the Rural Priorities Scheme, however, that takes the lion's share of the budget (45 per cent), and there has been a shift in emphasis in the programme from the original funding allocations towards business development and capital investments, consequently this priority accounts for a slightly greater proportion of expenditure than agri-environment or forestry measures.

Table A - 2: 2012-2013 Draft SRDP budget – Scheme Allocations (€ million)

	LMO	LMCMS	Skills Dev	FPMCG	CCAGS	LFASS	Agri-Env Legacy	FWS Legacy	LEADER	Technical Assistance	Rural Priorities	TOTAL	
Business Development	2.0		1.0	9.0	2.0			0.1			29.7	**43.8**	20.5%
LFASS						65.5						**65.5**	30.6%
Agri Environment	10.0	1.0					3.0				26.0	**40.0**	18.7%
Forestry FSC	0.3							2.3			33.4	**36.0**	16.8%
Forestry SG								3.5				**3.5**	1.6%
Rural Enterprise	5.0	1.0									3.2	**9.2**	4.3%
Rural Communities	1.0										4.0	**5.0**	2.3%
LEADER									10.5			**10.5**	4.9%
Technical Assistance										0.3		**0.3**	0.1%
Total	**18.3**	**2.0**	**1.0**	**9.0**	**2.0**	**65.5**	**3.0**	**5.9**	**10.5**	**0.3**	**96.3**	**213.8**	100%
	8.6%	0.9%	0.5%	4.2%	0.9%	30.6%	1.4%	2.8%	4.9%	0.1%	45.0%	100%	

Source: PMC Meeting 9 October 2012, Finance Update Annex PMC/2012/96a http://www.scotland.gov.uk/Topics/farmingrural/SRDP/PMC/MeetingsHeld2012/FinanceAnnex9October2012

Table A - 3: Agri-environment options available in the LMO and RP schemes in Scotland[32]

Level	Scheme	Packages of management actions	Target
Open to all farmers	Land Mangers' Options (LMO)	Rush (*Juncus*) pasture for wildlife	2.02million ha and 4,545 additional holdings under agreement by 2013
		Summer cattle grazing	
		Moorland grazing	
		Linear features	
		Grass margins and beetle banks in arable fields	
		Biodiversity cropping	
		Wild bird seed mix/unharvested crop	
		Conservation headlands	
		Winter stubbles	
		Natural regeneration after cereals	
		Farm woodlands (2 options)	
		Animal welfare	
		Maintenance of organic farming	
competitive entry	Rural Priorities (RP)	Conversion and maintenance of organic farming	
		Grassland (9 options)	
		Arable (5 options)	
		Heathland and peat soils (9 options)	
		Wetland (6 options)	
		Hedges (2 options)	
		Farm woodland and scrub (2 options)	
		Habitat and species management (7options)	
		Other (3 options)	

Source: Keenleyside et al., 2011

Table A - 4: Approved Rural Priorities funding by region in 2010

RPAC Region	Funding	UAA (ha)	£/UAA
Outer Hebrides	£10,331,128.71	308,503	33.49
Highland	£102,986,050.66	2,130,847	48.33
Tayside	£45,297,389.48	819,762	55.26
Argyll	£33,205,683.08	487,173	68.16
Clyde Valley	£22,225,965.56	216,484	102.67
Northern Isles	£27,500,334.98	239,853	114.65
Ayrshire	£31,192,442.87	243,717	127.99
Borders	£49,785,648.65	379,653	131.13
Grampian	£95,286,771.28	701,394	135.85
Dumfries and Galloway	£74,773,476.99	457,172	163.56
Forth	£41,419,178.85	223,931	184.96

