Scottish Government
Climate Change and
Water Industry Directorate

Strategic Environmental Assessment (SEA)
of the
Scottish Climate Change Bill
Consultation Proposals

Final Environmental Report
(Post-Consultation Issue)
November 2008

In association with
AEA Technology

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

Scottish Government
Climate Change and
Water Industry Directorate

Strategic Environmental Assessment (SEA)
Environmental Report for the:
Scottish Climate Change Bill Consultation Proposals

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	0	Draft for comment	21/12/07	Mr John Fox (JF)
1	1	2nd Draft	21/12/07	Ms Louise Tricklebank (LT)/ JF
1	2	3rd Draft for Comment	09/01/08	LT/JF
1	2	Quality Review	09/01/08	Dr Nick Murry (NM)
1	3	4th Draft for Comment	30/01/08	LT/JF
1	3	Quality Review	30/01/08	NM
1	4	For Issue	05/02/08	JF
2	1	Post Consultation Issue	19/11/08	JF

Note on Post Consultation Re-Issue of this Environmental Report

The consultation on the Scottish Climate Change Bill (SCCB) Proposals closed on the 23rd April 2008. 21,046 responses were received on the Bill consultation itself; however, only two responses were received on the Strategic Environmental Assessment Environmental Report (ER). These two responses were received from SEPA and SNH, in their role as Statutory SEA Consultees. No response was received from Historic Scotland; however, at the Environmental Report stage, they are not obliged to respond. One of the wider consultation responses to the SCCB (from RSPB) recommended the addition of a provision to allow alteration of the permitted dates for muirburn practice in upland management. The Scottish Government have been considering such a provision and, as a consequence, asked for an additional SEA assessment to be included within this re-issue to cover its inclusion in the SCCB.

SEPA and SNH acknowledged and welcomed the fact that the SEA provided a comprehensive assessment of the potential environmental implications associated with a wide range of measures envisaged to meet an 80% emissions reduction target. Their major criticism; however, referred to the fact that the comprehensive nature of the assessments led to the report being difficult to read in places, with a lack of a clear summary of key findings.

SEPA noted that the Non-Technical Summary did provide a reasonable summary of findings, although they suggested that the SEA Post Adoption Statement could be used to provide a more easily accessible summary, to aid any Parliamentary debate. This recommendation will be taken forward, and this re-issued Environmental Report is therefore not wholly rewritten, it merely acknowledges and provides changes recommended to the original content. Similarly, as the consultation comments do not change any of the findings of the assessments, the Non-Technical Summary is not reviewed.

Specific comments on particular aspects of the Report, and assessments, have been addressed and incorporated through the body of the text, using comments boxes highlighted in green, for example:

SNH Consultation Comment:
"Paragraph xxx – Note that the…
SEA Response:
Noted – The…

The comment boxes can be found on the following pages of this re-issued Report:

SEPA Comments	SNH Comments	Wider Consultation Comment
Pages: 5, 8, 9, 32, 33, 39	Pages: 18, 20, 52, 62, 67, 78	Page: 73 (RSPB)

Two new Appendices have also been added to this re-issue:

- Consultation Response and Comments Table (Appendix H)
- Addition of Muirburn Proposals – Post Consultation Assessment (Appendix I)

List of Acronyms

AA	–	Appropriate Assessment
AD	–	Anaerobic Digestion
BAP	–	Biodiversity Action Plan
BPEO	–	Best Practicable Environmental Option
CDM	–	Clean Development Mechanism
CFC	–	Chlorofluorocarbon
CH_4	–	Methane
CHP	–	Combined Heat and Power
CO2	–	Carbon Dioxide (CO_2)
CRC	–	Carbon Reduction Commitment
DAMs	–	Detailed Assessment Matrices
EC	–	European Community
EIA	–	Environmental Impact Assessment
ETS	–	Emissions Trading Scheme
EU	–	European Union
EU ETS	–	European Union Emissions Trading Scheme
FCS	–	Forestry Commission Scotland
GHG	–	Greenhouse Gas
GWP	–	Global Warming Potential
HFC	–	Hydrofluorocarbon
HS	–	Historic Scotland
IPCC	–	Inter-Governmental Panel on Climate Change
IPPC	–	Integrated Pollution Prevention and Control
JI	–	Joint Implementation
LCA	–	Life Cycle Analysis
LMC	–	Land Management Contract
NAEI	–	National Atmospheric Emissions Inventory
NO_2	–	Nitrogen Dioxide
N_2O	–	Nitrous Oxide
NPPG	–	National Planning Policy Guidance
PM_{10}	–	Particulate Matter (with a diameter ≤10 micrometers)
PPC	–	Pollution Prevention and Control
PPS	–	Planning Policy Statement
PPS/PPP	–	Policies, Plans & Strategies / Policies, Plans & Programmes
RIA	–	Regulatory Impact Assessment
ROS	–	Renewables Obligation Scotland
RSPB	–	Royal Society for the Protection of Birds
RTFO	–	Renewable Transport Fuels Obligation
SCCB	–	Scottish Climate Change Bill
SCCP	–	Scottish Climate Change Programme
SEA	–	Strategic Environmental Assessment
SEPA	–	Scottish Environment Protection Agency
SG	–	Scottish Government
SME	–	Small & Medium sized Enterprises
SNH	–	Scottish Natural Heritage
SNIFFER	–	Scotland and Northern Ireland Forum for Environmental Research
SPP	–	Scottish Planning Policy
SRDP	–	Scottish Rural Development Programme 2007-2013
SUDS	–	Sustainable Urban Drainage Systems
UK CCP	–	UK Climate Change Programme
UK CIP	–	UK Climate Impacts Programme
UK ETS	–	United Kingdom Emission Trading Scheme
UN	–	United Nations
UNEP	–	United Nations Environment Programme
UNFCCC	–	United Nations Framework Convention on Climate Change
WFD	–	Water Framework Directive

Limitations

Halcrow Group Ltd. has been instructed to provide the Scottish Government, Climate Change and Water Industry Directorate, with an Environmental Report for the Strategic Environmental Assessment carried out on the likely implications of the Scottish Climate Change Bill Consultation Proposals.

The assessment is based on information that was made available at the time of publication. The report is presented as a consultation document. Any subsequent additional information arising during the consultation will allow refinement of the conclusions.

It should be noted that:

- The findings of this report represent the professional opinion of experienced environmental scientists, sustainability consultants and other specialists. Halcrow does not provide legal advice and the advice of lawyers may also be required.
- All work carried out in preparing this report has utilised and is based upon Halcrow's professional knowledge and understanding of current relevant European Union and UK/ Scottish standards and codes, technology and legislation.
- Changes in this legislation and guidance may occur at any time in the future and cause conclusions to become inappropriate or incorrect. Halcrow does not accept responsibility for advising the facts or implications of any such changes.
- This report has been prepared using factual information contained in documents prepared by others. Halcrow can accept no responsibility for the accuracy of such information. Every endeavour has been made to identify data sources, where appropriate.
- This report represents the independent views and recommendations of the consultants conducting the analysis and may not necessarily reflect the opinions held by the Scottish Government.

Contents

Continued…

List of Tables

List of Figures

1. Introduction

1.1 Background

1.1.1. This Environmental Report has been prepared by Halcrow Group Ltd., working with AEA Technology, as part of the Strategic Environmental Assessment (SEA) undertaken in relation to the Scottish Government Climate Change and Water Industry Directorate's Draft Consultation Proposals for a Scottish Climate Change Bill (SCCB).

1.1.2. SEA on the draft consultation proposals was conducted to comply with the Environmental Assessment (Scotland) Act 2005, which requires SEA for all public sector plans, programmes and strategies with potentially significant environmental effects. Clearly, any legislation on Climate Change has the potential to have far reaching, long term environmental impacts.

1.2 The Scottish Climate Change Bill (SCCB)

1.2.1. Climate change is the most serious environmental threat facing us and future generations. In their Fourth Assessment Report on Climate Change, issued in November 2007, the Inter-Governmental Panel on Climate Change (IPCC) conclude that "warming of the climate system is unequivocal", citing observations of increases in global average air and ocean temperatures. Major advances in climate modelling and the collection and analysis of data now give scientists "very high confidence" (at least a 9 out of 10 chance of being correct) in their understanding of how human activities are causing the world to warm. This level of confidence is much greater than could be achieved in 2001, when the IPCC issued its Third Assessment Report.[1]

1.2.2. The Scottish Government has one, clear purpose: to focus Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth. The Scottish Government acknowledges that reducing emissions is a central facet of sustainable growth, and in June 2007, the Cabinet Secretary for Finance and Sustainable Growth announced that Government would consult on a Scottish Climate Change Bill to set a mandatory target for cutting emissions by 80% by 2050.

1.2.3. In setting this target, the Government wants to drive appropriate and necessary action, to reduce emissions and help mitigate the effects of climate change globally. The Scottish Climate Change Bill will therefore :

- set mandatory targets for emission reductions;
- include monitoring arrangements to ensure Government is on course to meet those targets;
- set out mechanisms for appropriate advice on climate change and emissions reduction budgets, to ensure achievement and accountability for long term goals;
- bring forward legislative measures to help reduce emissions and adapt to changing climate.

[1] Statements adapted from the IPCC Fourth Assessment Report Summary for Policymakers, available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

1.3 Key Facts Relating to the SCCB Consultation Proposals SEA

1.3.1. This SEA should be read in conjunction with the Scottish Climate Change Bill Consultation document and Regulatory Impact Assessment, prepared by the Climate Change Bill Team. Table 1.1 below, presents some key facts in relation to this SEA.

Table 1.1 Key Facts

Responsible Authority	Scottish Government Climate Change and Water Industry Directorate
Title of plan/ programme	Scottish Climate Change Bill Consultation Proposals
Administrative provision for the plan/ programme	The Scottish Climate Change Bill will introduce primary legislation setting statutory targets for reductions in carbon dioxide and, potentially, other greenhouse gases.
Plan subject/ Objectives	The Scottish Climate Change Bill consultation aims to consult widely on the proposals for the Bill and the potential measures required to meet ambitious reductions targets.
Period covered	The SCCB consultation and associated processes will end with the submission of the Scottish Climate Change Bill to the Scottish Parliament towards the end of 2008. Targets within the SCCB will aim to realise reductions by 2050.
Frequency of updates	Not applicable in this case. SEA will be conducted at proposals stage only. Revisions will be addressed until such time as the Scottish Climate Change Bill is introduced to Parliament.
Plan area	The Scottish Climate Change Bill will apply to the whole of Scotland.
Consultation contact	Andrew Henderson Scottish Climate Change Bill Team Scottish Government Area 1-F South, Victoria Quay, Leith Edinburgh EH6 6QQ Tel: 0131 244 0736 Andrew.Henderson@scotland.gsi.gov.uk

1.3.2. The Scottish Climate Change Bill (SCCB) Team at the Scottish Government produced a Scoping Report, which was sent to the Consultation Authorities, SEPA, SNH and Historic Scotland, in September 2007. The project for carrying out the SEA assessments and the production of the Environmental Report was put to tender in October 2007.

1.3.3. Halcrow, with specialist advice from AEA Technology, were awarded the project, and this Environmental Report documents the methodologies used in the process, with resultant findings and recommendations. An outline of SEA activities undertaken is provided in Table 1.2.

1.4 The SEA Process

1.4.1 The requirement to undertake Strategic Environmental Assessment (SEA) is established by the European Directive 2001/42/EC, 'the Assessment of the Effects of Certain Plans and Programmes on the Environment' (the SEA Directive). SEA provides plan-making authorities with a process to incorporate environmental considerations into decision-making at an early stage and in an integrated manner. The objective of SEA is to:

'Provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development'
(Article 1 of the SEA Directive).

1.4.2 The SEA Directive establishes the need for an SEA in Article 3, section 2:

'…an environmental assessment shall be carried out for all plans and programmes,

(a) which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of projects…'
(Article 3 of the SEA Directive)

1.4.3 To determine whether or not an Appropriate Assessment (AA) is required under the Habitats Directive, Environmental Reports prepared under the SEA Directive must discuss;

"Any existing environmental problems which are relevant to the Strategy including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive on the conservation of wild birds [the 'Birds Directive'] and the Habitats Directive"

1.4.4 Section 4.3.2 of EC guidance on Article 6 of the Habitats Directive[2] states that,

"…*a distinction needs to be made with 'plans' which are in the nature of policy statements, i.e. policy documents which show the general political will or intention of a ministry or lower authority. An example might be a general plan for sustainable development across a Member State's territory or a region. It does not seem appropriate to treat these as 'plans' for the purpose of Article 6(3), particularly if any initiatives deriving from such policy statements must pass through the intermediary of a land-use or sectoral plan*."

1.4.5 Given the geographical scale of a Bill that applies to Scotland, appropriate assessment (AA) is not required for the SCCB Consultation Proposals. This does not mean that the process of consideration should not be recorded in the SEA, just that an AA need not be undertaken.

[2] EC Guidance on Managing Natura 2000 Sites, The Provisions of Article 6 of the Habitats Directive 02/43/EEC is available at http://ec.europa.eu/environment/nature/nature_conservation/eu_nature_legislation/specific_articles/art6/pdf/art6_en.pdf#search=%22ec%20managing%20natura%20sites%20alternative%22

1.4.6 The first stage of consideration relates to whether the Strategy is a plan or project. As the SCCB will provide primary legislation, it can be regarded as a policy document detailing the general political will of the Scottish Government; it does not provide direction or planning guidelines for land management measures on specific sites and as such, does not require to be treated as a plan or project for the purpose of Article 6(3) of the Habitats Directive. Effective appropriate assessment will be required at the local/ site level for any project or programme of works which may impact upon the integrity of a European site, European Protected Species or Natura 2000 interests in the wider countryside.

1.4.7 In Scotland, the 'Environmental Assessment (Scotland) Act 2005', now provides the legislative mechanism for transposing the SEA Directive into Scottish legislation. Scottish Government Ministers envisage Scotland as a world leader in SEA provision and as such, Section 1 of the 2005 Act sets out the primary requirement, which is to secure the completion of an environmental assessment during the preparation of a qualifying plan or programme. The explanatory notes to the Act state,

"*Through the Act the aim is to improve protection of the environment, to improve public decision making and in particular to implement the commitment in 'A Partnership for a Better Scotland' to legislate to introduce Strategic Environmental Assessment across the range of all new strategies, plans and programmes developed by the public sector in Scotland*".

1.4.8 Section 1.1(b)(i) states that SEA should be conducted before submission to legislative procedure.

'Section 1.1 The responsible authority shall—

(a) during the preparation of a qualifying plan or programme, secure the carrying out of an environmental assessment in relation to the plan or programme; and

(b) do so—

(i) where the plan or programme is to be submitted to a legislative procedure for the purposes of its adoption, before its submission.'

1.4.9 This SEA was conducted in accordance with the European SEA Directive (2001/42/EC), the Scottish Act, as noted above, Scottish Government SEA Gateway Templates and Guidance (2005), and best practice. Best practice would suggest that SEA and strategy or plan development are fully integrated from the outset through to adoption; however due to the implications of the Parliamentary legislative process, using SEA to assess proposals for a legislative bill presents particular challenges.

1.4.10 After consultation on the SCCB proposals, the SEA will address significant changes, and will close with the submission of the SCCB to the Scottish Parliament. At that point, an SEA Post Adoption Statement will be produced that sets out how the SEA process has informed the development of policies within the submitted Bill. It must be stressed therefore, that this SEA considers options within the c*onsultation proposals* for the SCCB, and is not intended to represent an SEA of the Bill itself. There may be no assessment of the adopted version of the Bill, following Parliamentary handover and the legislative process; however, this SEA will be considered compliant with the aims of the Environmental Assessment (Scotland) Act 2005, under Section 12.1(b), outlined below.

'Section 12 Restriction on adoption or submission

(1) A qualifying plan or programme shall not be—

(a) adopted; or

(b) submitted to a legislative procedure for the purposes of its adoption,

before the requirements of such provisions of Part 2 of this Act as apply in relation to that plan or programme have been met.'

1.4.11 Part 2 of the Act refers to the completion of an Environmental Report and associated assessments, which this document fulfils. SEA processes are intended to improve the contribution that the policy/plan/strategy being appraised makes to the achievement of sustainable development, whilst at the same time minimising adverse and maximising positive environmental effects. As such, this SEA may help set a framework for future assessment of the adopted Bill, and any associated measures/ powers.

1.4.12 The primary purpose of this SEA was to assess the consultation proposals for the Bill, however due to the difficulty in producing assessments at such a high level, the SEA also includes assessments of possible emissions reduction measures, to identify and make recommendations on the environmental implications for Scotland. E-test matrices were used (described further in Section 5 and Appendix D of this report) to speculate on possible measures that might be implemented in order to meet an 80% emissions reduction target. These emission reduction measures may not feature in the submitted SCCB, but may be introduced as a result of it.

1.4.13 The SEA methodology developed during the course of the study included a participatory workshop and literature review, to inform a series of assessments that identify the key significant effects and implications of the SCCB. The methodology is outlined in Section 2; however Table 1.2 below outlines the key stages in the process and its relationship to the Bill preparation and consultation processes.

1.4.14 It should be noted that due to the high-level and cross-cutting nature of the SCCB, the production of a detailed baseline was not considered appropriate; however an overview of issues related to the SEA topics required by Annex I of the European SEA Directive (see Section 4, paragraph 4.1.1) has been included in Appendix C of this report.