[32] Both the LMO and RP elements of Scotland's Rural Development Contracts scheme combine measures from all three axes of EAFRD within a single scheme. The list shown here includes only the Axis 2 options targeted at agricultural management available in 2011 It excludes Axis 1 and Axis 3 options, and forestry options other than those for small farm woodlands and wood pastures. Source: http://www.scotland.gov.uk/Topics/farmingrural/SRDP/Land-Managers-Options/Availableoptions and http://www.scotland.gov.uk/Topics/farmingrural/SRDP/RuralPriorities/Options]

Grand Total	**£534,004,071.11**	**6,208,489**	**86.01**

Source: Own table based on data from October 2012 PMC (PMC/2012/97) and Scottish Government, 2012e

Table A - 5: Revised payment rates in disadvantaged areas of LFA (from 2011)

Land Category	"Standard" areas with lower transport costs	"Fragile" mainland areas of disadvantage and higher transport costs	"Very fragile" island areas
	Payment per Adjusted Hectare (£)	Payment per Adjusted Hectare (£)	Payment per Adjusted Hectare (£)
More Disadvantaged Land (categories A and B)	52.16 (+ 38%)	62.10 (no change)	71.35 (no change)
Less Disadvantaged Land (categories C and D)	34.12 (+5%)	54.51 (no change)	63.00 (no change)

Source: http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/Schemes/LFASS/AddtlInfo

The MTE was carried out before these most recent payment changes were implemented. However this showed that the greatest number of LFASS beneficiaries are, unsurprisingly, located in the Highlands, the Northern Isles and Outer Hebrides, with the average payment per applicant being £11,000, £10,000 and £3,000 respectively. In contrast, higher average payments per beneficiary are seen in more productive areas, such as the Borders (£26,000), Argyll (£22,000) Tayside (£21,000), Dumfries and Galloway (£20,000) and Grampian (£12,000).

ANNEX 2 ALISED AGAINST PROGRAMMED EXPENDITURE FOR THE SRDP

Axis	Measure	Description	Realised 2007-2008-2009-2010-2011		Programmed 2007-2013*		EAFRD: % on target	Total Public: % on target	EU EAFRD: % on target	EU Total Public: % on target
			EAFRD	Total Public	EAFRD	Total Public				
Axis 1	111	Vocational training and information actions	666,574.43	1,401,642.15	17,271,567.00	30,478,934.00	3.9%	4.6%	29.8	32
	112	Setting up of young farmers	91,483.57	183,963.23	4,605,024.00	8,126,432.00	2.0%	2.3%	50.4	49.6
	113	Early retirement	0.00	0.00	0.00	0.00	-	-	54.8	55.5
	114	Use of advisory services	4,032.10	12,632.87	0.00	0.00	-	-	13.3	14.6
	115	Setting up of management, relief and advisory services	0.00	0.00	0.00	0.00	-	-	15.8	18.2
	121	Modernisation of agricultural holdings	36,155,994.92	74,241,178.71	32,206,098.00	56,833,728.00	>100%	>100%	50.4	51.6
	122	Improvement of the economic value of forests	130,950.79	263,544.58	1,611,758.00	2,844,251.00	8.1%	9.3%	23.1	25
	123	Adding value to agricultural and forestry products	8,532,234.31	19,207,845.25	24,936,596.00	44,005,322.00	34.2%	43.6%	34.9	36.6
	124	Cooperation for development of new products, processes and tech-nologies in the agriculture and food sector and in the forestry sector	423,548.75	1,087,563.84	6,739,421.00	11,892,978.00	6.3%	9.1%	14.5	14.9
	125	Infrastructure related to the development and adaptation of agricul-ture and forestry	452,811.72	916,617.56	7,653,033.00	13,505,219.00	5.9%	6.8%	28.3	30.5
	126	Restoring agricultural production potential	0.00	0.00	0.00	0.00	-	-	43.3	45.6
	131	Meeting standards based on EU legislation	0.00	0.00	0.00	0.00	-	-	64.7	59.5
	132	Participation of farmers in food quality schemes	835,967.80	2,160,057.78	1,474,248.00	2,601,588.00	56.7%	83.0%	17.9	17.7
	133	Information and promotion activities	0.00	0.00	0.00	0.00	-	-	15.8	16.9
	141	Semi-subsistence farming	0.00	0.00	0.00	0.00	-	-	51.2	52.4
	142	Producer groups	0.00	0.00	0.00	0.00	-	-	27.4	27.6
	143	Providing farm advisory and extension services	0.00	0.00	0.00	0.00	-	-	1.9	1.9
	144	Holdings undergoing restructuring due to a reform of a common market	0.00	0.00	0.00	0.00	-	-	37	34.7

		organisation								
Tot Axis 1	**Axis 1**		**47,293,598.36**	**99,475,045.97**	**96,497,745.00**	**170,288,452.00**	**49.0%**	**58.4%**	**41.6**	**42.8**
Axis 2	**211**	Natural handicap payments to farmers in mountain areas	0.00	0.00	0.00	0.00	-	-	73.5	74.7
	212	Payments to farmers in areas with handicaps, other than mountain areas	114,428,593.67	285,323,521.70	196,634,523.00	418,596,351.00	58.2%	68.2%	66.8	68.1
	213	Natura 2000 payments and payments linked to Directive 2000/60/EC	0.00	0.00	0.00	0.00	-	-	23.8	23
	214	Agri-environment payments	39,395,757.63	101,924,850.78	116,306,835.00	247,594,450.00	33.9%	41.2%	57.2	58.7
	215	Animal welfare payments	3,511,709.17	10,502,697.23	10,856,924.00	23,112,263.00	32.3%	45.4%	50	53.2
	216	Non-productive investments	18,253,398.68	38,323,065.30	25,748,606.00	54,813,734.00	70.9%	69.9%	25.6	25.8
	221	First afforestation of agricultural land	24,798,314.05	72,795,180.67	38,007,354.00	80,910,205.00	65.2%	90.0%	40.3	43.6
	222	First establishment of agroforestry systems on agricultural land	0.00	0.00	0.00	0.00	-	-	1	0.8
	223	First afforestation of non-agricultural land	14,228,203.94	36,348,482.95	38,007,354.00	80,910,205.00	37.4%	44.9%	22.5	24.6
	224	Natura 2000 payments	0.00	0.00	0.00	0.00	-	-	14	13.6
	225	Forest-environment payments	738,275.01	1,477,134.26	20,262,105.00	43,134,049.00	3.6%	3.4%	11.7	14.7
	226	Restoring forestry potential and introducing prevention actions	0.00	0.00	0.00	0.00	-	-	39	41.8
	227	Non-productive investments	3,256,208.78	8,296,165.82	19,801,603.00	42,153,731.00	16.4%	19.7%	28.5	31.4
Tot Axis 2	**Axis 2**		**218,610,460.91**	**554,991,098.71**	**465,625,304.00**	**991,224,988.00**	**46.9%**	**56.0%**	**57.6**	**59.5**
Axis 3	**311**	Diversification into non-agricultural activities	5,793,297.41	11,980,005.66	12,636,414.00	23,120,759.00	45.8%	51.8%	29.3	29.6
	312	Support for business creation and development	3,095,247.24	6,969,320.05	11,793,986.00	21,579,374.00	26.2%	32.3%	21.8	22.3
	313	Encouragement of tourism activities	16,652,425.58	48,697,078.65	28,895,265.00	52,869,466.00	57.6%	92.1%	20.6	23.5
	321	Basic services for the economy and rural population	3,719,356.90	7,522,947.11	15,511,813.00	28,381,856.00	24.0%	26.5%	30.7	30.7
	322	Village renewal and development	0.00	0.00	0.00	0.00	-	-	42	42.9
	323	Conservation and upgrading of the rural heritage	3,249,746.01	6,622,177.52	4,675,473.00	8,554,680.00	69.5%	77.4%	30.3	31.5
	331	Training and information	550.09	1,100.18	2,948,497.00	5,394,844.00	0.0%	0.0%	25.4	26
	341	Skills-acquisition and animation measure with a view to preparing and implementing a local development	5,928.86	11,857.70	0.00	0.00	-	-	40.7	37.4