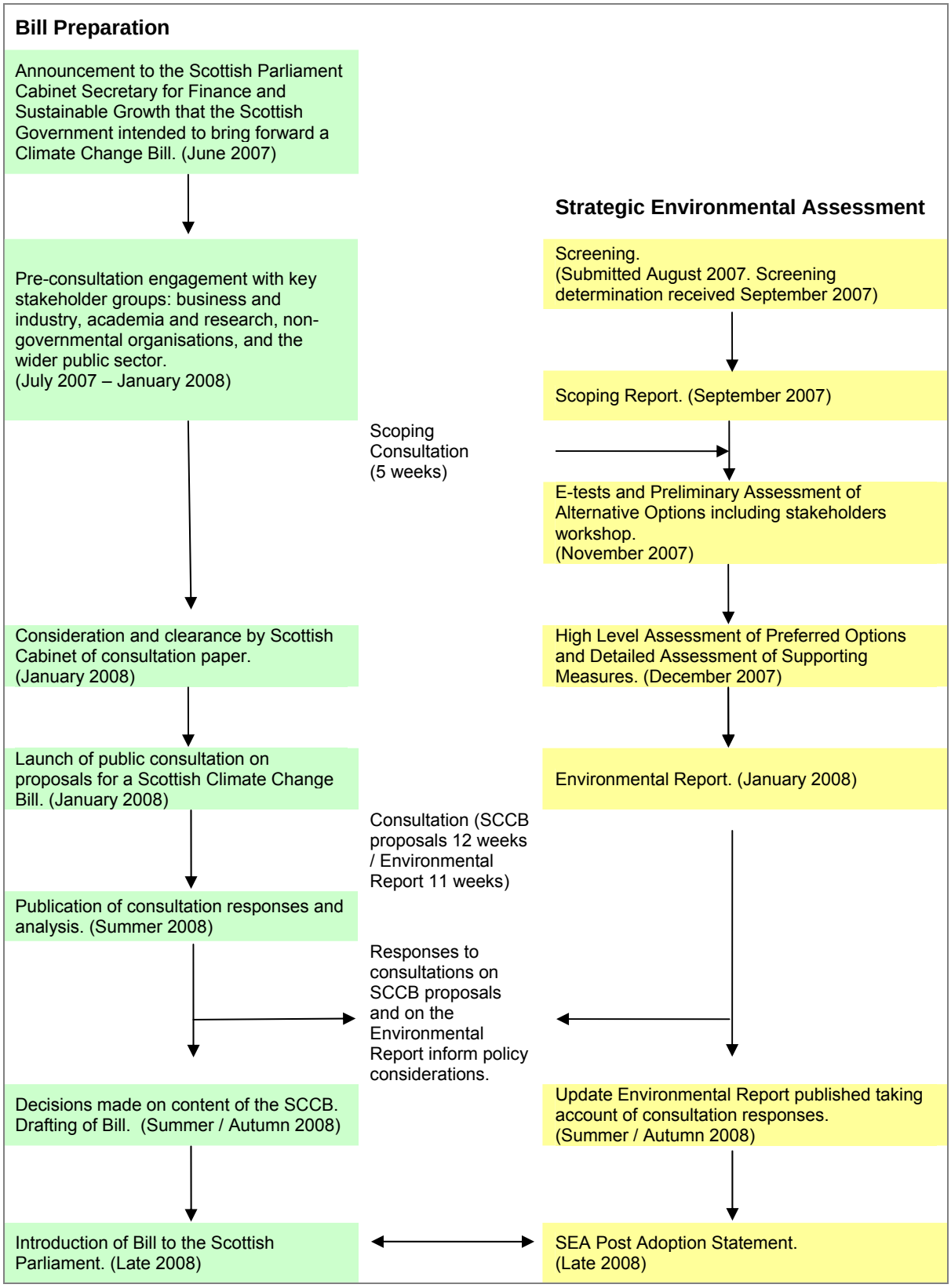
SEPA Consultation Comment:

"We note the position that the SEA is of the consultation proposals and not of the Bill itself and also that there may be no assessment of the adopted version of the Bill following the Parliamentary handover and the legislative process.

SEPA cannot comment on whether this is compliant with the SEA legislation.

We are of the view, however, that given the comprehensive nature of the assessment that has been undertaken on the SCCB consultation and, on the assumption that the findings of the Environmental Report are fully taken into account as the Bill is drafted, that we are broadly content with this approach."

Table 1.2 Integration of the SEA process with the Bill preparation process



2. SEA Methodology

2.1 Statutory Requirements

2.1.1. SEA, as required by the Environmental Assessment (Scotland) Act 2005, has five key stages:

A. Screening	Determining whether the Plan/ Programme/ Strategy (PPS) is likely to have significant environmental effects and whether an SEA is required
B. Scoping	Deciding on the scope and level of detail of the Environmental Report, and the consultation period for the report in consultation with Scottish Natural Heritage, The Scottish Ministers (Historic Scotland) and the Scottish Environment Protection Agency
C. Environmental Report	Publishing an Environmental Report on the PPS, which considers environmental effects and mitigation or enhancement methods, and consulting on that report
D. Adoption (SEA or Post Adoption Statement)	Publish SEA Post Adoption Statement that provides information on: the adopted PPS and how consultation comments have been taken into account; methods for monitoring the significant environmental effects of the implementation of the PPS
E. Monitoring	Outline a monitoring framework to allow for monitoring of significant environmental effects in such a manner as to also enable the Responsible Authority to identify any unforeseen adverse effects at an early stage and undertake appropriate remedial action

2.2 Stages A & B: Screening and Scoping

2.2.1. Stages A and B, Screening and Scoping, were conducted by the Climate Change Bill Team. A Screening Determination was submitted to the Consultation Authorities (CA) in August 2007, which generally determined that certain actions taken to meet the proposed SCCB target had the potential to result in significant environmental effects.

2.2.2. The SCCB Team produced and submitted a Scoping Report in September 2007. CA responses were returned by mid-October 2007 and forwarded on to Halcrow mid-November 2007.

2.2.3. In the main, the CA's were concerned that a lack of baseline data and detail on the likely contents of the Bill limited their ability to comment fully on the likely environmental implications; although the general consensus was that the Bill offered potentially long-term environmental benefits associated with a general reduction in Scottish greenhouse gas emissions. Although the production of a detailed baseline was not considered appropriate, in order to carry out the SEA, an overview of issues has been included. (See Appendix C of this report).

2.2.4. Concern was expressed over the ability of the SEA to address the more indirect impacts of emissions reductions (Historic Scotland suggested adopting an E-test methodology) and on how the SEA would inform the development of the Bill as it passes through the Parliamentary process. CA responses to the Scoping Report are addressed fully in Appendix A.

2.3 Stage C: Environmental Report

2.3.1 This Environmental Report (ER) represents the key output of Stage C. Upon completion of the consultation on the SCCB proposals and this ER, consultation responses will be reviewed and any resultant significant changes, to be included in the SCCB proposals, will be assessed, with an addendum to this report produced or a new ER issued, depending on the scale of changes.

2.3.2 In order to develop an effective method for the SEA of the SCCB consultation proposals, it was necessary to adopt a structured, high-level approach that identified and separated out the strategic aims of the SCCB from the options and alternatives likely to be included within the consultation document.

2.3.3 A four-stage process was developed to allow effective appraisals of the varied issues surrounding, and implications of, the SCCB proposals.

1. A modified E-test approach was utilised to assess sectoral implications, likely emissions reduction measures required and the anticipated effects on the SEA topics.
2. An assessment was carried out using the PPP/PPS review and baseline to identify high-level issues under each of the SEA topics that might arise from reducing GHG emissions.
3. A preliminary assessment considered an early draft of alternative options, against the SEA topics, and included a preliminary detailed assessment of supporting measures. A stakeholder workshop helped to facilitate this process.
4. A secondary high-level options assessment of the preferred consultation paper options using high-level matrices, discursive notes and detailed assessment matrices.

2.3.4 These stages are discussed further in Section 5 of this report, with full assessments recorded in Appendices D – G.

2.3.5 The SCCB consultation refers to emissions reduction or emissions mitigation, treating them as inter-changeable terms. In order to avoid potential confusion over terminology, this SEA refers to 'emissions reduction' as opposed to 'emissions mitigation'. Mitigation in this SEA will refer to measures to prevent, reduce or avoid negative environmental consequences of a particular action. This convention will be maintained.

SEPA Consultation Comment:

"As the SCCB consultation is progressed and the Bill itself prepared and indeed introduced to parliament, it would be helpful for a very simple overview of the assessment findings to be prepared (eg from the non technical summary or via the SEA statement) in order to help inform debate on the Bill and its implications."

SEA Response:

A more concise summary of assessment results will be included as part of the SEA Statement, once the provisions of the Scottish Climate Change Bill, for submission to the Scottish Parliament, have been finalised.

2.4 Stage D: Adoption

2.4.1. Stage D Adoption, usually requires the production of a Post Adoption Statement that documents how the SEA process and consultation comments were taken into account in refining the adopted version of a plan, programme or strategy. However, on submission of the SCCB to Parliament, this particular SEA will come to an end.

2.4.2. An SEA Post Adoption Statement will be produced, documenting how the SEA process has informed the development of policies within the submitted Bill. This will meet the principles of Stage D, and the requirements of Section 12.1(b) of the Environmental Assessment (Scotland) Act 2005. Any further assessment of the SCCB, as an adopted Act, will be at the discretion of the Scottish Ministers.

2.5. Stage E: Monitoring

2.5.1. As the SCCB is likely to introduce statutory monitoring and reporting requirements, and may recommend independent monitoring and verification of emissions reductions, Section 8 of this report will discuss the implications for an SEA monitoring framework and the potential for environmental indicators to be included.

SEPA Consultation Comment:

"We note that any further assessment as the Bill progresses will be at the discretion of Scottish Ministers.

We acknowledge that this is a practical arrangement that reflects the uncertainties regarding progress of the Bill and the possibility that its provisions may be amended.

It is SEPA's view that there would be merit, if at all possible within the constraints of parliamentary procedure, in considering any significant environmental effects that may arise from proposed changes to the Bill."

SEA Response:

Scottish Ministers do not plan to make any amendments to the Bill which will be outwith the scope of the existing Environmental Report.

If non-governmental amendments are made which are considered to have an environmental effect outwith the areas considered in the Environmental Report it may be most appropriate to consider separate strategic environmental assessment of the proposed actions to implement such provisions.

2.6. Limitations and Assumptions

2.6.1. SEA conducted on draft proposals for a legislative Bill consultation presented some limitations, and required some key assumptions to be made, which are presented in Table 2.1 below.

Table 2.1 SEA Process – Limitations and Assumptions

Limitation	Approach to SEA
Timescales	The consultants developed a methodology based on assumptions about the future and opted to concentrate on known and emerging technologies, but did not consider a range of scenarios with differing combinations of measures due to time constraints.
Methodology	The Scoping Report did not set out a detailed methodology or assessment framework to be consulted on, and a 'standard' SEA objectives-led methodology was not considered appropriate due to the limited opportunity for the SEA to result in revisions to the consultation proposals. Developing an appropriate methodology that would satisfy the requirements of the Environmental Assessment (Scotland) Act 2005 was a key concern, and is discussed in Section 5 of this report. It is anticipated that the SEA will help advise the consultation on the SCCB proposals and recommendations on preferred options post-consultation.
Uncertainty	When assigning impacts related to the Scottish Climate Change Bill proposals and the likely effects of emissions reduction measures, uncertainty exists throughout the assessments due to the lack of detailed information on measures likely to result. 'Business as Usual' scenarios were considered within the e-tests and baseline sections, based on the UKCIP02 high emissions scenario, in accordance with the precautionary principle.
Revisions and Additions	Throughout the period, the consultation proposals were revised and updated as the Consultation Draft was passed through government departments for comment. It was therefore necessary to review the initial draft proposals and adopt an overview approach for the SEA appraisals. All appropriate consultation options have been assessed, although some questions were identified as better addressed through Regulatory Impact Assessment.
Data Availability	No baseline was included in the Scoping Report and the production of a detailed baseline was not considered appropriate due to the high level nature of the SCCB. However, an overview of key issues and updated national emissions data was collected, in conjunction with AEA Technology.
Key Assumptions	The SCCB consultation proposals will focus on an 80% emissions reduction target as its key objective. The SEA will assume that emissions reductions apply to the range of greenhouse gases produced in Scotland, and not solely on carbon dioxide emissions, to provide a wider base for assessments. The SEA will be primarily concerned with the direct, secondary and indirect environmental effects of measures to reduce emissions to meet the 80% target. The SEA will assess the options presented in the SCCB consultation proposals at a high level, rather than attempt to identify and assess potential policy measures that might emerge at the next stage. The SEA will not restate climate science or develop specific scenarios but refer to well developed and understood science and scenarios from the SNIFFER Handbook of Climate Trends Across Scotland and the UK Climate Impacts Programme (UKCIP02) Scenarios. The SEA will acknowledge wider environmental impacts on each of the SEA topics, as required by the SEA Directive and 2005 Act.

3. Policy Drivers and Context for the SCCB

3.1 Background

3.1.1 Schedule 3 of the Environmental Assessment (Scotland) Act 2005 requires that the Environmental Report includes an outline of relationships with other relevant programmes, plans and strategies (PPS), and how their environmental protection objectives have been taken into account in the PPS review.

3.1.2 In this section, International, UK and Scottish Government policies that impact upon, or could influence the direction of, action taken under the auspices of the SCCB, are reviewed to provide the context for assessments and to identify any associated pressures or synergies. Section 3.4, provides a summary of some key Scottish PPS and presents annotated climate recommendations made within their associated SEAs. Appendix B provides a fuller PPS review.

3.2 Kyoto Protocol and EU Drivers

3.2.1 In response to the scientific consensus that human activities are having a noticeable effect on the worldwide climate, the Kyoto Protocol was agreed at the Third Conference of the Parties (CoP-3) to the UN Framework Convention on Climate Change (UNFCCC) in Japan in 1997. This international agreement aims to reduce developed countries' emissions of greenhouse gases (GHG's) by, on average, 5.2% below 1990 levels by 2008-2012. The Protocol entered into force in February 2005, following ratification by Russia.

3.2.2 The UK share of the collective Kyoto target, assumed by the European Union under the Protocol, is an emissions reduction of 12.5%. Early in 2007, and in advance of the December 2007 United Nations Climate Change Conference in Bali, Indonesia, all EU member states agreed to go further than Kyoto targets and commit to emissions reductions of 20% by 2020, increasing to 30% should international agreements be reached. These reductions would be based on the range of greenhouse gases and not on carbon dioxide (CO2) alone.

3.2.3 The two-week Bali conference included sessions of the Conference of the Parties to the UNFCCC, its subsidiary bodies as well as the Meeting of the Parties to the Kyoto Protocol. The conference culminated in the adoption of the 'Bali Roadmap', which initiates a two-year process of negotiations designed to agree a new set of emissions targets to replace those in the Kyoto Protocol and lead to a post-2012 international agreement on climate change. The final text does not mention specific emissions targets, but acknowledges that "deep cuts in global emissions will be required to achieve the ultimate objective" of avoiding dangerous climate change, and that delays in reducing emissions make severe climate impacts more likely.

3.2.4 The roadmap contains text on emissions cuts, the transfer of clean technology to developing countries, halting deforestation and helping poorer nations protect their economies and societies against the impacts of climate change. Consensus was reached on the principle of rewarding poorer countries to protect their forests, which is acknowledged as the cheapest single method of curbing climate change, and brings benefits in other environmental areas such as biodiversity and fresh water conservation.

3.2.5 The roadmap sets the parameters and aims for a further set of negotiations to be finalised by the 2009 UN Climate Conference, to be held in Denmark; by which stage, parties should have agreed a comprehensive plan for curbing global warming and adapting to its impacts. This will include:

- emissions targets for industrialised countries, possibly but not necessarily binding;
- some softer form of targets or ambitions for major developing countries;
- mechanisms for leveraging funds from carbon trading to fund adaptation projects.

3.2.6 Many economists believe that mandatory emissions targets are needed to create a meaningful global market and one of the most significant mechanisms is the EU Emissions Trading Scheme (EU ETS); the current aim of which is to help deliver CO2 emissions reductions where they are most cost-effective. The Scheme is a key feature of the European Climate Change Programme and the largest emissions trading scheme in the world. The EU's 'Linking Directive' (2004/101/EC) amends the Emissions Trading Directive (2003/87/EC) and provides for the use of credits from the Kyoto Protocol's project mechanisms in the EU ETS. The Kyoto mechanisms provide a means for countries to be awarded credits for projects carried out in other countries that limit or reduce emissions:

- Joint Implementation (JI) operates between developed countries that are Parties to the Protocol and have a quantified emissions reduction or limitation target (Annex I Parties).
- Clean Development Mechanism (CDM) operates between one country which is a Party to the Protocol (Annex I) and another which does not have a target (non-Annex I Parties).

3.2.7 The EU ETS began in January 2005 and is mandatory for large-scale emitters (see Table 3.1 below). The first phase runs to December 2007 and subsequent phases will last five years, with Phase II running from 2008-2012. The scheme is evolving however, and there are discussions on extending the period to 8 years, widening the scope to apply to other GHG's and increasing the sectoral coverage. An EC announcement on the future of the EU ETS is expected by the end of January 2008.[3]

3.2.8 In Scotland, the EU ETS currently covers almost 50% of Scottish CO2 emissions and will play a vital role in driving emissions reductions across the country. Sections 5.35 to 5.46 of the SCCB consultation document outline the significant interplay between the EU ETS, its potential effect on the Scottish target and the difficulties in working an effective solution. In effect, the EU ETS could be a limiting factor on the effectiveness of the SCCB, in both the design and management of efforts to meet a domestic reduction target that is more challenging than the EU ETS caps.

3.2.9 Should the scheme be extended to apply to all GHG's, and other sectors become eligible for inclusion, the overall impact on the trajectory of emissions reductions towards the SCCB target will need to be closely scrutinised, with suitable mechanisms introduced to track reductions achieved through the EU ETS, in conjunction with reductions made outwith the scheme, to allow effective carbon budgets to be realised.

[3] Details of the announcement are available at http://ec.europa.eu/environment/climat/emission/ets_post2012_en.htm
The announcement came too late to be included in the SCCB consultation and is therefore not considered in this SEA.

Table 3.1 EU ETS Eligible Activities

Activities covered by the EU Emissions Trading Scheme
Energy activities • Combustion installations with a rated thermal input exceeding 20 MW (excepting hazardous or municipal waste installations) • Mineral oil refineries • Coke ovens
Production & processing of ferrous metals • Metal ore (including sulphide ore) roasting or sintering installations • Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
Mineral industry • Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day • Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day • Installations for the manufacture of ceramic bricks by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4m^3 and with a setting density per kiln exceeding 300kg/m^3
Other activities Industrial plants for the production of: (a) pulp from timber or other fibrous materials (b) paper and board with a production capacity exceeding 20 tonnes per day

3.2.10 A range of other international policies that could have an influence on the SCCB are reviewed in Appendix B, including EU energy efficiency and renewables plans/ programmes.