		strategy								
Tot Axis 3	**Axis 3**		**32,516,552.08**	**81,804,486.87**	**76,461,448.00**	**139,900,979.00**	**42.5%**	**58.5%**	**31**	**31.6**
Axis 4	**411**	Competitiveness	8,599,312.02	14,075,367.00	11,364,926.00	18,684,103.00	75.7%	75.3%	12	13.4
	412	Environment/land management	369,697.06	626,166.89	10,864,925.00	17,862,095.00	3.4%	3.5%	4.3	4.9
	413	Quality of life/diversification	2,607,616.58	4,295,536.63	10,864,925.00	17,862,095.00	24.0%	24.0%	17.6	17.9
	421	Implementing cooperation projects	408,297.28	642,619.89	2,897,898.00	4,764,186.00	14.1%	13.5%	6	6
	431	Running the LAG, skills acquisition, animation	1,871,211.96	3,739,200.13	3,832,705.00	6,301,023.00	48.8%	59.3%	30.8	30.8
Tot Axis 4	**Axis 4**		**13,856,134.89**	**23,378,890.54**	**39,825,379.00**	**65,473,502.00**	**34.8%**	**35.7%**	**18.4**	**18.6**
TA	**511**	Technical assistance	563,652.32	1,352,768.43	834,648.00	1,835,587.00	67.5%	73.7%	27.60	28.90
	611	Complimentary direct payments	0.00	0.00	0.00	0.00	-	-	67.70	67.70
Total	**Total**		**312,840,398.56**	**761,002,290.52**	**679,244,524.00**	**1,368,723,508.00**	**46.1%**	**55.6%**	**45.9**	**47.6**

Source: Own table based on data from ENRD (data sourced February 2012)

ANNEX 3 EXPENDITURE UNDER THE RP SCHEME UP TO OCTOBER 2013

Axis	Total Funding	Measure expenditure as % total expenditure
Axis 1		
111- Vocational Training	£146,297.81	0.03%
112 – Setting up of young farmers	£2,324,046.30	0.44%
114 – Use of advisory services	£17,166.96	0.00%
121- Farm Modernisation	£133,576,734.07	25.01%
122 – Improving economic value of forests	£327,176.58	0.06%
123 – Adding value to products	£1,594,663.31	0.30%
125 – Infrastructure Development	£2,613,362.95	0.49%
Total Axis 1	**£140,599,447.98**	**26.33%**
Axis 2		
214 – Agri-Environment	£189,933,959.99	35.57%
216 – non-productive investments (ag)	£88,573.70	0.02%
223 – Afforestation of non-agricultural land	£117,885,573.02	22.08%
225 – Forest-environment payments	£15,298,707.60	2.86%
227 – Non-productive investments (for)	£9,241,379.63	1.73%
Total Axis 2	**332,448,193.94**	**62.26%**
Axis 3		
311 – Diversification	£25,498,576.36	4.77%
312 – Business creation	£13,441,234.51	2.52%
313 – Tourism activities	£2,991,789.26	0.56%
321 – Basic services	£12,289,375.18	2.30%
323 – Conservation of rural heritage	£6,679,734.56	1.25%
331 – Training and information	£26,874.38	0.01%
341 – Skills acquisition and animation	£28,845	0.01%
Total Axis 3	**£60,956,429.25**	**11.41%**
TOTAL – all Axes	**£534,004,071.17**	**100%**

Source: PMC Meeting 9 October 2012, Finance Update Annex PMC/2012/96a http://www.scotland.gov.uk/Topics/farmingrural/SRDP/PMC/MeetingsHeld2012/FinanceAnnex9October2012

ANNEX 4 CROSS COMPLIANCE

SMR 1 - Conservation of wild birds
SMR 2 - Protection of groundwater against pollution
SMR 3 – The use of sewage sludge in agriculture
SMR 4 – Protection of water in Nitrate Vulnerable Zones (NVZ)
SMR 5 – Conservation of Flora and Fauna
SMR 6 – Identification and registration of Pigs
SMR 7 – Identification and registration of Cattle
SMR 8 – Identification of Sheep and Goats
SMR 9 – Restrictions on the use of plant protection products
SMR 10 – Restrictions on the use of hormones
SMR 11 – Food Law
SMR 12 – Prevention and control of Transmissible Spongiform Encephalopathies (TSE)
SMR 13 – Control of foot and mouth disease
SMR 14 – Control of certain animal diseases
SMR 15 – Control of blue tongue
SMR 16 – Welfare of calves
SMR 17 – Welfare of pigs
SMR 18 – Welfare of farmed animals
GAEC 1 – Post harvest management of land
GAEC 2 – Wind erosion
GAEC 3 – Soil capping
GAEC 4 – Erosion caused by livestock
GAEC 5 – Maintenance of function field drainage systems
GAEC 6 – Muirburn code
GAEC 7 – Arable crop rotation standards
GAEC 8 – Arable stubble management
GAEC 9 – Appropriate machinery use
GAEC 10 – Undergrazing
GAEC 11 – Overgrazing
GAEC 12 – Ploughing pasture of a high environmental / archaeological value
GAEC 13 – Protection of rough grazings / semi natural areas
GAEC 14 – Application of lime and fertiliser on rough grazings / semi natural areas
GAEC 15 – Field boundaries
GAEC 16 – Non-productive landscape features
GAEC 17 – Historic features
GAEC 18 – Encroachment of unwanted vegetation
GAEC 19 – Abstraction of water for irrigation

ANNEX 5 CROSS COMPLIANCE BREACHES AND INSPECTIONS (2008-2011)

	2008			2009			2010			2011		
	No of breaches	No of Inspections	Breach as % insp.	**No of breaches**	No of Inspections	Breach as % insp.	**No of breaches**	No of Inspections	Breach as % insp.	**No of breaches**	No of Inspections	Breach as % insp.
SMR1 - Conservation of wild birds	2	387	0.5%	2	242	0.8%	0	216	0.0%	0	218	0.0%
SMR2 - Protection of groundwater against pollution	37	769	4.8%	13	505	2.6%	8	362	2.2%	5	132	3.8%
SMR3 - The use of sewage sludge in agriculture	0	6	0.0%	0	71	0.0%	1	5	20.0%	0	4	0.0%
SMR4 - Protection of water in Nitrate Vulnerable Zones (NVZ)	4	134	3.0%	2	136	1.5%	5	78	6.4%	17	90	18.9%
SMR5 - Conservation of Flora and Fauna	0	386	0.0%	0	240	0.0%	0	216	0.0%	1	218	0.5%
SMR9 - Restrictions on the use of plant protection products	21	396	5.3%	12	245	4.9%	5	219	2.3%	3	218	1.4%
Total	**64**			**29**			**19**			**26**		
GAEC - Set aside management	1			-			n/a			n/a		
GAEC1 - Post harvest management of land	-	236		-	195		-	149		-	143	
GAEC2 - Wind erosion	-	236		-	195		-	150		-	143	
GAEC3 - Soil capping	-	236		-	195		-	150		-	143	
GAEC4 - Erosion caused by livestock	1	377	0.3%	-	240		-	211		-	203	
GAEC5 - Maintenance of function field drainage systems	-	386		-	240		-	216		-	218	
GAEC6 - Muirburn code	-	227		-	207		-	146		-	157	
GAEC7 - Arable crop rotation standards	-	236		-	167		1	123	0.8%	-	117	
GAEC8 - Arable Stubble management	-	236		-	167		-	123		-	117	
GAEC9 - Appropriate machinery use	-	421		-	240		-	150		-	143	
GAEC10 - Undergrazing	-	421		1	240	0.4%	-	213		-	216	
GAEC11 - Overgrazing	-	244		-	240		-	147		-	157	
GAEC12 - Ploughing pasture of a high environmental/archaeological value	1	353	0.3%	-	215		1	210	0.5%	-	212	
GAEC13 - Protection of rough	6	354	1.7%	2	216	0.9%	-	210		-	86	