3.3 UK Climate Change Bill

3.3.1 The UK Bill puts into statute targets to reduce CO2 emissions through domestic and international action by at least 60% by 2050 and 26-32% by 2020, against the 1990 Kyoto baseline. The target will be reviewed, based on reports by an independent Committee on Climate Change on whether it should be even stronger still, and the implications of including other greenhouse gases and emissions from international aviation and shipping.

3.3.2 Five-year carbon budgets will set binding limits on CO2 emissions ensuring each year's emissions count. Three successive carbon budgets (representing 15 years) will always be in law – providing a balance between predictability and flexibility. Budgets will be backed by annual accountability and independent scrutiny.

3.3.3 Emission reductions purchased overseas can be counted towards the UK's targets, consistent with the UK's international obligations. This ensures emission reductions can be achieved in the most cost effective way, recognising the potential for investing in low carbon technologies abroad as well as action within the UK to reduce the UK's overall carbon footprint.

3.3.4 The Scottish Government will work in partnership with the UK Government and the Devolved Administrations to meet the CO2 reduction targets. The UK Climate Change Bill will set the direction for reserved policies, as the 60% target applies to the UK as a whole. The UK Bill will have an effect on Scottish emission levels; however the Scottish Government intends to go further by setting a higher 80% emissions reduction target (possibly on a range of GHG's, as well as CO2), where the Scottish Bill will be the driver for action in devolved areas of government.

3.4 Changing Our Ways: Scotland's Climate Change Programme (2006)

3.4.1 The first Scottish Climate Change Programme (SCCP) was published in 2000 and formally reviewed between September 2004 and early 2006, in parallel with a review of the UK Climate Change Programme (UKCCP). The updated SCCP was published in March 2006 and set out the main activities across a range of sectors in Scotland to address climate change. It supported Government's commitment to make an equitable contribution to UK targets, under the Kyoto Protocol, and more ambitious domestic goals to identify and realise potential carbon savings.

3.4.2 The SCCP quantified this contribution in carbon terms for the first time, through the Scottish Share concept. The SCCP set a Scottish Target to substantially exceed the Scottish Share by one million tonnes of carbon equivalent emissions by 2010. The main policy developments in key sectors, envisioned as contributing to carbon savings, were outlined. The Programme also set out the Government's role in assisting Scotland to adapt to the unavoidable impacts of climate change, and the mechanisms for moving forward and reporting progress.

3.4.3 The SCCP was expected to deliver environmental benefits through its contribution to global reductions of greenhouse gas emissions, thereby helping to avoid the most serious predicted impacts of climate change on Scotland's natural and built environments. The SCCP focused on devolved policy measures within the Government's control, although it was recognised that reserved policy measures can also have an impact in Scotland – in terms of emission reductions, reducing vulnerability, and wider positive or negative impacts on aspects of the environment.

3.4.4 An informal environmental assessment was conducted upon the SCCP, which recognised that:

> "*There is an important environmental dimension to climate change – global efforts to curb emissions are necessary to ensure we live within environmental limits – although it should be stressed that climate change has far reaching consequences for our economy and society as well. However, it is not always the case that policies which deliver carbon savings are necessarily benign on other aspects of the environment."*

3.4.5 The assessment also states that the process resulted in a:

> *"Greater emphasis throughout the Programme on the need to tackle climate change in Scotland in a sustainable way, which includes consideration of wider environmental impacts, and that a mechanism to ensure this happens throughout the Government was needed as part of our mainstreaming of climate thinking. In addition, a specific recommendation was included in the SCCP to consider how climate factors are being addressed at policy, plan and programme level as part of the review of the SEA process and contribute to strengthening guidance if necessary."*

3.4.6 It is anticipated that the Scottish Climate Change Bill will put an ambitious emissions reduction target into statute, and that whilst the measures and policies outlined within the SCCP (2006) will contribute; the statutory imperative to do more, as set by the target, should drive stronger action and a commitment to greater reductions (upon strategy or policy review), in conjunction with new measures and secondary legislation following the adoption of the SCCB.

3.5 Key Scottish Strategies and SEAs

3.5.1 In this section, some key Scottish sectoral PPS that are more specifically related to climate change and potential emissions reductions, and which have undergone SEA, are reviewed briefly. It is expected that targets introduced by the SCCB will act upon these strategies/ programmes to drive more ambitious commitments to action and help deliver effective emissions reductions.

3.5.2 It is also likely that strengthening SEA guidance or requirements on the consideration of climatic factors, to account for and address likely emissions effects will help maintain the long term focus on reducing emissions across all areas of government and policy review. (Section 8.29 of the SCCB consultation document discusses SEA and Question 31 aims to evaluate these considerations further).

SPP 6: Renewable Energy and SEA

3.5.3 SPP6 outlines how the Scottish Ministers expect the planning regime to facilitate development of renewables in Scotland. Planning authorities are expected to make positive provision for renewable energy developments by:

- Supporting a diverse range of renewable energy technologies including encouraging the development of emerging and new technologies.
- Recognising the importance of fully engaging with local communities and other stakeholders at all stages of the planning process.
- Guiding development to appropriate locations and providing clarity on the issues that will be taken in to account when assessing specific proposals.
- Maximising environmental, economic and social benefits.

3.5.4 An SEA was carried out for SPP6[4] and the main findings relating to climate change were:

- Renewables were assigned a positive impact on climatic factors due to a reduction in CO2 emissions compared to other technologies.
- Siting of renewables projects was highlighted as having the potential to have negative impacts on climatic factors through the disturbance of peat soils.
- These measures were already considered in NPPG6, which represents the “status quo” for the assessment. Overall, SPP6 was not assessed as having an impact on climatic factors when compared against NPPG6 and the status quo.

[4] SPP6 SEA Environmental Report available at http://www.scotland.gov.uk/Resource/Doc/143317/0036380.pdf

3.5.5 Development of renewable capacity is vitally important for the success of the SCCB and statutory emissions reduction targets will help drive further uptake and integration of renewables across Scotland. The Scottish Government has recently announced new targets for energy supplied from renewable sources of 31% by 2011 and 50% by 2020, up from 40% by 2020.

3.5.6 As stated in the SEA, the key environmental concern will be the appropriate siting of installations and the minimisation of risks to carbon stores in soils.

Energy Efficiency and Microgeneration Strategy for Scotland and SEA

3.5.7 The first Energy Efficiency and Microgeneration Strategy for Scotland sets out the Government's aims for improving energy efficiency and encouraging a greater uptake of microgeneration. Energy efficiency and microgeneration can help achieve a low carbon future for Scotland's homes and workplaces and the Strategy takes and reflects a more joined-up approach.

3.5.8 Coupled to energy efficiency, microgeneration could make a significant contribution to tackling climate change, by ensuring reliable energy supplies and providing a powerful visual statement which helps to increase awareness and engage the public in taking action. It can provide a sustainable source of low carbon energy and help reduce carbon dioxide emissions from homes, small commercial buildings and community buildings, including leisure centres and schools.

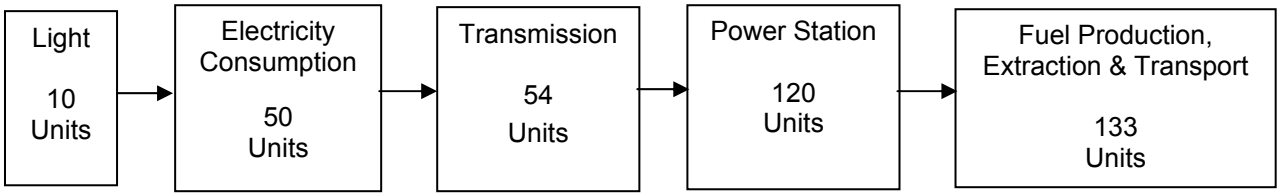
3.5.9 An SEA[5] of the Strategy was commissioned by the Scottish Government. The main relevant findings of which included:

- There will be no significant environmental effects of the Draft Strategy per se on biodiversity, soils, water and cultural heritage, as it does not directly promote development projects.
- Overall slight positive effects on air quality, climatic factors, human health, and neutral impacts on visual amenity.

3.5.10 As the built environment in Scotland is a major energy consumer, SCCB targets should help drive efficiency measures that reduce emissions from the use of buildings and throughout the development chain, to promote considerations of embodied energy and carbon emissions.

3.5.11 Wider benefits of energy efficiency measures can be demonstrated by the light bulb analogy, represented in Figure 3.1 below, where the power required for 10 units of light (heat) energy at the point of use, translates to roughly 130 units required in upstream extraction and transport, production, distribution, transmission and efficiency losses. Therefore, saving one unit of energy demand equates to saving up to 13 units required to supply that single unit to the point of use.

Figure 3.1 Light Bulb Energy Use and Upstream Energy Requirements



Source: Tyndall Centre for Climate Change

[5] Energy Efficiency and Microgeneration SEA Environmental Report available at http://www.scotland.gov.uk/Publications/2007/03/28154502/0

3.5.12 Many modern electrical appliances operate under similar inefficiencies therefore, at the national level, significant reductions in energy demand across homes and businesses can save a vast amount of energy, and hence help reduce overall emissions. However, there may be difficulties in ensuring the SCCB target reflects progress in energy efficiency, as demand may not change substantially eg. if a greater number of more efficient appliances are used.

Marine Renewables and SEA

3.5.13 Development of marine renewables could provide an important contribution to Scotland's renewable obligations and also to its wider climate change objectives. Recognising this, the Scottish Government commissioned an SEA[6] to examine the environmental effects of developing wave and tidal power and to use the results to inform the preparation and delivery of the Scottish Government's strategy for the development of marine energy.

3.5.14 SEA Objectives were to assess, at the strategic level, the effects on the environment of meeting or exceeding the Marine Energy Group's estimate of 1,300MW of marine renewable energy capacity around Scotland by 2020, and:

- To advise and support the Scottish Government in the development and implementation of its strategy for marine renewable energy and to inform future development of planning guidance for marine developers;
- To inform the project-level decision-making process for all stakeholders (to include regulators and developers), and
- To facilitate focused investment into the marine renewable energy sector in Scotland.

3.5.15 The primary question addressed in this SEA was: can wave and tidal stream energy contribute towards helping the Scottish Government achieve its (then) target for producing 40% of its electricity from renewable sources by 2020 without significant effects on the environment, and if so, how can this best be achieved?

3.5.16 The main conclusions included:

- Wave and tidal devices could have moderate to major significant effects on coastal processes, particularly in areas with high levels of erosion, accretion and long-shore drift.
- Failure of a device or part of a device could result in the accidental spillage or leakage of potentially polluting substances e.g. hydraulic fluids, lubricating oils, cleaning fluids, paints, or toxic substances.
- The effect on water quality depends on the quantity of potentially polluting substances released, the type of substance e.g. whether it is toxic or non-toxic, soluble or insoluble, and the sensitivity of receptors to the substance.
- The physical presence of vessels and equipment involved in the installation of marine devices could potentially disturb marine birds, mobile fish species and marine mammals.
- Marine noise generated during the installation and operation of devices could have major significant effects on marine birds, marine mammals and fish.

---

[6] Wave and Tidal Energy SEA Environmental Report available at http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/WaveTidalSEA

- Seabed disturbance during device installation and cable trenching could lead to increased levels of suspended sediment/ turbidity. This could potentially have moderate to major significant effects on benthic and shellfish species in close proximity to the works.

3.5.17 The framework provides a national context for development plans and planning decisions and will inform the ongoing programmes of the Government, public agencies and local government. It is also one of the factors the Government will take into account in coming to decisions on policy and spending priorities.

3.5.18 Action to meet the SCCB targets is likely to increase the focus on efforts to realise effective energy supplies from marine sources, and to help develop a market for Scottish technological expertise.

3.5.19 SEA would suggest that off-shore renewables decisions must take account of as many, if not more, environmental considerations as on-shore. Care must be taken to ensure that decisions on emissions reductions measures consider the cost (financial and environmental) of supporting off-shore renewables against similar capacity development of proven on-shore technologies.

National Planning Framework (NPF) and SEA

3.5.20 The framework is a non-statutory planning policy document, which looks at Scotland from a spatial perspective and sets out an achievable long-term vision. It provides a view of Scotland as a place and identifies likely change to 2025 to ensure different areas can develop to their full potential. It also identifies key strategic infrastructure needs to allow planning for the right investment in the right places.

SNH Consultation Comment:

"Paragraph 3.5.20 – Note that the National Planning Framework now has statutory status following the passage of the Planning (Scotland) Act 2006."

SEA Response:

Noted – the ER stated that the NPF is non-statutory and this is accepted as an error; however, the inclusion of this note is considered sufficient to address the error.

3.5.21 The framework provides a national context for development plans and planning decisions and will inform the ongoing programmes of the Government, public agencies and local government. It is one of the factors the Government will take into account in coming to decisions on policy and spending priorities.

3.5.22 The Scottish Government undertook a voluntary SEA[7] of the Framework; its main findings with relevance to climate change were:

- All of the aims are likely to have some positive effects on the environment. Increased economic growth and competitiveness can deliver a higher quality of life, improved infrastructure and better environments. A commitment to environmental justice can ensure improved living environments and better health for disadvantaged communities. However, care will need to be taken to ensure that development promoted in furtherance of economic

[7] National Planning Framework SEA Environmental Report (2004) available at http://www.scotland.gov.uk/Publications/2004/04/19204/35605

growth and competitiveness complements and reinforces environmental aims and objectives. Proposals will need to be carefully assessed at the development plan and project stages.

- Negative impacts on climate are possible if external links are developed or strengthened, mainly through better road links or encouraging air travel (though this can be mitigated through promoting more sustainable patterns of surface transport, countering long-distance commuting and using pricing to manage travel demand).
- Support for renewables development, better waste management, developing recycling capability, developing rail services, supporting public transport development, may all have a beneficial impact on climate, although there can be localised negative impacts on many of the SEA topics.

3.5.23 The process of updating the NPF commenced in 2006/7 and a new SEA Scoping Report has been submitted. Our understanding is that the completed SEA and associated assessments have not been reported as yet.

3.5.24 It is likely that the planning system will play a key role by either limiting or enabling certain actions taken to meet SCCB targets. SEA suggests that major advantages lie in developing a more holistic approach to climate change mitigation and adaptation that accounts for local environmental impacts in a managed, sustainable and equitable manner whilst allowing efficient and justifiable planning processes and decisions to be made.

Scotland's National Transport Strategy (2005) and SEA

3.5.25 We are travelling more by car in comparison with other terrestrial modes. We are also travelling more by plane; with one of the most significant changes in transport in recent years being the dramatic growth in air travel. These trends are expected to continue. The National Transport Strategy (NTS) sets out three key challenges/ outcomes to be addressed through transport policy making for the next 20 years.

- Improve journey times and connections;
- Reduce emissions;
- Improve quality, accessibility and affordability.

3.5.26 NTS forecasts suggest total road traffic will grow by around 12% between 2005 and 2010 and by 22% between 2005 and 2015, with air travel predicted to rise by 150% between 2004 and 2030. To measure progress against strategic outcomes, a range of indicators will be developed, including the introduction of a carbon balance sheet for transport, to present the impact of all Scottish transport policies and projects that are expected to have a significant impact on carbon, whether positive or negative.

3.5.27 The voluntary SEA of the NTS[8] presented a high level assessment which aimed to provide a framework for further more detailed environmental appraisal at regional and local levels, where there is greater certainty regarding the exact location, nature and specifications of different measures, especially in terms of proposals for new infrastructure. The main findings with respect to climate included:

[8] NTS SEA Environmental Report available at http://www.scotland.gov.uk/Publications/2006/05/16112258/0

- Promotion of policies to effect a stabilisation in overall traffic and less demand on the existing network through measures to reduce the need to travel, manage demand and encourage modal shift would have positive environmental benefits in terms of climatic factors, in particular carbon related emissions.
- Possible increase in the proportion of public transport vehicles would require promotion of cleaner fuels and technology to ensure benefits are maximised. Also a need to ensure targeted modal shift from the car to alternatives is not accompanied by an unintended shift from non-motorised to motorised transport that could potentially off-set any gains.
- Biofuels widely recognised as more environmentally sound option. Gains offset to a degree by cultivation processes and intensive land use which can lead to carbon emissions. However, potential scope to enhance environmental performance through developments in production processes and use of biomass to generate hydrogen for fuel cells from which water would be the only by-product.
- Careful management required to ensure released network capacity from measures to manage existing demand and encourage use of alternative modes to private car do not encourage uptake of space by other vehicles, resulting in no overall benefit to the environment.

3.5.28 Over time, Scottish transport emissions will play an increasingly important role in efforts to meet SCCB targets, and actions/measures identified in the NTS are likely to require strengthening to drive further reductions over limited timescales. It is also likely that fiscal measures need to be introduced to maximise modal shift, limit vehicle use and encourage greater fuel efficiencies.

SNH Consultation Comment:

"Paragraphs 3.5.25-3.5.28 state that biofuels are widely recognised as a more environmentally sound option.

This statement must be substantially qualified.

International discussions are still underway with a view to ensuring that biofuels are based on sustainable production – for example using crops which do not replace valuable habitats and grown and harvested such that significant life cycle carbon savings are achieved.

There are also global issues emerging about competition between land for biofuels and food.

Biofuels are indeed likely to play an important role in carbon reduction for transport, but great care will be needed initially, with the real potential probably realised only when second generation biofuels (based on ligno-cellulose) become economic."

SEA Response:

The statement on biofuels was taken directly from the Government's own SEA of the National Transport Strategy.

The issues raised by SNH are accepted and the ER does discuss sustainable sourcing, local impacts and international trading restrictions under Material Assets and Transport Mitigation on pages 33 and 42.

It is accepted that there are significant difficulties and issues associated with the sustainable development and growth of acceptable biofuel solutions, but the ER simply recognises that they are likely to be of increasing importance within the future transport fuel mix.