grazings/semi natural areas												
GAEC14 - Application of lime and fertiliser on rough grazings/semi natural areas	1	353	0.3%	1	216	0.5%	-	210		-	212	
GAEC15 - Field Boundaries	2	386	0.5%	5	242	2.1%	2	218	0.9%	2	220	0.9%
GAEC16 - Non-production landscape features	-	386		1	240	0.4%	-	216		-	218	
GAEC17 - Historic Features	-	170		1	163	0.6%	-	90		-	105	
GAEC18 - Encroachment of unwanted vegetation	1	386	0.3%	1	240	0.4%	-	214		-	216	
GAEC19 - Abstraction of water for irrigation	n/a	n/a		n/a			-	149		2	296	0.7%
Total	**13**			**12**			**4**			**4**		

ANNEX 6 DIFFUSE POLLUTION PRIORITY CATCHMENT SURVEY RESULTS

Diffuse pollution priority catchment	Size (km^2)	Period of monitoring	Number of rural diffuse problems	Main problem	Source
River Ayr	574	March and April 2010	Over 450	85 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/ayrshire_catchments/river_ayr_catchment.aspx
River Doon catchment	322	April 2010	54	Over 90 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue. Other identified issues were cultivation of land and poor fertiliser storage	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/ayrshire_catchments/river_doon_catchment.aspx
River Irvine catchment	481	April and May 2010	425	93 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue. Other identified issues: cultivation of land, poor fertiliser storage, overflowing septic tanks, contaminated drainage, poor channel realignment and fly tipping	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/ayrshire_catchments/river_irvine_catchment.aspx
River Garnock catchment	No data	May and June 2010	335	97 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue. Other identified issues: cultivation of land, poor fertiliser storage, overflowing septic tanks, contaminated drainage, poor channel realignment and fly tipping	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/ayrshire_catchments/river_garnock_catchment.aspx
Ayrshire Coastal	No data	No data	No data	No data	n/a
Galloway Coastal	1145	No data	No data	Water quality in 15 of 30 WFD baseline rivers has been degraded by diffuse pollution. Agriculture is responsible for ~71 per cent of phosphorus; ~85 per cent of nitrate pollution; 94 per cent of sediment catchment load. Main sources of pollution identified are: poaching and soil erosion due to livestock access to water courses, and cultivation too close to water courses.	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/galloway_coastal_catchment.aspx
Stewartry Coastal	No data	No data	No data	No data	n/a
Eye water	120	Between May 2008 and 2011	121	Over 90 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue (109 breaches). Another issue identified was the cultivation within two metres of a watercourse (7 breaches)	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/eye_water_catchment.aspx
River Tay	5000	No data	No data	15 rivers, two ground waters and 12 lochs have been degraded by diffuse pollution. Agriculture accounts for 66 per cent of phosphorus pollution; 87 per cent of pesticides; 95 per cent of sediment; 76.6 per cent of nitrate. Main sources of pollution identified are: poaching and soil erosion due to livestock access to water courses, and cultivation too close to water courses.	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/river_tay_catchment.aspx

River South Esk catchment	564	April and May 2010	504	Over 90 per cent were related to livestock keeping with poaching within 5 m of riparian edges identified as a key issue. Another issue identified was the cultivation within two metres of a watercourse	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/river_south_esk_catchment.aspx
River Dee (Grampian) catchment	2083	2010 and 2011	No data	Water quality has been degraded by diffuse pollution in 18 of 53 WFD baseline rivers (mainly in the east of the catchment). The main diffuse pollution issues found were poaching and soil erosion as a result of in-stream cattle watering points and cultivation too close to a watercourse	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/river_dee_grampian_catchment.aspx
River Ugie catchment	335	2010	223	Identified issues: 'livestock causing significant poaching of land within five metres of a watercourse: a breach of Diffuse Pollution General Binding Rule (DP GBR) 19; cultivation within two metres of a watercourse: a breach of DP GBR 20; issues relating to pesticide application and storage.'	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/river_ugie_catchment.aspx
Buchan Coastal	548	No data	No data	All 16 classified rivers in the catchment are currently not achieving 'good ecological status', set by the Water Framework Directive (WFD), and diffuse pollution has been identified as the reason in all but two of these cases. Effects from diffuse pollution have also been detected in 11 of the 17 smaller burns and lochs not classified under the WFD.	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/buchan_coastal_catchment.aspx
River Deveron catchment	1232	No data	No data	28 out of the 36 baseline rivers are assessed as being damaged by diffuse pollution	http://www.sepa.org.uk/water/river_basin_planning/dp_priority_catchments/river_deveron_catchment.aspx

ANNEX 7 THRESHOLDS APPLIED FOR SCREENING APPLICATIONS FOR THE APPLICATION OF THE EIA (AGRICULTURE) DIRECTIVE IN THE UK REGIONS AND IRELAND

Country	Thresholds	
	Restructuring of rural land holdings on agricultural land	**Conversion of land: 'use of uncultivated land or semi-natural areas for intensive agricultural purposes'**
Scotland	**Sensitive areas:** • All restructuring projects within defined sensitive areas will be considered on a case by case basis **Non-sensitive areas:** Where a restructuring project involves : • more than 200 hectares of land; or • the movement of more than 5,000 cubic metres of earth or rock; or • the construction or addition of more than 1km of vehicle track; or • the removal of 0.5 km of hedges or dry-stane dyke or the removal or addition of 6km of other boundary features (eg fencing, walls, ditches or channels).	**No threshold** For unimproved grassland, heath and moorland, land would be considered uncultivated if (1) it had less than 30% of ryegrass (Lolium species) and/or white clover (Trifolium repens), or other sown species indicative of cultivation; or (2) it has not been improved by management practices including liming or fertiliser To assist in determining whether the land is uncultivated using the above definition, the following guidance might be useful: • Land has not been cultivated for around 12 - 15 years. • The land has not been reseeded, drained or ploughed within this time period.
England	**Sensitive areas:** • changes to two km or more of field boundaries; • movements of 5,000 cubic metres or more of earth of other material in relation to land; or • restructure an area of 50 hectares or more **Non-sensitive areas:** • changes to four kilometres or more of field boundaries; • movements of 10,000 cubic metres or more of earth or other material in relation to land; or • restructure an area of 100 hectares or more.	**No threshold** Land is considered to be uncultivated if it has not been subject to physical or chemical cultivation in the last 15 years. Cultivated land is that which has been cultivated by physical or chemical means. There is a presumption that land is uncultivated land unless the responsible person can provide evidence that the land has been cultivated in the last 15 years. This might be done through witness evidence, statements from previous owners, tenants or other land managers, farm records, subsidy records, photographic evidence etc
Wales	**Sensitive areas:** • changes to two kilometres of field boundaries; • movements of 5,000 cubic metres of earth or rock; • restructuring of an area of 50 hectares. **Non-sensitive areas:** • changes to four kilometres of field boundaries; • movements of 10,000 cubic metres of earth or rock; • restructuring of an area of 100 hectares.	**No threshold** Land is considered uncultivated or semi-natural if it contains less than 25 - 30% of improved agricultural grass species (for example rye grass and/or white clover), that are indicative of cultivation