This inclusion of SNH's comment and the above statement recognising that there are potentially adverse side-effects associated with the cultivation and use of unsustainable biofuels, is considered sufficient to address SNH's comments.

Scottish Forestry Strategy and SEA

3.5.29 The Scottish Forestry Strategy (SFS) is one of the key elements for the overall direction of rural development and industry in Scotland, in conjunction with the Scottish Rural Development Plan and the Next Steps Strategy for Agriculture. At the present time, each of these has distinct strategies and departments with distinct responsibilities. The SFS is the responsibility of Forestry Commission Scotland (FCS) and the underpinning vision, to 2025 and beyond, is:

> "*Scotland's trees, woodlands and forests are a central part of our culture, environment and economy. People are benefiting widely from them, actively engaging with and looking after the resource for the use and enjoyment of generations to come*."

3.5.30 The vision reflects the emphasis within the SFS on the three key social, environmental and economic strands of sustainability. This is supported by the principles of sustainability, social inclusion, and forestry for and with people. The three key outcomes of the SFS are:

- Improved health and well-being of people and their communities.
- Competitive and innovative businesses contributing to the growth of the Scottish economy.
- High-quality, robust and adaptable environment.

3.5.31 In 2005 FCS completed an SEA in conjunction with the review process for updating the SFS.[9] A summary of the key SEA findings, with respect to climate, would include:

- Climate change adaptation and mitigation provide both a challenge and an opportunity for the forestry sector. There is a need to ensure that the sector contributes as far as possible towards mitigation targets, through both short- and long-term projects that aim to reduce carbon emissions. This reflects the importance of balancing different mitigation strategies; for example, long-term carbon fixing compared to relatively short-term, high gain, projects such as renewable energy schemes. Indeed, climate change policy in Scotland provides a major challenge for most policy commitments, including forestry.
- There are opportunities where SFS objectives and themes could achieve additional benefits through enhancement. These include promoting the growth and management of trees, which provide multiple benefits by providing both economic and natural heritage value.
- Forestry should be considered within the wider context of rural land use and decision making. Woodlands can contribute to, and be supported by, farming practice and sustainable transport is a key national policy aim, to which the forestry sector has the potential to contribute.
- Rural development is a key policy priority in Scotland, with diversification, and economic development (including tourism) being important aims which sit alongside environmental protection and community development.
- Contextual analysis shows that there remain policy concerns that some environmental resources are continuing to be degraded. This is illustrated by a lack of progress towards meeting some of the key national indicators for sustainable development.

3.5.32 The SCCB targets should lead to greater action within sustainable forestry and land management to increase afforestation, provide woody biomass and further sequester carbon over the long-term.

---

[9] The SFS SEA Environmental Report is available at http://www.forestry.gov.uk/forestry/infd-6c3dj8

A Forward Strategy for Scottish Agriculture: Next Steps and retrospective SEA

3.5.33 'A Forward Strategy for Scottish Agriculture: Next Steps', was produced in March 2006. Key desired outcomes for the industry are described as:

- being competitive in markets;
- being a driver of sustainable rural development; and
- being renowned for high environmental standards.

3.5.34 The Strategy includes the key goal that,

"*Scottish agriculture should continue to be a leading player in the protection and enhancement of our environment, with increased emphasis on climate change and the promotion of a landscape-scale approach*"

3.5.35 Within which, key actions include:

Action 9: Promote research into the commercial viability of alternative crops and biomass.

Action 14: Establish a stakeholder group to evaluate and monitor agriculture's response to climate change, through mitigation and adaptation.

Action 17: Implement action on diffuse water pollution based on sound science and the outcome of the current consultation exercise.

Action 15: Promote an integrated, landscape-scale approach to environmental improvement with clearly established local and regional priorities.

3.5.36 The SEA assessed the commitments within the Strategy and found that:

- Long-term positive impacts associated with the action on climate change, once the stakeholder group moves from evidence gathering to driving action on mitigation and adaptation. This is a key factor, as the effects of climate change are likely to become more pronounced in the coming years.
- Related action on the viability of energy crops and the development of an effective market will prove beneficial, with respect to carbon sequestration and work towards reducing Scotland's share of greenhouse gas emissions. However, potentially negative effects are associated with large scale conversion to monocultures and relatively intensive management processes, with respect to biodiversity and habitat networks, landscape and the historic environment. Again, effective assessment of these effects would be required at the local level with appropriate provision for inter-cropping or biodiversity breaks considered, as well as analyses of impacts on the local landscape, the historic environment and anticipated soil and water effects. These analyses should become part of the standard applications for energy crop schemes.
- Positive effects are to be expected with actions related specifically to diffuse water pollution, biodiversity action and developing a landscape scale approach to ensure effective, managed action on each of these factors.

3.5.37 SCCB targets should further drive action on climate change mitigation and adaptation, as noted above, and a report from the working group on agriculture and climate change is expected early in 2008.

Scottish Rural Development Plan and SEA

3.5.38 The reform of the Common Agricultural Policy (CAP) in 2003 provided the opportunity to introduce, through the SRDP, Land Management Contracts which are intended to support the delivery of environmental, economic and social benefits. The SEA considered the environmental implications of the objectives for Land Management Contracts[10] (LMC) and concluded that five main actions were identified as having potentially negative impacts:

1. Increased production of feedstock and energy crops for renewable energy production.
2. Construction of renewable energy plants within rural Scotland such as wind farms and hydropower schemes.
3. Increasing the number of rural processing facilities by the construction of new buildings.
4. The creation of recreational and tourism attractions which require land take.
5. Changes in the infrastructure of communities in rural Scotland.

3.5.39 All five could result in a range of impacts including the loss of land supporting biodiversity interests and priority and/or protected habitats and/or species, impacts on soil quality and quantity, impacts on the water environment and impacts on air quality and the release of greenhouse gases to the atmosphere.

3.5.40 Mitigation measures suggested included the development of a National Renewables Strategy to identify those areas where wind farms, hydropower schemes, biofuel plants (and associated biomass cropping sites), marine and coastal renewable schemes should be permitted and those areas where, due to a number of reasons such as the sensitivity of the environment and/ or remoteness from the National Grid, renewable plant development should not be permitted.

3.5.41 With regard to biomass cropping, mitigation included interspersing areas of monoculture biomass crops with new hedging, biodiversity crops or other habitats to break up the visual impact on the landscape and increase biodiversity levels, as well as the introduction of crop rotation to prevent large scale harvesting and associated negative environmental impacts.

3.5.42 Within its strategic goals, the SRDP now contains a priority commitment on tackling climate change and meeting relevant international and UK commitments on air quality by:

- reducing gaseous emissions from the management and use of rural land in ways which have a beneficial impact on climate change and air quality;
- enhancing the significant role played by carbon sinks in Scotland (e.g. peat and woodland);
- conserving soil organic matter and encouraging targeted fertiliser applications to reduce emissions to air in addition to climate change mitigation; and,
- adapting to climate change, considering the effects on flood risk and biodiversity in particular.

3.5.43 The SRDP does contain an outline action, measure and target for climate change:

Action – Woodland Planting **Current Measure** – 17% land cover **Target** – Increase

3.5.44 SCCB targets are likely to help drive the uptake of LMC measures over the medium-long terms.

[10] The SRDP SEA Environmental Report is available at http://www.scotland.gov.uk/Publications/2006/05/17102624/0

Scottish Biodiversity Strategy

3.5.45 The Scottish Biodiversity Strategy[11], "Scotland's Biodiversity: It's in Your Hands" which aims to conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland now and in the future, was published by the Scottish Government in May 2004. This strategy was developed in close partnership with the Scottish Biodiversity Forum, a broad based partnership of public, private and voluntary organisations; however, no SEA was conducted at the time.

3.5.46 At the local level, the Local Biodiversity Action Plan process ensures effective delivery on the ground as well as raising awareness of local biodiversity issues and action. The vision which the Strategy works towards is that by 2030, Scotland is recognised as a world leader in biodiversity conservation. Everyone is involved and everyone benefits.

3.5.47 It is likely that actions required to meet the SCCB targets may have some localised effects on biodiversity, however in many cases these should be addressed through EIA or Appropriate Assessment (AA), should Natura 2000 sites (under European protection) be affected. Biodiversity issues require full and proper consideration, and can lead to delays in the planning process, potentially limiting the rate at which emissions reduction measures are implemented.

Note on the Nature Conservation (Scotland) Act 2004

3.5.48 Section 12 of the Nature Conservation (Scotland) Act 2004 relates to the exercise of functions in relation to Sites of Special Scientific Interest (SSSI) specifically applying to "the exercise by a public body or office-holder of any function on, or so far as affecting, any land which is or forms part of a site of special scientific interest".

3.5.49 Section 12 (2) states that the body or office-holder must-

(a) consult SNH in relation to the exercise of the function,

(b) have regard to any advice given by SNH, and

(c) in exercising the function, take reasonable steps, so far as is consistent with the proper exercise of the functions of the body or office-holder, to-

(i) further the conservation and enhancement of the natural feature specified in the SSSI notification, and

(ii) maintain or enhance the representative nature of any series of sites of special scientific interest to which the SSSI notification contributes.

3.5.50 In developing the SCCB, the Scottish Government will consult a wide of range of stakeholders including SNH, and it is anticipated that the implementation of measures derived from the SCCB will be also guided by consultations with SNH, in line with the 2004 Act.

[11] Details on the Scottish Biodiversity Strategy are available online at http://www.biodiversityscotland.gov.uk/index.php

3.6 Comment on Extended PPP/ PPS Review

3.6.1 As part of its contribution to the international effort required on climate change, the Scottish Government is committed to achieving an 80% reduction in Scotland's emissions by 2050 and to place this in statute. The Scottish Government considers this to be an integral part of its overall purpose to deliver sustainable economic growth. To achieve this will require action on the part of every business, every household and will affect the daily lives of all the people of Scotland.[12]

3.6.2 Scotland emits 0.2% of worldwide greenhouse gases however, with only 0.1% of the world's population; this is a disproportionately large level of emissions. Although the magnitude of Scotland's emissions is small in global terms, as a developed nation, Scotland has a distinguished legacy of leading in industrial innovation, production and manufacture and hence, a moral imperative to take a lead in providing another example of best practice in innovation and industrial adaptation to reduce its emissions burden. Climate change and greenhouse gas mitigation presents an extremely complicated, long-term problem that must be addressed in a rational, coordinated, cross-sectoral manner. The SCCB may therefore lead to wide ranging policy reviews and specific commitment to emissions targets across each policy area.

3.6.3 It is expected that the statutory target set by the SCCB will provide a much more effective incentive/driver for action across many more policies, strategies and initiatives than the (mostly) voluntary measures in place today. Appendix B provides an overview and analysis of a wide range of policies that will be influenced by the SCCB, and a summary highlights the following issues relating to the SCCB target:

- The Bill will set a national target for emissions reduction within a statutory framework.
- SCCP schemes present strategic objectives to meet Scottish obligations, but with the Bill likely to implement quantitative carbon budgeting periods, there is a lack of commitment on quantifying actual reductions to be realised. SCCB targets should drive such commitments.
- There is co-ordinated target-based action within those sectors currently operating within the EU ETS, and although this may present a limiting factor for the SCCB target, complementary sectoral targets may help drive progress. At present, it is feasible that actors within other sectors ignore the issue, assuming savings are being made elsewhere.
- Carbon reduction measures outlined in the National Transport Strategy, specifically those resulting from devolved policies, offer very limited projected contributions to the Scottish Share of emissions reductions. Little quantified information is provided on how to manage or control transport-derived greenhouse gas emissions in Scotland.

3.6.4 There is some evidence of a 'joined up' approach to climate change, however so far, no national strategies have produced clear GHG emissions reduction targets. Many include phrases that commit to work to achieve the 'Scottish Share', but in the context of a statutory reductions target much more ambitious language and commitment is required. The PPS review in Appendix B helps highlight the following issues:

[12] As expressed in the Draft Regulatory Impact Assessment of the SCCB Consultation

- Within the energy generation sector renewable energy developments will be central to delivering reductions (targets for total energy from renewables have recently been increased), but again, there is little indication of which “sectors within the sector” will be supported and developed, and what the expected contributions of each will be.
- There is potential divergence between the Scottish and UK administrations on the future role of nuclear power. The Scottish Government does not support nuclear power generation in Scotland and the UK Government does not currently propose to build any new nuclear power stations in Scotland. Significant gains will be required in renewables development.
- The current planning system may not facilitate the required rapid development of Scotland’s renewable capacity; this may be an area that the SCCB target wields significant influence.
- There is also the issue of grid infrastructure development (which is a reserved matter) in terms of developing capacity for distributed generation and, long-term, energy feed in from micro-renewables. The SCCB target may help focus attention on long-term grid investment.
- A multitude of initiatives and advice bodies face both the domestic and business sectors, which could be confusing. A one-stop shop for all energy issues would be helpful.
- Agriculture and forestry are often promoted as offering significant contributions to emissions targets, but it is unclear how this will be realised. Carbon sequestrations may be outweighed by methane and nitrous oxide emissions from agriculture and as such, effective quantification is required. Appropriate biomass production and use may offer significant diversification opportunities to the land use industries, but this must be balanced by effective investment in distributed processing and CHP systems, to minimise downstream emissions and improve overall energy efficiencies.
- It will be difficult to ensure transport makes appropriate contributions, as the fiscal side of transport is a reserved area (fiscal measures will likely be major levers in reducing transport emissions). Difficult decisions will be required to address transportation issues, for example on major road building schemes, and potentially strengthening the planning regime to limit developments which generate further car usage.
- Direct environmental impacts at a project level can be evaluated/ controlled by existing methods (EIA, planning, etc.), however strengthened regulations and guidance should be provided on climate considerations to minimise overall emissions and account for embodied carbon costs.

4. Key Environmental Issues

4.1 Background

4.1.1 Part 2 of Schedule 3 (in relation to Section 14) of the Environmental Assessment (Scotland) Act 2005 establishes that environmental reports should record,

> "*The relevant aspects of the current state of the environment and the likely evolution thereof without the implementation of the plan or programme."*

Annex 1 (f) of the SEA Directive identifies the environmental topics which should be included and assessed (see Box 1).

Box 1: Annex 1(f) of the SEA Directive

Biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and inter-relationship between the above factors.

4.2 Climatic Factors

4.2.1 Climatic factors in SEA can include a range of issues from emissions to adaptation, or flooding and drought risks. References to climatic factors in this SEA will focus on emissions reductions and the likely impacts of climate change across other SEA topics. Updated emissions data to 2005 are presented in Appendix C, in conjunction with other environmental baseline details.

4.2.2 The overall trend in Scottish GHG emissions since the base years of 1990 (for CO2, CH4 and N2O) and 1995 (for fluorinated gases) up until 2005, as reported in the Disaggregated Greenhouse Gas Emissions Inventory for Scotland (2007)[13], can be summarised as follows:

- total GHG emissions (expressed as CO2-equivalents) fell by 16%;
- CO2 emissions fell by 13%; CH4 emissions fell by 38% and N2O emissions fell by 21%;
- PFC emissions fell by 20%; HFC emissions increased 457% and SF6 emissions increased by 125%;
- the carbon sink function - which removes CO2 emissions from the atmosphere by sequestration in forests and soils - increased by 80%.

4.2.3 Whilst Scotland may be able to reduce its GHG emissions under the SCCB target, climate impacts are unlikely to be significantly affected due to the relatively low global emissions ratio (0.2%). There is a significant body of work on climate change scenarios and, as the world is already locked into some legacy of climate change, this SEA adopts the precautionary principle and considers that the UKCIP02 high emissions scenario[14] represents the most likely evolution of the climate, in the absence of the SCCB, with associated impacts for Scotland's environment.

[13] http://www.airquality.co.uk/archive/reports/cat07/0709180907_DA_GHGI_report_2005.pdf

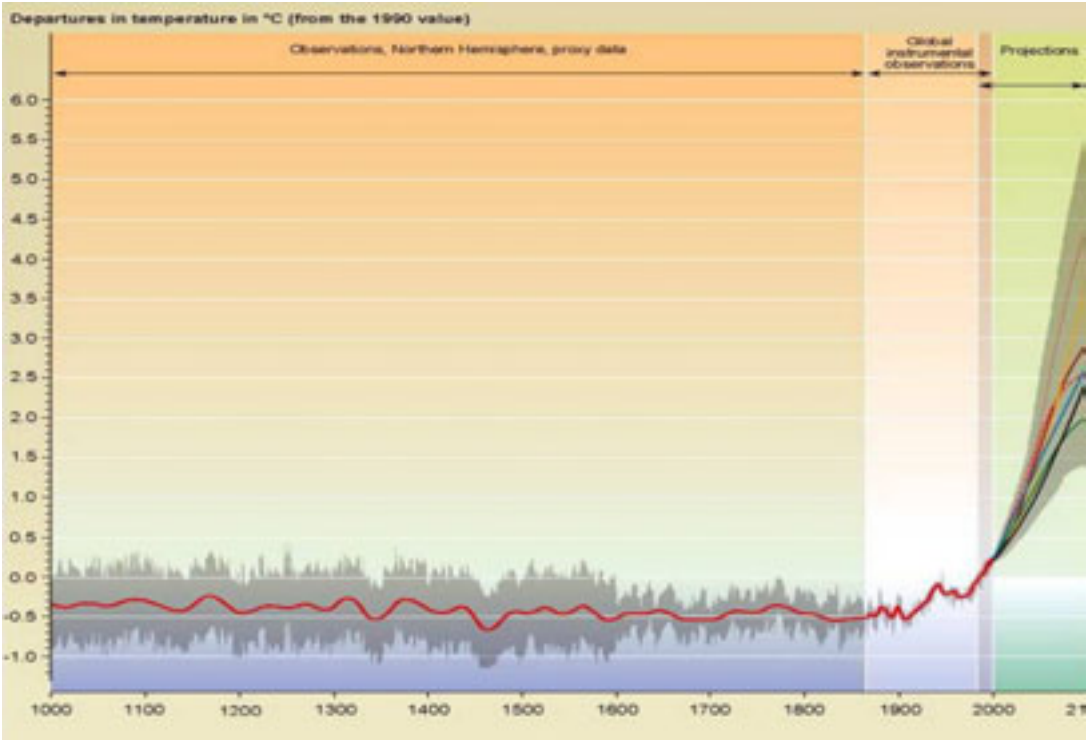
[14] UKCIP08 scenarios were not available at the time of conducting this SEA.

Expected impacts in Scotland by the 2080s (UKCIP02 High Emissions Scenario) [15]

- Annual temperatures averaged across Scotland will rise by up to 3.5˚C in the summer and 2.5˚C in the winter.
- Summers will become generally drier across Scotland. There may only be a slight reduction in rainfall in the north-west but as much as a 40% reduction in the south and east.
- Scotland's growing season will become longer, by between 30 and 80 days.
- Scotland's sea levels will rise, by up to around 600 mm around the mainland.
- Average snowfall levels will decrease, by up to 90% less depending on location, and snow-less winters may become normal in some parts.
- Scotland will have more severe extreme rainfall events, with rainfall in 24 hours from storms expected to occur on average every two years up by 25%, especially in the east.

4.2.4 Figure 4.1 below outlines IPCC/ UNEP projections on surface temperature to the year 2100, demonstrating little deviation in temperature projections to at least 2040, which supports the statement in Section 4.2.3 above.

Figure 4.1 Variations of Earth's Surface Temperature: Year 1000-2100



Source: IPCC/ UNEP Website available at http://www.ipcc.ch/graphics/index.htm

4.3 Key Issues for Scotland

4.3.1 The baseline information (presented in Appendix C) and the PPS review, along with the consultation responses from the scoping consultation and inputs from the Scottish Government, have helped identify the key environmental issues (with respect to climate and emissions reductions) facing Scotland. These are summarised in Table 4.1 below.

[15] http://www.ukcip.org.uk/scenarios/ukcip02/

Table 4.1 Key Environmental & Climate Issues

Key Climate Issues by SEA Topic	
Biodiversity, Flora & Fauna	**Material Assets**
Habitats & species **Adaptation to climate change** • Loss of BAP & Priority Habitats or European Protected Species • Potential loss of species at the limit of their range in Scotland • Potential damage to marine diversity	**Energy** • Supply & demand management • Energy efficiency • Renewables growth • Grid infrastructure/ distributed generation/ micro-generation • Conventional fossil fuel production emissions • Nuclear option **Waste management** • Reduction • Recycling • Composting • Landfill • Incineration **Development & Infrastructure** • Construction effects • Raw material extraction & use • Buildings and energy efficiency **Transport** • Infrastructure development • Growth of transport emissions • Private vs. public transport • Alternative fuels • Aviation • Maritime
Population & Human Health	
Demographic Change • Ageing population could result in higher domestic emissions and increased demand as older people stay home more, in older less efficient properties • Heat & Flooding increases demands on healthcare and domestic energy • Increasing urbanisation **Transport** • Increasing reliance on private car and limited use of public transport • Tourism growth **Behavioural Change** • Patterns of consumption • Domestic energy & water use & waste **Business & Industry** • Energy & water use • Flooding issues • Improving efficiencies	**Water** **Water resources** • Energy input for water treatment (drinking water and waste water) **Precipitation change** • Increasing summer droughts • Increased risk of flooding **Sea level rise** • Coastal areas at risk in Scotland • Stronger storm surges, higher waves **Water Quality** • Indirect impact of climate effects on other receptors (esp. soils)
Soil and Land Use	**Air and Climatic Factors**
GHG emissions from Scottish soils • Potential for high carbon soils to become net GHG emitter rather than carbon sink • Temperature and precipitation links **Loss of soil organic matter** • Loss of carbon store and other soil functions • Diminished water retention, increasing flooding risks • Indirect GHG releases **Soil stability** • Potential for increased erosion and landslides • Indirect GHG releases **Fertiliser use/ livestock emissions** • Nitrates and nitrous oxide release • Minor methane release **Carbon sequestrations from land use** • Increasing forestry cover • Biomass potential	• Air quality is directly linked to GHG emissions and reductions **Global action required** • Unilateral action in Scotland/ UK not sufficient • Localised GHG emission reductions may have no influence on global climate change
Cultural Heritage & Historic Environment	**Landscape**
Potential loss of historic assets • Coastal flooding affecting sites • Drought and potential loss of assets preserved by water features	**Changing landscape pattern** • Land use change

5. Assessment of SCCB Proposals

5.1. Assessment Stages

5.1.1 As noted in Section 2 of this report, a four stage assessment process was developed to allow effective appraisals of the varied issues surrounding, and implications of, the Scottish Climate Change Bill proposals.

5.1.2 This section expands on the methodologies adopted and provides a summary of the E-test assessments.

5.2. Stage 1 Modified E-tests

5.2.1 In their Scoping Report response, Historic Scotland suggested using an E-test methodology to address the likely implications of the SCCB across government sectors. The standard use of this method should involve the relevant Government department, responsible for a new policy, distributing a draft of the policy and an e-test questionnaire to all other Government departments, as a means of identifying and recording potential synergies, conflicts and implications of the policy across other departmental policies and initiatives.

5.2.2 Due to the tight timeframe of this project, and likely delays in responses from other departments, this was not seen as an effective means of progressing with the SEA. However, it was acknowledged as a valuable method for considering sectoral overviews of the likely implications of the Bill target. Standard e-test questions would include:

What are the consequences of the draft legislation:

1. for energy consumption and mobility?

2.for the consumption and stocks of raw materials?

3. for waste streams and atmospheric, soil and surface water emissions?

4. for use of available physical space, eg. land take/ land use change?

5.2.3 For the purposes of the SEA, sectoral experts were identified within AEA Technology, who considered the high-level implications and measures likely to be required to meet the 80% GHG reduction target. The sectoral breakdown, chosen to limit analysis, generally followed that within the Scottish Climate Change Programme 2006, and the assessment was employed as an information gathering tool to identify both likely emissions reduction measures and associated sectoral environmental impacts. The resultant analysis assumes those features or impacts repeatedly identified to be the most significant.

5.2.4 On the advice of SEPA and RSPB, the assessments were refined to include biodiversity effects and emissions to the water environment in general. The assessments included an overview of a 'Business as Usual' scenario and likely emissions reduction measures required under the headings of: *Policy, Behavioural, Technical and Financial*. It is conceded that many other measures/ distinctions could feasibly have been used, however in order to limit the scope of the assessment the four noted were considered sufficient.

5.2.5 An outline of the assessment worksheets is provided in Table 5.1 below, the populated tables are available in Appendix D and Section 5.3 provides an overview of the key environmental issues identified by sector.

Table 5.1 Example Modified E-test Worksheet

What are the likely consequences of the Scottish Climate Change Bill on…?					
		Energy Consumption & Mobility	Consumption & Stocks Of Raw Materials	Waste Streams: Atmospheric, Soil & Water Emissions	Use Of Available Physical Space, Land Use Change, Biodiversity Effects
Sector: Energy Supply					
Business as usual					
Emission Reduction Measures	Policy/ Behavioural				
	Technical/ Financial				
Anticipated Environmental Effects (of reduction measures) on SEA Topics					
SEA Comment					

5.3. E-test Summary Results

5.3.1 The modified e-test methodology was employed to identify the likely implications of an 80% reduction target across key sectors in Scotland. The choice of sectors was informed by the Scottish Climate Change Programme (2006). The assessments are limited by the fact that identified measures may be applicable at the UK level and not specifically within the control of devolved policies open to the Scottish Government.

5.3.2 The e-tests did not separate out specific emissions sources that come within the attention of the EU ETS, and therefore present a high level overview of a range of measures that may or may not be directly applicable in Scotland. Combining the analysis with the PPS review suggests that there are already many initiatives and guidelines driving action on emissions reductions, however on realisation of the SCCB, these may have to be reviewed, streamlined and strengthened to determine specific sectoral targets, taking into account those exceptions covered by the EU ETS.

5.3.3 A summary of the analysis of environmental implications for each sector is provided below and should be read in conjunction with the e-test tables in Appendix D. It is important to note that future emissions reduction measures must be accompanied by appropriate regulatory, monitoring and reporting mechanisms to ensure continual improvement and progress and to identify potential environmental implications as early as possible. It is also important to note that the recommendations made fall within the opinions of the consultancy team and may not necessarily reflect current thinking within the Scottish Government.

Energy Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics

Biodiversity, Flora and Fauna

Indirect impacts on biodiversity depending on the source of renewable energy (e.g. wind farms, biomass).

Impacts are generally localised and negative, may be permanent, though limited in severity.

Planning system, Biomass Action Plan and appropriate EIA should work to limit impacts.

Air

Biomass combustion can result in negative local air quality impacts and adversely affect human health.

Other renewables technologies should have neutral impacts on air quality

Waste streams could be diverted to energy production; thereby reducing material use, although can have direct impacts on air quality resulting from biomass transport and combustion.

Air quality improvements likely through energy efficiency, demand reduction, switching from fossil fuels to renewables and more efficient energy production.

Localised impacts should be minimised through local pollution control, Biomass Action Plan and Air Quality Strategy.

Water

Generally, as waste streams and emissions are reduced, emissions to water should also decline.

Water resource use in energy production will improve with transfer to renewables.

SEPA Consultation Comment:
Potential for some detrimental impacts on waterbody status/ aquatic biodiversity from water based renewables, eg. hydro, off-shore wind and marine renewables, including wave and tidal devices.

Soil

Land use change to biomass and managed woodland has the potential for significant short term loss of carbon stores, but may improve stores in the long term.

Renewables installations on high carbon soils have the potential for significant losses of soil carbon, increases in GHG emissions, risks of erosion and potentially peat landslides.

Biomass Action Plan, planning system and appropriate EIA should work to limit impacts.

Human Health/ Population

Potential impacts from local or community generation projects that involve biomass combustion.

Local pollution control and appropriate EIA should limit impacts.

Widespread benefits on ambient air quality with reduction in emissions.

Long term benefits associated with reduced demand and integrated/ distributed supply.

Material Assets/ Landscape/ Cultural Heritage &Historic Environment

Secondary, indirect and cumulative impacts as renewables (all scales) involve raw materials use and physical infrastructure with associated effects on biodiversity, soils, and landscapes, townscapes.

Applies equally to development of energy crops (monocultures, fertiliser use, etc).

Landscape affected by new energy generation developments, changes to existing generation and transmission infrastructure.

Long term reductions in fossil fuel consumption, although short-term intensive resource use will be necessary for adequate renewables and infrastructure development.

Conclusions / Recommendations & Mitigation

Identify opportunities to maximise energy efficiency and demand reduction across all sectors, as these provide benefits in reducing all impacts associated with energy production.

Energy efficiency offers low cost, high impact gains in the short term, therefore significant on-going investment in education, at all levels is required.

Technological change (ie. renewables) to reduce emissions from energy production should be considered a medium term gain.

Enabling provisions could allow for setting future GHG reduction targets at sector level.

National planning policy guidance should steer renewables development towards non-sensitive land and sea.

EIA should be carried out for all energy developments; SEA could be carried out for sector wide initiatives.

Combustion technologies have the potential for local air quality impacts; these should be assessed on a case-by-case basis.

Life cycle assessments should be carried out for new technologies to ensure carbon savings justify the technique.

Significant infrastructure change required, resulting in short term increases in materials/ energy consumption and waste generation.

Long term benefits in phasing out fossil fuel and nuclear power generation.

Short term investment focus on increasing renewables capacity to cope with phased decline of conventional power generation.

Carbon capture and storage is in its infancy and should not be implemented without further research on environmental risks.

Transport Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics

Biodiversity/ Soil/ Water/ Landscape

Use of biofuels can produce direct, negative, long term impacts associated with intensive crop production.

Potential indirect, long term impact on the water environment depending on energy crop production methods.

Increased land use change for biomass fuel development with possible detrimental impacts on associated habitats and species as more is used for monocultures.

Transport infrastructure development will impact negatively on all topics and increase emissions.

SEPA Consultation Comment:

SEPA would expect an increase in use of biomass for fuel to have impacts on Scotland's land that should be recorded. This may also lead to effects on population (eg through diverting land away from food crops) which should be recorded. The potential for increased use of biofuel in both energy and transport sectors, driven by the 80% target, is an issue that deserves some focus in this assessment as the implications of this are quite significant for many issues.

SEA Response:

It is agreed that the biofuel issue is complex and worth more detailed consideration, however this level of detail is outwith the scope of this SEA. More detailed work on this issue has been developed by the Forum for Renewable Energy Development in Scotland (FREDS) in work supporting the Scottish Government's Biomass Action Plan.
www.scotland.gov.uk/Topics/Business-Industry/infrastructure/19185/17883

Air

Aviation, maritime and road transport all present growing sources of emissions.

Increasing transport emissions reduces air quality.

Low carbon transport has the potential to greatly reduce local air quality problems.

Air quality negatively impacted by biofuel use as emissions still contain Air Quality Strategy priority substances.

Modal shift may also negatively impact air quality at certain locations.

Potential emissions from manufacturing/ refinement processes, though it is likely these will be regulated by PPC.

Human Health/ Population

Improvement to public transport systems is implied, which can have a positive impact on mobility.

Impacts on human health will depend on the suite of measures adopted, although there may be little difference if biofuels are widely used.

Road pricing may increase risks by moving traffic to lower grade/ rural roads.

Material Assets

Reduced use of fossil fuels and associated materials.

Increase in use of materials associated with manufacture of new technologies.

Improved energy security though decreased reliance on fossil fuels, increasing diversity of energy/ fuel mix and improved efficiencies.

Reduced use of raw materials from improved lifetime and recycling standards.

Reduced waste streams if these can be utilised for biofuel production.

New waste streams could be produced from biofuel production.

Conclusions / Recommendations & Mitigation

The use of biofuels, supported by the RTFO, has the potential for environmental damage from inappropriate management or import of biomass energy crops.

However, the integration of biofuels will aid reductions in fossil fuel use.

Individual technologies should be subject to Life Cycle Assessment to assess whether they provide GHG savings.

Bio-diesel from waste, properly supported, has the potential to offer significant GHG savings.

The Scottish Government should encourage satisfactory mechanisms to address emissions from the air transport (and maritime) sector whilst allowing for acceptable development of capacity.

In light of SCCB targets, financial measures must be identified (subsidies and incentives) to drive modal shift.

The SCCB target is likely to influence proposals relating to strategic transport choices and the may help refocus the debate from voluntary modal shift to simply reducing transport emissions.

The National Transport Strategy (2006) advocates introduction of a carbon 'balance sheet' for all future transport development decisions, which should be supported and considered across other sectors, if successful.

Agriculture and Land Use Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Climatic Factors Emissions reduction from land management processes will have beneficial effects, however these may be difficult to realise without limiting the productivity of the sector. Intensive livestock processes can also lead to significant emissions, however without long-term change in consumption habits, reducing these levels will be difficult to realise without limiting the productivity of the sector. Transport within the sector (food miles) presents an area where savings could be realised, however this requires long-term commitment to distributed and more local processing and sales channels. **Biodiversity, Flora and Fauna** Generally positive impacts through measures such as improved fertiliser application techniques, responsible afforestation, wetland creation. Moves to woody biomass production or woodland pasture could present biodiversity benefits, however intensive agricultural processes and extensive monocultures can have negative impacts. **Air** Potentially positive impact on air quality from reduced emissions from livestock, soils, and farming vehicles representing a positive permanent impact. **Water** Responsible, reduced and improved or targeted use of fertiliser should reduce diffuse pollution to waters representing a positive permanent impact. **Soil** Soil management measures are a central focus of the contribution agriculture can make to mitigating climate change. These measures generally involve some form of soil improvement (or development of a better understanding of soil processes) and can therefore be ascribed a permanent positive impact on this topic. **Human Health/ Population** Introduction or extensive expansion of biofuel crops could have negative impacts on human health through increasing incidence of allergies (hay fever) or respiratory illness (asthma). Better control of agricultural pollution should have an indirect positive permanent impact on human health and population. **Material Assets/ Landscape/ Cultural Heritage & Historic Environment** No significant effects have been identified for material assets or the historic environment. Potential mixed impacts on landscape depending on land take in, for example, forestry.
Conclusions / Recommendations & Mitigation
There are general environmental benefits with agriculture and land management contributing to the mitigation of climate change and future conservation of high carbon soil resources in Scotland. The sector has an important role to play both in adapting its practices in order to directly/indirectly reduce GHG emissions, but also in providing a framework for mitigating the effects of other sectors. It is important that the climate change imperative is not seen as an overarching environmental objective tackled at the expense of other, localised environmental issues. This is particularly apparent in the agriculture sector as mitigation of other sectors' contributions to climate change invariably involves some form of land use.

Business Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Benefits will be realised mainly as a result of adopting energy efficiency measures, development of sustainable transport programmes, reduction in waste, adoption of renewable energy technologies, and more efficient use of resources. These will lead to generally positive (mostly indirect) impacts on SEA topics. **Biodiversity, Flora and Fauna** Improved energy efficiency reduces demand with positive and permanent indirect benefits on biodiversity through reduction in emissions, and other factors such as land use change, extraction of raw materials. **Air** Indirect positive impact on emissions to air through a reduction in energy consumption. Direct positive impacts on air from reducing waste, using more sustainable transport. **Water** Direct permanent benefit on consumption of water resources, and indirect positive effects on water pollution through reduced emissions and waste generation. **Soils** Potential for significant indirect permanent impacts if new practices lead to a reduction in raw material extraction. Less waste generation implies a reduced need for development of further landfill capacity. **Human Health/ Population** Indirect permanent positive benefits to population through new employment opportunities. **Material Assets/ Landscape/ Cultural Heritage & Historic Environment** Generally positive permanent impacts on these subjects. The measures described above imply a more resource efficient sector, thereby reducing the need for raw material extraction and generation of waste streams, all of which have positive implications for these topics.
Conclusions / Recommendations & Mitigation
The business sector is very important in mitigating climate change as the financial and social influence the sector wields is well placed to influence the behaviour of employees, suppliers and other stakeholders. Climate change mitigation actions are likely to have indirect environmental benefits relating to reduction in energy use and reduction in waste stream volumes. Business can contribute greatly, for example through the Carbon Reduction Commitment, which sets targets that large businesses must meet in the most cost-effective manner for them. Best practice within certain businesses already link senior grade salaries to emissions reductions and energy efficiency gains. A number of areas particularly renewable energy, waste management and recycling are identified as having particular opportunities for development in Scotland. Other areas such as biofuels, construction and sustainable design, organic farming, tourism and cleaner technologies also have growing potential. The SCCB target should encourage further development of these sectors, with associated employment opportunities.