Northern Ireland	**Environmentally valuable land:** • changes to two kilometres or more of field boundaries, or • restructures an area of 50 hectares or more. O**ther land:** • changes to four kilometres or more of field boundaries, or • restructures an area of 100 hectares or more.	**No threshold** Land is considered to be uncultivated land if it has not been subject to physical or chemical cultivation in the last 15 years. Cultivation would include agricultural soil-disrupting activities such as ploughing, sub-surface harrowing, discing, or tining, as well as chemical enhancement of soil through the addition of organic or inorganic fertilisers and soil improvers. Cultivation would not include practices which do not directly affect the soil. Mowing grass, chain harrowing or clearing scrub or other vegetation would not in themselves be considered as cultivation of land.
Ireland	• Length of field boundary to be removed: Above 500 metres • Re-contouring (within farm-holding): Above 2 hectares • Area of land to be restructured by removal of field boundaries: Above 5 hectares	**Above 5 hectares** Land is considered to be uncultivated land if it has not been subject to mechanical or chemical cultivation (for example by ploughing or rotavating or by the addition of organic or chemical fertilisers) for at least 15 years.

ANNEX 8 OVERVIEW OF SECTORAL EMISSIONS TOTALS

Transport, international aviation and shipping: The emissions totals for the "transport" category include those from road transport, rail, national navigation and coastal shipping, domestic aviation and military aviation and shipping. Of greatest interest to our analysis is road transport which comprises 88% of all transport emissions with 50% of emissions attributed to passenger vehicles. What is surprising about road transport is the increase in emissions over the 1990-2010 period despite increased vehicle efficiency. This is largely attributed to an increased demand for car travel combined with decreases in vehicular and oil prices. (AEA and Aether, 2012)

Agriculture, land use, forestry and development: Agricultural GHG emissions in Scotland can be attributed to methane from livestock and to both methane and nitrous oxide emissions from soil. Enteric fermentation is the largest source of methane emissions from livestock, 72% of which originates from dairy and beef enteric and waste management. Agriculture is the largest source of nitrous oxide emissions in Scotland (78% in 2010). (AEA and Aether, 2012) Emissions of both GHGs have decreased over the 1990-2010 period; methane by 15.5% due to the decrease in cattle and sheep numbers, and nitrous oxide by 21.6% also due to the decline in livestock numbers and lower use of nitrogen fertilisers. (AEA and Aerther, 2012) Scotland's sequestration potential has increased by 161% from 1990-2010 largely to due to improved forest management but also due to increased rates of land conversion to cropland. (AEA and Aerther, 2012) A separate category entitled 'development emissions' is used to account for GHG emissions from biomass burning and land conversion. (Scottish Government, 2010.)

Residential, public and waste: Direct combustion due to due to heating and cooking comprise 96% of all emissions for this sector. Although residential emissions account for only 15% of the emissions, 30% of energy end use is attributed to residential housing. Despite some modifications to household energy efficiency, forecast trends should be treated with caution given the lack of reported energy data at the household level. (AEA and Aerther, 2012) Emissions from "public" refer to combustion of fuels by the public sector. Reductions of 28.5% over the 1990-2010 period are largely attributed to improvements in the energy efficiency of buildings and the use of gas fired boilers. Emissions from the waste sector have decreased by 67% over the 1990-2010 period due to increased utilisation of methane to generate electricity. (AEA and Aether, 2012)

Business and Industrial Process: Emissions from the business sector include emissions from combustion of fuels by industry, manufacturing and construction, refrigeration and air conditioning, as well as emissions from solvent use. Emissions reductions in this sector over the 1990-2010 period are largely attributed to a decline in manufacturing and a downturn in the iron and steel sector. Roughly 50% of emissions from the business sector are covered by the EU-ETS. The industrial process sector is responsible for emissions from cement decarbonisation of limestone (73%), glass (14%), aluminium (10.5%) and chemicals (3%). (AEA and Aether, 2012)