Industrial Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Biodiversity, Flora and Fauna Moving towards clean technology should offer indirect benefits to biodiversity by avoiding emissions to air, water and soil. Impacts generally positive and permanent. Possible negative impacts depending on development requirements. **Air** Cleaner production techniques can offer climate change benefits as well as reducing emissions of priority pollutants at a local/regional level. Impacts generally positive and permanent. **Water** Clean production implies a reduction in release of pollution to the water environment thereby reducing the frequency and severity of pollution episodes. Impacts generally positive and permanent. **Soil** Generation of new contaminated land sites should be minimised by clean technology adoption so impacts are generally positive and permanent. **Human health/Population** General reduction in emissions should have a permanent positive impact on human health, populations could benefit from new employment opportunities. **Material Assets/ Landscape/ Cultural Heritage & Historic Environment** Clean production techniques imply a reduced need for development of new raw material sources with knock on permanent positive impacts on these SEA topics. **Transboundary** As existing PPC regimes are strengthened or specific measures become more/ too onerous, there is some risk associated with the potential for transboundary effects and impacts in other countries, should polluting industries move away from Scotland, especially where products are then shipped back.
Conclusions / Recommendations & Mitigation
Measures taken in the industrial sector could offer direct benefits to the wider environment through emission reductions to air, water and soil. It is likely that these could be directly realised through development of clean technologies, with indirect benefits arising from improved energy efficiency, waste management, and behavioural changes in employees. Energy efficiency and adoption of renewable energy technologies should offer cost as well as environmental benefits. Regulatory regimes should have the necessary influence to initiate change where voluntary schemes do not produce results. Transboundary or relocation effects are difficult to predict and control as wider market forces also influence these decisions, however this may be more related to wider forms of pollution as opposed to greenhouse gases specifically. Care needs to be taken to address such issues, at the appropriate level, whilst maintaining the focus on emissions reductions through the most relevant mechanisms, eg. the EU ETS.

Residential Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Climatic Factors
Personal responsibility for energy efficiency and awareness of the need to minimise demand must be fostered to realise any long term beneficial effects.
Continued domestic consumption and transport use will lead to highly critical negative impacts and potentially dangerous/ cataclysmic climate change.
Air/ Water/ Soil
With appropriate consideration of wider environmental impacts of construction resource efficiency, there could be long term positive effects, however soil, water and air will all remain under pressure from domestic housing and business growth, therefore mixed impacts are likely.
Biodiversity
Direct impacts realised during construction/ land use change phases.
These pressures will continue in line with domestic housing and business growth.
Long-term negative impacts associated with development, minor positives possible with appropriate planning for biodiversity/ habitat links and green routes.
Human Health/ Population –
Only concerted and coordinated effort across the Scottish population has the potential to make a difference to emissions reductions.
Energy demand reduction is the only feasible option within the short term, with integration of renewables making some headway in the medium-long term.
Lack of early action will lead to long term, significant negative effects on health and population due to dangerous climate change effects.
Material Assets –
New building efficiency standards will have positive effects but possibly not enough to make a huge dent in the level of emissions reductions required.
Consideration of embodied energy/ carbon in existing building stock against the energy/carbon costs of new buildings could help focus efforts/ priorities on improving energy efficiency.
Considering the energy used in running a building ignores the embodied energy of that building, therefore historic or existing buildings may be recommended for demolition when demolition and construction of a new energy efficient building to replace them might emit far more than appropriate re-use.
Incentives required to encourage people with older housing stock to take action also, otherwise potential benefits of new building efficiencies will be lost.
Landscape/ Cultural Heritage & Historic Environment –
Potential for short term thinking to have long term impacts on landscape; however landscape change may become accepted with time.
Loss of historic features to development is usually permanent, but may not necessarily be significant.
Conclusions / Recommendations & Mitigation
Behavioural adaptation is particularly important in the residential sector as regulation has limited reach.
Energy performance of buildings is likely to be an important feature in meeting the SCCB targets.
Further work on energy performance and standards is progressing throughout government.
SEA would suggest that energy standards are extended to cover all engineering and construction projects.
Conservation Area issues must be resolved to encourage uptake in older buildings.
The general environmental benefits seen in this sector are indirect but far reaching, mainly through reducing requirements for energy generation and reduced waste streams.
Integrating the principal of embodied energy into policy development could help address energy efficiency improvements and savings in existing building stock, therefore lifecycle analysis should be considered as a means of determining the most appropriate options for redevelopment.

Public Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Climatic Factors Reductions in energy demand/ consumption through concerted investment in energy efficiency and education (with savings re-invested) will present direct, long term, positive impacts. **Air/ Water/ Soil** A significant shift towards renewable sources of supply, coupled with a direct reduction in the use of raw materials (including water) and conservation of resources/ reduction in emissions will have long term, positive impacts, if impact of renewables and soil sealing/ SUDS issues are properly considered. Reductions in waste stream volumes would enhance indirect positive effects and reductions in overall emissions. **Biodiversity** Indirect, long term, mixed impacts likely dependent on measures implemented at the local level. **Human Health & Population** Indirect, local, positive impacts likely with the majority of measures implemented. Some localised issues may need specific attention when considering energy from waste or biomass and health impacts associated with combustion processes. **Landscape** Renewables present the potential for negative impacts on visual amenity (will decrease with time). **Cultural Heritage & Historic Environment** Indirect benefits through conservation of resources
Conclusions / Recommendations & Mitigation.
The participation of Local Authorities is particularly important if targets set out in the SCCB are to be realised. Measures outlined in Scotland's Climate Change Declaration provide a methodology as to how the Authorities intend to contribute to climate change mitigation. The Local Government in Scotland Act 2003 (Best Value and Sustainable Development Duty) provides a driver for work on climate change. SEA processes supplement this with the need to consider climatic factors. However, realising the cross-cutting and priority nature of long-term consideration of climate change impacts and present means to deliver early emissions reductions may be relatively weak. Senior level buy-in is a vital prerequisite to maintain focus across the target period, and reporting on action to meet SCCB targets could provide a platform for Local Authorities to develop climate change strategies, share best practice and maintain the focus on re-investment of energy savings to develop greater efficiencies and further reduce energy demand. All local authorities and public bodies should be required to set targets for emissions reductions across all areas of energy/ resource use and transport. Measures to link senior public sector salaries to emissions reductions and energy efficiency gains could heighten the focus on climate change mitigation and action; encourage a move away from simply buying energy from green suppliers and drive awareness across organisations. Stronger legislative drivers are required for the public sector if the targets of the UK and Scottish Climate Change Bills are to be realised. Reliance on voluntary measures may present a weaker (light green) sustainability approach. The SCCB target should inform the development of future policies, plan and strategies, which should ideally include commitments to emissions reduction action (at all levels), identifying responsibilities for achieving targeted action.

Waste Management Sector

Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics
Climatic Factors
Waste prevention and minimisation is the best long term option, but requires coordination across all sectors.
Organic waste management by anaerobic digestion (AD) and use of resultant methane in CHP most beneficial in terms of reducing GHG emissions from waste.
Landfill emissions continue to decline, with associated benefits for climatic factors in reducing methane release.
Air/ Water/ Soil
Organic waste management and reductions in overall waste stream volumes would enhance indirect positive effects and reductions in overall emissions.
However, direct incineration for electricity production increases CO2 emissions (as compared to AD/ CHP combined) and can degrade local air quality.
Use of organic waste in dedicated biomass CHP also has implications for local air quality and emissions.
Biodiversity
Indirect, long term, mixed impacts likely dependent on measures implemented at the local level, including suitable landfill reuse.
Human Health & Population
Some localised issues may need specific attention when considering energy from waste or biomass and health impacts associated with combustion processes.
Landscape
Indirect benefits feasible through reduction in wastes to landfill extending lifetimes of existing sites and limiting the need for new sites.
Waste management facilities should be designed sympathetically to fit with surrounding landscapes and returned to beneficial use at the end of their useful life-cycles.
Cultural Heritage & Historic Environment
Indirect benefits through conservation of resources.
Conclusions / Recommendations & Mitigation
Government should consider increasing support for those waste handling measures that minimise GHG production.
Anaerobic Digestion and Combined Heat & Power should be supported to drive long-term integration and resultant GHG gains over direct incineration.
Government should target local authorities on collection and separation of organic waste for composting, AD/CHP and biomass.
Government should consider measures to ensure all products for sale in Scotland have recyclable/ biodegradable packaging and packaging should be minimised across all sectors.

SEPA Consultation Comment:

The most effective means of reducing greenhouse gas emissions from waste is to adopt a waste management regime that deals with waste as far up the waste hierarchy (prevent, reuse, recycle (including composting), recover and dispose) as possible.

Since publication of the SCCB consultation proposals, the Scottish Government has announced its vision for waste management in Scotland, which calls for 70% recycling by 2025 and proposes a cap of 25% of all municipal waste being used to generate energy.

The assessment notes that energy from waste facilities will have impacts on local communities.

While SEPA does not contend this statement, it should be noted that:

(a) ***all*** waste management facilities will have impacts on those living close to them (eg. from vehicle movements or from emissions from that waste management process); and

(b) these emissions will be strictly controlled through both the land use planning and environmental consenting processes, to ensure that adverse effects are prevented or minimised.

SEA Response:

The comments from SEPA are noted and inclusion at this stage in the revised Environmental Report is considered sufficient to address the points raised.

5.4. Stage 2 Assessment of Potential GHG Reductions

5.4.1 An assessment was carried out on the PPS/PPP review, the baseline and the e-tests to identify high level issues under each SEA topic that might arise from potential GHG reductions, which helped form the basis for later assessments. The results of this appraisal are given in Table 5.2.

Table 5.2 Key Climate Issues and Potential Emissions Reduction Effects

Key Climate Issues	Potential GHG Emissions Reduction Effects
Biodiversity, Flora & Fauna	
Habitats & species **Adaptation to climate change** • Loss of BAP & Priority Habitats or European Protected Species • Potential loss of species at the limit of their range in Scotland • Potential damage to marine diversity	• Move to biofuels/ biomass may lead to re-intensification of agricultural land and associated diffuse pollution effects on aquatic biodiversity • Field homogenisation, loss of field boundary features and habitat connections • Wind farms may disturb sensitive peat/ moorland/ sub-sea habitats
Soil and Land Use	
GHG emissions from Scottish soils • Potential to become net GHG emitter rather than carbon sink • Temperature and precipitation links **Loss of soil organic matter** • Loss of carbon store and other soil functions • Diminished water retention, increasing flooding risks • Indirect GHG releases **Soil stability –** • Potential for increased erosion and landslides • Indirect GHG releases **Fertiliser use/ livestock emissions** • Nitrates and nitrous oxide release • Minor methane release **Carbon sequestrations from land use** • Increasing forestry cover • Biomass potential	• Windfarm installations and access routes can exacerbate soil losses directly and by affecting soil stability (eg. peat slides) • Long-term benefit of renewable source of energy may be outweighed by GHG release from soils • Soil disturbance leads to indirect effects on water quality and aquatic biodiversity • Fertiliser and other agricultural GHG emissions can be limited but probably not eradicated • Land use change to biomass crops could exacerbate intensive agriculture emissions/ soil losses to air and water • Key issue is to maintain soil carbon stocks, maximising sequestration potentials across Scotland and minimising flooding and diffuse pollution risks • Sustainable forestry management using appropriate woody species may benefit soils, biodiversity, water and air
Water	
Water resources – • Energy input for water treatment (drinking water and waste water) **Precipitation change** • Increasing summer droughts • Increased risk of flooding **Sea level rise** • Coastal areas at risk in Scotland • Stronger storm surges, higher waves **Water Quality** • Indirect impact of climate effects on other receptors (esp. soils)	• Potential for biomass options to change hydrological regimes due to irrigation demand • Hydro renewables (dams or in-river) can impact upon terrestrial receptors • Business and domestic growth adds pressure on water supplies, exacerbated by widespread system leakage (poor energy and resource efficiency) • Construction of flood defence systems (adaptation) may exacerbate soil losses and GHG emissions from extensive concrete use • Construction of more energy efficient buildings can place heavy demand on water resources

Key Climate Issues	Potential GHG Emissions Reduction Effects
Air	
GHG Emissions as Air Pollutants • GHG Emissions to air incl. CO2, Sox, Nox, CH4, HFC, PFC, SF6 • Associated emissions of particulates • Associated odour nuisance	• Potential for some renewable energy systems (eg. CHP and Waste Incineration) to degrade local air quality through particulate release • Widespread change to biomass options may exacerbate local respiratory health conditions (eg. asthma, hay fever) • Windfarm development may increase methane emissions from soils (odours)
Population & Human Health	
Demographic Change • Ageing population could result in higher domestic emissions and increased demand as older people stay home more, in older less efficient properties • Heat & Flooding increases demands on healthcare and domestic energy • Increasing urbanisation **Transport** • Increasing reliance on private car and limited use of public transport • Tourism growth **Behavioural Change** • Patterns of consumption • Domestic energy & water use & waste **Business & Industry** • Energy & water use • Flooding issues • Improving efficiencies	• Building efficiencies and standards may help reduce demand but mostly in new builds • New construction, flood defences and other adaptations may increase GHG emissions • Increasing urbanisation directly affects landscape, biodiversity, soil, water, air and material assets and emissions • Reducing private vehicle use benefits emissions reductions and improves urban air quality • Tourism growth brings significant revenue but can exacerbate population GHG emissions in peak seasons • Consumption levels difficult to control, but improved standards in products sold and packaging levels may reduce emissions • Energy efficient consumer products may encourage greater use, hence increasing emissions • Increasing housing stock will increase overall water/ energy demand and waste generation • Water leakage and resource use increases energy demand also • Business growth will similarly increase energy and water demand • Potential preventative measures to avoid disruption from flooding may increase short-term GHG emissions
Climatic Factors	
Global action required • Unilateral action in Scotland/ UK not sufficient • Localised GHG emission reductions may have no influence on global climate change	• Emissions reduction in UK/ Scotland must be coupled with effective lobbying to drive similar action in other developed nations • Use of carbon trading, CDM & JI will go some way to reducing global emissions burden but will not directly affect actual Scottish emission levels
Material Assets	
Energy • Supply & demand management • Energy efficiency • Renewables • Grid infrastructure/ distributed generation/ micro-generation • Conventional production • Nuclear	• Demand reduction has significant positive impacts by reducing overall energy inputs to electricity supply • Energy efficiency presents best opportunity for short term gains in reducing emissions (up to 13:1 ratio, ie. reduce end user demand 1 unit, returns up to 13 saved by not providing energy) • Renewables installation may have significant localised impacts on biodiversity, water, landscape • Micro-renewables may have impacts on townscapes and historic environment (visual impact on conservation areas) • Conventional fossil fuel power generation exacerbates GHG emissions, carbon capture not yet proven, does not prevent upstream energy inputs and may have significant localised impacts depending on location and technology • Nuclear power emits no CO2 in operation but requires massive energy and resource use in construction, waste management and fuel processing, also presents long term security and waste issues

Key Climate Issues	Potential GHG Emissions Reduction Effects
Waste management • Reduction • Recycling • Composting • Landfill • Incineration	• Improved waste management and separation of organic waste at source can have wide ranging benefits • Reduction in waste presents imperative to minimise packaging, also leading to emissions reductions • Domestic composting can reduce burden on waste facilities and aerobic composting reduces methane production • Improved recycling reduces energy and emissions burden of primary production • Incineration for electrical power production only is inefficient in terms of power produced by calorific input and it reduces local air quality
Development & Infrastructure • Construction effects • Raw material extraction & use • Buildings and energy efficiency	• End product/ building efficiencies in energy use do not account for energy used and emissions produced during construction • Materials choice and transportation can increase emissions, for example cement imported from abroad produces significant quantities of CO2 in manufacture and transport but emissions would not count as Scottish emissions • This might seem a better carbon option than locally-produced, particularly traditional materials, where all the production carbon will be counted against Scottish totals but does not fit with a responsible and sustainable approach to addressing the global problem of climate change. • Building orientation may help maximise energy efficiency but could impact landscape/ townscapes • Development location and piecemeal encroachment can have serious cumulative impacts
Transport • Infrastructure development • Growth of transport emissions • Private vs. public transport • Alternative fuels • Aviation • Maritime	• Improving transport infrastructure could encourage more vehicle use • Fastest growing (terrestrial) direct emissions source but also energy and embodied carbon costs in production and transportation • Continued global fuel demand increases costs and pollution risk • Promotion of modal shift away from private vehicles not yet evidenced as successful • Biodiesel from waste offers potential win-win solution for large domestic market • Biofuel from biomass may not be viable in Scotland, imports may have local, unknown environmental impacts and increase emissions during transit • Aviation and Maritime emissions currently not accounted for in any trading, control or efficiency system and are each responsible for growing levels of emissions
Landscape	
Changing landscape pattern • Land use change	• Move to biofuels/ biomass may lead to increased homogenisation, loss of boundary features and disruption to local water tables • Renewables development may degrade landscape/ townscape quality • May increase GHG emissions from soil carbon stores
Historic Environment	
Potential loss of historic assets • Coastal flooding affecting sites • Drought and potential loss of assets preserved by water features	• Emissions reduction may impact on the historic environment and archaeological remains through land use change

5.5. Stage 3 Preliminary Options Assessment

5.5.1 An early draft of the consultation proposals, containing initial alternative options, was assessed by considering anticipated positive and negative effects on SEA topics, along with first thoughts on mitigation. The alternative options were focused around three high level categories; 'What is the target?', 'Monitoring the target', and 'Ways of meeting the target.'

5.5.2 A participatory workshop was held to inform stakeholders of the Bill preparation process and to identify the key concerns of attending stakeholders. The workshop was held on the 5th December 2007 and the following organisations attended:

- SEPA
- SNH
- RSPB & Scottish Environment LINK
- Scottish Government Climate Science Advisor
- SCCB Team
- Halcrow
- AEAT

5.5.3 The 3 high level categories mentioned above were used as a basis for discussion in the workshop. An outline of the assessment worksheets used is provided in Table 5.3 below.

Table 5.3 SCCB Draft Proposal Options Assessment

Draft SCCB Proposal Option	Rationale/ Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics	Recommendations/ Additional Measures
What is the target?					
Monitoring the target – measures					
Ways of meeting the target					

5.5.4 These worksheets were consolidated and additional comments added by the consultants. The populated sheets are presented for reference in Appendix E.

5.6. Stage 4 Preferred Options Assessment

5.6.1 The SCCB consultation document contains options structured around key high level issues, and the Scottish Government has already expressed opinion on some options they wish to adopt. Other options are presented in the form of consultation questions offering different alternatives.

5.6.2 Because of the nature of the range of options, different assessment techniques were employed. Some options were more appropriately scrutinised in the RIA, however, general comments have been made on others. Some options were reviewed under high level assessments and others underwent full detailed assessment using standardised matrices (explained later in this section).

5.6.3 Where necessary, some of the individual questions or proposals were split into components in order to allow effective appraisal. Table 5.4 outlines the options in the draft consultation paper and how they were assessed. The full assessments are presented in Section 5.8 of this report.

Table 5.4 Overview of SCCB Draft Options Assessment Methods

Consultation paper reference	Preferred Option/ Question	Type of Assessment Adopted/ Question Split
Setting the Targets		
Para 5.4-5.9	What should be targeted - Production or Consumption?	High Level Assessment Matrix: Target based on emissions produced.
Para 5.10-5.15	How should the target be expressed: a point target or a cumulative target?	General Comments: Point target
Question 1	Should a Scottish target be based on carbon dioxide only or the basket of six greenhouse gases?	High Level Assessment Matrix: Carbon dioxide based target High Level Assessment Matrix: Six GHG based target
2	Should the Bill contain provisions to alter which gases are included, for example if the reliability of data for a particular gas improves or if science changes in the future about which gases cause climate change?	General Comments
3	The Scottish Government wishes to ensure that the Bill gives sufficient incentives to invest in energy efficiency and renewable energy. Should the targets be based on source emissions an end-user inventory or have individual targets for energy efficiency and renewable electricity? Do you have any other suggestions?	High Level Assessment Matrix: Should the target be based on an end user inventory? High Level Assessment Matrix: Should there be separate individual targets for energy efficiency and renewable electricity?
4	Do you agree that the Bill should allow the means of measuring the target to be changed through secondary legislation to reflect international developments or unforeseen consequences of the Bill?	General Comments
5	Should the method for measuring the target take account of the abatement effort made by companies under emissions trading schemes?	General Comments
6	Do you agree that international credits should be counted towards Scottish targets?	High Level Assessment Matrix

Consultation paper reference	Preferred Option/ Question	Type of Assessment Adopted/ Question Split
	Should there be limits on credits counted towards Scottish targets?	
Para 5.49-5.52	International Aviation and Shipping not included within the target.	General Comments
Para 5.53-5.57	Level of the target	High Level Assessment Matrix: Reduce emissions by 80%
7	Should the Bill allow the level of the 2050 target to be changed through secondary legislation? If so, should this only be allowed on the basis of independent, expert advice, to reflect international developments or unforeseen consequences of the Bill? Should any changes to the target be limited to an increase in the target?	General Comments
Supporting Framework		
Para 6.2-6.3 & 6.14-6.18	Interim Budgets and Annual Targets	High Level Assessment Matrix: Set interim emission budget periods
		High Level Assessment Matrix: Set mandatory annual emission reduction targets
8	What factors should be taken into account when setting the level of budgets?	General Comments
9	How long should interim budget periods be?	General Comments
10	How many years in advance should emissions budget periods be set in order to provide sufficient time to develop infrastructure?	General Comments
11	What should be the limit (in terms of absolute quantity or as a percentage of the budget period) on the amount of emissions which the Government can borrow from a following budget period?	General Comments
12	Should the Bill include an interim point target? If so, what year (or years) should it be for (2020, 2025, 2030 etc)? How should the level be chosen?	General Comments
Reporting and Scrutiny Framework		**Parked for attention in RIA**
Meeting the Target (Supporting Measures)		
Para 8.3-8.7	Energy Efficiency and Microgeneration	Assessed in DAMs (Appendix G)
Para 8.8	Combined Heat and Power	Assessed in DAMs (Appendix G)
Para 8.9-8.11	Reducing Carbon Emissions from Buildings	Assessed in DAMs (Appendix G)
Para 8.12-8.13	Waste Reduction and Recycling	Assessed in DAMs (Appendix G)
Para 8.14-8.15	Carbon Storage	Assessed in DAMs (Appendix G)
Para 8.26-8.27	Trading Schemes	Assessed in DAMs (Appendix G)

Consultation paper reference	Preferred Option/ Question	Type of Assessment Adopted/ Question Split
23	Should the Bill contain enabling powers to introduce a duty on certain parts of the public sector (i.e. local authorities and large public bodies) to take specified actions on climate change or other specified environmental issues? Why?	High Level Assessment Matrix
24	What should such a duty (or duties) include?	General Comments
25	Should the Bill contain enabling powers to introduce statutory guidance for certain public sector bodies (i.e. local authorities and large public bodies) on specified climate change or other environmental measures? Why? Are there gaps in any existing guidance?	High Level Assessment Matrix
26	What should this guidance include?	General Comments
27	Should the Bill contain enabling powers to create a requirement for certain public sector bodies (i.e. local authorities and large public bodies) to make regular reports on specific measures they are taking to tackle climate change (whether mitigation or adaptation) or other environmental issues? Why? What should be included in such reports?	High Level Assessment Matrix
28	As a potential non-legislative vehicle, should current Best Value guidance be amended to take specific account of climate change mitigation and adaptation? How should Best Value guidance be amended?	High Level Assessment Matrix:
29	Are there any amendments to existing legislation or any enabling powers needed to allow for variable charging (for example by local authorities) to incentivise action or eliminate perverse incentives?	General Comments
30	Are there any provisions to help Scotland adapt to the impacts of climate change which should be included in the Scottish Climate Change Bill?	General Comments
31	Should provisions within the Environmental Assessment (Scotland) Act 2005, be amended in order to provide clearer links with the Climate Change Bill? If so, how should this be done?	High Level Assessment Matrix
32	What are the equalities implications of the measures in the proposals for the Scottish Climate Change Bill?	General Comments
33	Is there any existing legislation within the competence of the Scottish Parliament (devolved) which needs to be amended so that appropriate action can be taken by sectors in society to take action on climate change?	General Comments

5.7. Detailed Assessment Matrices

5.7.1 For a range of Supporting Measure options it was possible to undertake detailed assessments of significant issues. These assessments were advised by professional judgement and further informed through the baseline and PPS literature review. Potential effects were identified and evaluated within a standardised matrix framework, and assessed against a significance matrix, as outlined in Table 5.5 below.

Table 5.5 Significance Matrix

		Impact magnitude								
		Negative				Neutral	Positive			
		High	Medium	Low	Negligible		Negligible	Low	Medium	High
Geographical significance	International	Severe	Severe	Major	Moderate		Moderate	Major	Superior	Superior
	National	Severe	Major	Moderate	Minor		Minor	Moderate	Major	Superior
	Regional	Major	Moderate	Minor	Negligible		Negligible	Minor	Moderate	Major
	Local	Moderate	Minor	Negligible	Negligible		Negligible	Negligible	Minor	Moderate

5.7.2 This technique was employed to assess preliminary high-level alternative Supporting Measures, presented in Appendix F, and the 'Preferred' Supporting Measures, as proposed in the later draft of the consultation document and provided in Appendix G.

5.7.3 The significance of effects has to be considered within the perspective of the long-term environmental implications of climate change and the potential benefits of emissions reductions. However, this must be tempered by the understanding that reductions in Scotland and actions undertaken in other countries, and attributed to Scotland under international agreements, may have no significant (even negligible) climatic effects, but may have significant local or regional effects on other receptors.

5.7.4 By determining which geographical scale an impact occurs over and comparing this with the perceived magnitude of the effect, a resultant significance can be determined. In this SEA, certain assumptions have to be made:

- Impacts associated with CDM or Carbon Offset programmes will occur in a receiving country, not in Scotland. These would generally be assumed to be localised effects in another country, but could equally be attached greater significance due to the international nature of the impact. The decision was taken to treat these effects as local.
- Temporal scales in this assessment were assumed to be:
  Short-Term = Up to 15 years, Medium-Term = 15-35 years, Long Term = 35 years plus.

5.7.5 Options considered under detailed assessments include:

Appendix F –

- Use of International Credit Schemes and the Clean Development Mechanism
- Use of Carbon Offset Schemes
- Increasing Renewables Integration
- Increasing Energy Efficiency Measures
- Changing Industrial Processes (promoting clean technology)
- Improving Resource Efficiency
- Reducing Consumption

Appendix G –

- Energy Efficiency
- Microgeneration
- CHP and District Heating
- Reducing Carbon Emissions from Existing Building Stock
- Waste Reduction and Recycling
- Carbon Capture and Storage
- Trading Schemes

5.8. Preferred Options Assessments

5.8.1 The assessment of Preferred Options, as contained within the latest draft of the consultation document and explained in Section 5.6, is provided below. The overall approach answers consultation questions from an environmental sustainability perspective. The discussion below identifies potential environmental effects of each consultation proposal/ question, including consideration of possible mitigation measures.

5.8.2 Sections 6 and 7 go on to provide summaries of the likely significance of these effects and the potential mitigation/ enhancement, by SEA topic. As previously stated, the assessment may not address all proposals within the final consultation document, in the event that further additions or amendments may have been made.

Setting the Target

Key	
+	Positive environmental effects
0	No foreseen effects (positive or negative)
+/-	Potentially positive or negative (mixed) effects
-	Negative environmental effects

Option	1. Biodiversity, Flora & Fauna	2. Air	3. Water	4. Soil	5.Human Health	6. Population	7. Material Assets	8. Landscape	9. Historic Environment (Cultural Heritage)
Para. 5.4-5.9 Target to be based on emissions produced.	+/-	+	+	+/-	+	+/-	+	+/-	0
Para. 5.10-5.15 Target to be a point target.	General Comments see below								
Q1. Carbon dioxide based target. (*Amended following SNH advice*)	0	+	+	+/-	+	+/-	+	0	+
Q1. Basket of six Greenhouse Gases based target.	+	+	+	+	+	+/-	+	+	+
Q2. Should the Bill contain provisions to alter which gases are included, for example if the reliability of data for a particular gas improves or if science changes in the future about which gases cause climate change?	General Comments see below								
Q3. Should the target be based on an end user inventory	+	+	+	+	+	+/-	+	+	+
Q3. Should separate individual targets for energy efficiency and renewable electricity be set?	+/-	+	+/-	+/-	+	+/-	+	+/-	+/-
Q4. Do you agree that the Bill should allow the means of measuring the target to be changed through secondary legislation to reflect international developments or unforeseen consequences of the Bill?	General Comments see below								
Q5. Should the method for measuring the target take account of the abatement effort made by companies under emissions trading schemes?	General Comments see below								
Q6. Do you agree that international credits should be counted towards Scottish targets?	+/-	+	+/-	+/-	+	+	+	+/-	+/-
Para. 5.49-5.52 International aviation and shipping emissions not included in the target.	General Comments see below								
Para. 5.53-5.57 Reduce emissions by 80% by 2050.	+/-	+	+/-	+/-	+	+/-	+	+/-	+
Q7. Should the Bill allow the level of the 2050 target to be changed through secondary legislation?	General Comments see below								

Para. 5.4-5.9 What should be targeted - Production or consumption? Decision to base target on emissions produced.

- 'Designing out' the use of greenhouse gases at the production stage of goods and services is the most effective way to limit the resources used and ensure that the energy consumption over the whole lifecycle of the good or service is considered.

- Targeting emissions produced is likely to increase overall resource efficiency and reduce the overall amount of resources used resulting in major benefits on other aspects of the environment. Using fewer raw materials, such as mineral and water resources will directly benefit water quantity and soil resources. An overall increase in efficiency is likely to reduce to pollution incidents' also benefiting soil, water and air quality. These improvements will have secondary benefits on biodiversity, flora and fauna which may also benefit from reduced pressure on land use activities such as agriculture or mineral extraction. Landscape character is also likely to benefit from a targeted approach to reducing production emissions.

- Reducing emissions will have a direct positive impact on air quality.

- Care will need to be taken to ensure that a drive to reduce emissions does not result in the development of alternative sources of energy which have different negative impacts on the environment. For example, inappropriate renewables development that does not take account of site conditions may have an adverse impact on landscape character. Care will especially need to be taken with regard to the development of biofuels which could potentially have a negative impact on soil resources, biodiversity and landscape character if specific site conditions are not fully taken into account.

- Improvements in air quality and a reduction in pollutants will cumulatively benefit human health, especially respiratory conditions and benefits to the environment will improve the quality of life for those in Scotland.

- As highlighted in the Bill consultation paper, care has to be taken to ensure that wider global emissions caused by consumption in Scotland (not only produced here) are also addressed by policies. Consumption of high emission goods (high levels of embodied carbon) from other parts of the world will have a negative impact on the populations and environment in those countries. Also solely targeting production of goods and services in Scotland, rather than seeking to reduce the demand for goods and services at the same time, is likely to increase the costs of production which are then likely to be passed on to consumers. This may cause equity problems, especially when the goods are fuel and food.

- As systems for carbon footprinting measures and input-output analyses are developed, refined and more widely accepted and used, these could be incorporated into target and measurement systems.

Para. 5.10-5.15 How should the target be expressed: a point target or a cumulative target? Point target

- An overarching cumulative target would aim to limit the total emissions burden to a fixed amount over time, which could require quite drastic reductions over a very short period. On a global scale, this would be more beneficial in limiting the overall stock of GHG's in the atmosphere, however with no internationally agreed mechanism, and at the national scale for Scotland, driving sustained emissions reductions and support for the target framework means that a more realistically achievable point target is likely to be acceptable to businesses.

- Efforts to reduce emissions are likely to have an overall beneficial impact on the environment as a target is likely to lead to measures to reduce resource use with resulting air quality, water, soil and biodiversity benefits. There are also likely to be knock-on benefits on landscape and human health. Specific environmental effects/benefits are likely to be similar between point and cumulative targets, with perhaps only variations in timing. A cumulative target may limit total emissions more quickly than a point target, which may lead to action being taken too quickly, with resultant adverse effects. However, the longer the time taken to make appropriate reductions, the more severe climatic change may become.

- Significant effects on the environment will only become obvious when more detail about which emission reduction measures are to be implemented are available. Identified measures should undergo a thorough environmental assessment, as different measures could vary widely from having significant environmental benefits, outwith the effects on climatic factors, to having significant adverse effects.

Q1. Should a Scottish target be based on carbon dioxide only or the basket of six greenhouse gases?

- Targeting either CO2 or all 6 GHG's will have significant beneficial effects on air quality. Air quality improvement will have secondary benefits on human health and the historic environment, as air pollutants are often damaging to historic buildings.

- Reducing carbon dioxide, or all 6 GHG, emissions is likely to benefit quality of life through reduced air pollution; however tighter controls and the increased regulatory burden on emissions of either CO2 or the basket of 6 GHG's are likely to increase the costs of some goods and services. Care needs to be taken (and detailed Equality Impact Assessments undertaken) to ensure that no one group in society is significantly more adversely effected than any other, and to ensure measures are in place to support existing disadvantaged groups.

- Reducing CO2 and other GHG emissions as a whole is likely to lead to a reduction in resource use, benefiting material assets. This would be significantly environmentally beneficial with respect to coal use around the world, with secondary beneficial impacts on air quality, human health, biodiversity, soil and water resources in those countries still currently producing coal. Similarly, environmental benefits would be gained from a reduction in oil and gas use.

- Targeting CO2 alone may inadvertently encourage the production of other greenhouse gases, as people look for alternatives. Banning the use of CFCs under the Montreal Protocol led to an increase in use of HFCs (one of the basket of 6 GHG's) as a substitute. Care would need to be taken such that focussing on CO2 does not cause a switch to alternative technologies with alternative GHG emissions produced, or miss the subtleties of looking at the whole picture when it comes to GHG emissions. Decision tools and systems such as life cycle analysis can help identify embodied carbon within the capital lifespan of technology or infrastructure, which may be poor in terms of emissions, to limit lock-in and promote more sustainable choices.

- Considering all six GHG's however, may reduce the focus of efforts. With CO2 produced in the largest volume, the largest and easiest cuts may be possible by primarily addressing CO2. However there are still potential gains from reducing high GWP emissions and a holistic approach to greenhouse gases needs to be adopted. Some HFCs and SF6 are growing sources of GHG emissions and, by considering all GHG's, expressed in terms of the GWP and CO2 equivalents, more options are open to the Government to meet the 80% GHG reduction target. If all figures are quoted as CO2(e), then small savings in high GWP emissions could equate to large CO2(e) reductions. Therefore it is more environmentally beneficial to allow for the basket of six GHG's to be included in the Scottish target, whilst developing a priority on reducing the bulk of CO2 emissions.

- For example, if the basket of 6 greenhouse gases were to be considered, there would be increased pressure to identify savings from agriculture; such as methane from livestock farming and nitrous oxide from fertiliser use. This could have significant knock on benefits for biodiversity, soil and water resources associated with a shift to less intensive agriculture and a move a way from intensive cattle rearing. Less intensive agriculture is also likely to benefit landscape, field patterns, boundaries and features, however these issues must be balanced with consideration of CAP reform, Land Management Contracts, productivity and the existing burden of regulatory measures to improve farming techniques and reduce the impact of farming activity.

SNH Consultation Comment:

In the Table of the Preferred Options Assessments, the assessment for 'Q1 carbon dioxide based target' is positive for soils. However, a CO2-only target could lead to perverse outcomes. For example, the emissions saved by some windfarm developments on peat-rich soils could be substantially overstated if the assessments fail to take account of potential emissions of greenhouse gases (including methane) resulting from land use change.

The overall assessment for a CO2-only target on soils should therefore be '+/-' (potentially positive or negative (mixed) effects).

We agree the assessment that reducing emissions of methane and nitrous oxide in the agriculture and land use sector and a shift to less intensive agriculture could bring benefits for biodiversity, landscape, field patterns, boundaries and features.

We suggest that the assessment for Q1 Basket of greenhouse gases should be '+' while for Q1 Carbon dioxide-based target might be '0'.

SEA Response:

This reviewed version of the ER now reflects SNH's determination of these impacts on the above table.

The inclusion of this comment box and the amendments to the table above, are considered sufficient to address SNH's comments.

Q2. Should the Bill contain provisions to alter which gases are included, for example if the reliability of data for a particular gas improves or if science changes in the future about which gases cause climate change?

- Once the Bill becomes law and is adopted as an Act of Parliament, further primary legislation is required to amend details. Options for secondary legislation can speed the process and it may be more beneficial to be able to change quickly due to increasing climate change, improved knowledge and unforeseen impacts. The possible addition of gases included under the Bill could have significant environmental effects, depending on the measures introduced to reduce emissions.

- The ability to add new gases is likely to increase the effectiveness of the Bill in its attempts to mitigate climate change, but the effects beyond those on climatic factors is unknown until such time as the gases are to be included are identified, their sources known and the measures to be brought in to reduce emissions are proposed. If necessary, further environmental assessment could be carried out at that time.

Q3. The Scottish Government wishes to ensure that the Bill gives sufficient incentives to invest in energy efficiency and renewable energy. Should the targets be based on source emissions, an end-user inventory, or have individual targets for energy efficiency and renewable electricity? Do you have any other suggestions?

- Each of these approaches would lead to air quality improvements however; an end user inventory would also reflect any reduction in energy demand and therefore help promote demand reduction. This would have wide ranging environmental and social benefits, however, as shifts in lifestyle would be required there maybe short term quality of life impacts whilst people adapt and energy or product prices change. Conversely, a separate individual target for energy efficiency may not reduce overall demand; as people may use a greater number of energy efficient products. An end-user inventory which allocates emissions produced in Scotland to end-users across the UK, may spread the cost of and responsibility for emissions reductions, but may not be as environmentally beneficial as removing the emissions at source. Measures would need to be individually assessed to understand their environmental impacts and ensure that appropriate mitigation was implemented.

- A reduction in overall energy demand is desirable from an environmental point of view as it implies a reduction not only in non-renewable energy use, but also reduced demand for renewables technology and associated infrastructure development, which can also have an impact on GHG emissions. Whilst largely beneficial, promoting renewable energy brings with it new problems such as the potential for landscape, biodiversity, soil and water resource impacts that can arise from inappropriate renewables schemes for a particular site. Biomass for example, has particular environmental problems associated with it that need careful consideration. Therefore measures need to undergo detailed environmental assessment to ensure these impacts are taken into account.

- Basing the target on source emissions provides an option where emissions are already well documented and monitored. As a large volume of Scotland's domestic emissions are currently from point sources, it may be more sustainable to introduce energy efficiency and renewables targets that augment a targeted framework to reduce emissions produced in Scotland, with mechanisms to ensure that point sources are phased out or reduced as far as possible.

Q4. Do you agree that the Bill should allow the means of measuring the target to be changed through secondary legislation to reflect international developments or unforeseen consequences of the Bill?

- Once the Bill becomes law and is adopted as an Act of Parliament, further primary legislation would be required to amend the Act. Options for secondary legislation can speed the process and it may be more beneficial to be able to change quickly due to increasing climate change, improved knowledge and unforeseen impacts. If necessary, further environmental assessment could be carried out at that time.

Q5. Should the method for measuring the target take account of the abatement effort made by companies under emissions trading schemes?

- Currently, there is no clearly preferred option, with both pros and cons applicable, as discussed in Sections 5.35-5.46 of the SCCB consultation document.

- Discounting abatement effort in the Scottish target is unlikely to make a difference to the global emissions environment; as allowances traded represent savings made somewhere within the scheme as a whole. Environmentally conscious domestic abatement effort is likely to benefit the Scottish environment; however the sale of surplus allowances may reduce the likelihood of localised improvements elsewhere (where allowances are bought).

- The Government's preference is to develop a mechanism that includes allowances, in order to allow efforts made within the EU ETS to be reflected in the Scottish target. Pre-set EU ETS allowance levels could help inform and advise domestic carbon budgets, however reporting on progress towards the SCCB target may be better advised to identify and separate domestic emission reductions from CDM credits and traded allowances to maintain transparency.

Q6. Do you agree that international credits should be counted towards Scottish targets?
Should there be limits on credits counted towards Scottish targets?

- Clear and open reporting on domestic emissions reduction should be highlighted as moving Scotland towards a real low-carbon society. In the long-term, once direct domestic emissions are as low as possible, other mechanisms for crediting remaining emissions, offsetting and clean development will really come to the fore to help maintain a trajectory towards 80% reductions.

- International credits are likely to have a neutral impact on the Scottish environment, as efforts to realise emissions reductions in other countries are more likely to affect the local environment. International credits, independently verified as attributable to effort by Scottish firms or Government, should therefore be counted towards the Scottish target through the appropriate CDM and JI mechanisms.

- If credits are counted, however, and are cheaper to realise, becoming preferable to domestic effort, they could indirectly result in reduced benefits for the Scottish environment, when potential emissions reductions are not carried out domestically.

- International credits can present mixed environmental and social effects upon the countries that they are implemented in and, wherever used, these impacts should be taken into account with full environmental and social assessments undertaken for the projects.

- The impacts on the receiving countries are unknown, but presumed negative (following the precautionary principle) as often poor legislation or limited enforcement exists to ensure stringent controls on development siting/ impacts. Care needs to be taken to ensure that schemes only occur in appropriate habitats and that great care is taken to understand local circumstances and needs.

- Air quality impacts are likely to be positive in the receiving country as measures will be installed to prevent, improve or remove emissions, and other schemes could provide low emission public transport etc. Programmes to improve local air quality through reducing emissions from existing industrial plants and transport should be a high priority. Best practice Scottish and EU guidelines should be employed to ensure projects do not negatively impact air quality.

- CDM programmes must take full account of the precautionary principle to ensure water quality and resource management does not exacerbate local problems. Local soil conditions must be fully taken into account in any projects and not adversely affected. Measures should be taken to protect and enhance soil quantity and quality. Projects need to take into account the health needs of the local population and take great care not to adversely affect the conditions of the local population who may already be living in extreme poverty.

- Schemes which improve environmental quality will benefit standards of living, and in subsistence farming communities' protection of soil and water resources will bring significant benefits. Technology transfer, job creation and knowledge sharing can all have positive social and economic impacts. CDM must ensure transfer does not lead to local environmental degradation or have a negative impact on local populations and their livelihoods. Ideally, transfer is based around the principles of sustainable livelihoods and long-term, may lead to enhanced opportunity and new local industry. Care needs to be taken in the planning and implementation of projects to minimise resource use and schemes should identify means to reduce impacts of future increases in resource use on the assumption that standards of living may increase.

- Schemes will have unknown impacts on landscape in the recipient country, but effects are presumed negative (following the precautionary principle) as often poor legislation or limited enforcement exists to ensure stringent controls on development. Care needs to be taken to ensure that schemes consider visual and landscape impacts and the most stringent UK / EU legislation and best practice is applied. Full understanding of local conditions and local community needs is a pre-requisite.

- Schemes will have unknown impacts on cultural heritage and the historic environment in the recipient country, but are presumed negative (following the precautionary principle) as often poor legislation and limited enforcement exist to protect the historic environment and archaeological features. Care needs to be taken to ensure that schemes consider cultural heritage, the historic environment and archaeology and that the most stringent UK/ EU legislation and best practice is applied. Full understanding of local conditions and local community needs should be gained.

Para. 5.49-5.52 International aviation and shipping emissions not included in the target.

- Scotland should make every effort to pursue and promote an internationally accepted method so that these emissions can be satisfactorily included in reduction targets. Difficult choices and decisions to be made under climate action will include a satisfactory solution to this situation.

- A satisfactory solution should inspire confidence across targeted sectors that these sources of emissions are being addressed in an equitable manner.

Para. 5.53-5.57 Reduce emissions by 80% by 2050.

- Setting a target of 80% is at the upper end of the recommended range for developed countries and under SEA, can be considered likely to be of significant benefit for climatic factors (specifically emissions reduction), air quality and, in turn, generally beneficial for Scotland's environment.

- The specific nature of effects on the environment will be dependent on the measures employed to meet the target and should be assessed further when more is known about what shape they are likely to take. In general, the target is likely to lead to overall benefits for the environment and society, however shifts may occur and aspects of the environment, or different parts of society, may be affected in ways as yet unknown.

- There may be short-term issues as regulatory controls and measures come into force and changes occur in the supply and demand of goods and services. Ongoing monitoring, consideration of changes in effects, and mitigation is required to ensure that the maximum beneficial effects of this target are realised.

- Significant emissions reductions can only be achieved by reducing the overall amount of fossil fuels used, which will have significant benefits for air quality, human health and on material assets; by reducing mineral extraction effects. It will also significantly benefit landscape, biodiversity, soil and water resources both in Scotland, and overseas; in countries that currently supply Scotland with fossil fuels.

- To meet the target, and to help move away from fossil fuels, renewable energy is likely to be significantly promoted. This will have considerable benefits socially and for all aspects of the environment with a significant reduction in air, soil and water pollution. However, there are adverse environmental impacts associated with renewable schemes, especially if the scale and siting is inappropriate, and these impacts need to be acknowledged and addressed.

- Certain renewables schemes may have significant soil and landscape impacts, for example large scale wind farms and the widespread uptake of microgeneration, including solar panels. If biomass is promoted then great care will have to be taken in ensuring appropriate crops and sites are chosen. Inappropriate planting can cause significant disruption to landscapes, changing the character and blocking views. Inappropriate crops can also significantly adversely affect soil and water resources and biodiversity.

- A push for modal shift towards public transport, walking and cycling is likely to occur, along with a number of regulatory measures. Although this may have significant benefits for the environment, human health and people's quality of life; there may be sections of the population who experience significantly more adverse impacts than others, for example those in rural areas and those with disabilities who rely on private vehicles for mobility, etc.

Q7. Should the Bill allow the level of the 2050 target to be changed through secondary legislation? If so, should this only be allowed on the basis of independent, expert advice, to reflect international developments or unforeseen consequences of the Bill? Should any changes to the target be limited to an increase in the target?

- Once the Bill becomes law and is adopted as an Act of Parliament, further primary legislation would be required to amend the Act. Options for secondary legislation can speed the process and it may be more beneficial to be able to change quickly due to increasing climate change, improved knowledge and unforeseen impacts. Additional environmental assessment could be undertaken at this stage, if required.

Supporting Framework

Key		SEA Topic	1. Biodiversity, Flora & Fauna	2. Air	3. Water	4. Soil	5.Human Health	6. Population	7. Material Assets	8. Landscape	9. Historic Environment (Cultural Heritage)
+	Positive environmental effects										
0	No foreseen effects (positive or negative)										
+/-	Potentially positive or negative (mixed) effects										
-	Negative environmental effects										
Option											
Para. 6.2-6.3 Set interim emission budget periods?			+/-	+	+/-	+/-	+	+	+/-	+/-	+/-
Para. 6.14-6.18 Set mandatory annual emission reduction targets?			+/-	+	+/-	+/-	+	+	+/-	+/-	+/-
Q8. What factors should be taken into account when setting the level of budgets?		**These options are more appropriately addressed through the Regulatory Impact Assessment (RIA) and brief general comments are given below**									
Q9. How long should interim budget periods be?											
Q10. How many years in advance should emissions budget periods be set in order to provide sufficient time to develop infrastructure?											
Q11. What should be the limit (in terms of absolute quantity or as a percentage of the budget period) on the amount of emissions which the Government can borrow from a following budget period?											
Q12. Should the Bill include an interim point target? If so, what year (or years) should it be for (2020, 2025, 2030 etc)? How should the level be chosen?		**Mixed impacts are likely across all topics under this option, with an increasing risk of adverse impacts if measures to meet targets are implemented at later stages.** **Wider environmental benefits are to be gained in effective early action on emissions reduction.**									

Para. 6.2-6.3 Set interim emission budget periods

- The overall 80% reduction in GHG emissions by 2050 is an ambitious long-term target. Interim budgets will help focus efforts by setting targets and limits within more accessible timescales and help the successful achievement of the target. This is likely to have significant beneficial effects on climatic factors and air quality with secondary benefits for human health.

- It is difficult to predict what effect interim budgets will have on wider environmental receptors. Without them there is potential for adverse environmental impacts; as it is possible that reduction measures are left till nearer 2050 with severe action then required, which could potentially have significant adverse effects. This may still happen within interim budget periods, but on a smaller scale; as action to limit emissions within budget periods will be less severe. Specific effects will depend on implementation measures however, and are therefore not possible to predict at this stage.

- Interim budgets will allow a degree of flexibility such that long and short term reduction strategies can be developed within sectors and across government departments. They should also encourage continued improvement and sustainable management/ phasing of measures to minimise disruption to other environmental receptors.

- There is significant merit in assigning budgets towards achieving the overall target as early as possible; to encourage significant early reductions and leaving more difficult reduction measures towards the end. This allows time for technological development and appropriate phasing of replacement measures. Interim budgets should drive short term gains and result in significant reductions in the medium to long term.

- EU ETS allowances and projections could be used to help set interim carbon budgets; this allows a greater degree of transparency and will help maintain confidence in the target and the interim budgets.

Para. 6.14-6.18 Set mandatory annual emission reduction targets

- It is cumulative GHG's emitted over time which causes climate change, rather than the level of emissions in any single year. Mandatory annual emission reduction targets could help drive early gains; however should the focus shift to short-term action to meet annual targets at the expense of sustainable management of measures to protect biodiversity, water and soil resources, annual targets may impact negatively upon wider environmental receptors,

- The specifics of these adverse environmental effects will be dependent on the nature of the measures implemented. Medium and long term planning is required to ensure that significant adverse effects are avoided and mitigated against.

Q8. What factors should be taken into account when setting the level of budgets?

- Early action to reduce global emissions will have more significant benefits in limiting climate change impacts (and be more cost-effective) than later action. Even though Scotland's total emissions are comparatively small on a global scale, setting challenging budgets as early as possible is likely to be significantly beneficial for climatic factors and air quality.

- Independent advice on budgets must take into account environmental factors, sustainably balanced against business competitiveness issues. Ideally, budgets should consider sectoral performance. Budgets that are not sector specific may not be as effective, as some actors within sectors may not take action unless specific targets are identified.

- Setting the level of budgets is likely to influence the extent of adverse or beneficial environmental effects. Budget levels will determine which measures result to meet reduction targets, and the environmental effects will be dependent on the emissions reduction measures employed. When more is known about the relevant measures, a more detailed review could help assess the effects of setting the level of budgets.

- In general, at the national scale and over the longer term, more ambitious budgets should be more beneficial for the environment. However, care will have to be taken to ensure that the manner in which budgets are met does not adversely impact local environmental factors, or that acceptable environmental trade-offs and mitigations are identified.

- Appropriate environmental factors and indicators should be identified and integrated into the reporting and advice processes, likely to help determine the level of budgets. As measures implemented are reviewed and monitored, any apparent environmental effects must be taken into consideration for future budgets, with suitable mitigation measures employed, as appropriate to scale and location. These are currently impossible to identify specifically.

- Potentially, conflicts exist if emissions reduction budgets do not account for installations operating within the EU ETS (accounting for around 50% of current Scottish emissions). Installations with allowances should be allowed to trade on the ETS market, however this may affect Scottish budgets, as the required rate of reductions may differ. Appropriately identified mechanisms should not add to the regulatory burden of the EU ETS, but aid an accurate means for measuring overall domestic progress. See the discussion provided under Question 5 above.

- The ideal should be to drive actual domestic reductions and phase out high emission sources; as such, budget reviews should take account of the latest climate change science and work to increase the rate of reductions as necessary.

Q9. How long should interim budget periods be?

- The pre-determined length of interim budget periods will not have direct environmental impacts. However if periods are too short, it could cause short term reactive measures to be brought in, with little planning, that could be harmful to the environment and not see the benefits to climatic factors.
- Budget periods should be long enough to implement change and measure progress, but short enough to take remedial action if implemented measures do not prove sufficient. The UK Government intends to use 5 year budgets and, if the Scottish Government plans to utilise the services of the independent Committee on Climate Change, it would make sense to align the budgeting periods with the UK system. This will maintain transparency and efficiencies across reporting mechanisms, thereby maintaining energy and resource efficiency as far as possible.
- This question is more appropriately considered through the Regulatory Impact Assessment.

Q10. How many years in advance should emissions budget periods be set in order to provide sufficient time to develop infrastructure?

- The UK Government is planning to set budgets up to 15 years in advance, this again would appear sensible as it allows sufficient time for infrastructure development, forward planning and adjustment of future budgets to account for any shortfall in current or previous budget periods.
- As before, this would also improve transparency, reduce duplication and maintain efficiencies as far as possible. There are unlikely to be any direct effects on the environment that can be attributed specifically to this issue.

Q11. What should be the limit (in terms of absolute quantity or as a percentage of the budget period) on the amount of emissions which the Government can borrow from a following budget period?

- Borrowing between budgets will allow a degree of flexibility within the system however, borrowing may add to the burden of reducing emissions at a later date, with associated knock-on effects for climatic factors. This may have an impact on the timing of environmental effects.
- Borrowing between budgeting periods must be completely transparent and only occur under exceptional circumstances; with limits set as low as possible to maintain the focus on driving actual reductions within agreed budgeting periods and limits.
- Ultimately, borrowing and budgeting mechanisms should be designed to encourage continued improvement and sustainable management/ phasing of measures to minimise disruption to environmental receptors.

Q12. Should the Bill include an interim point target? If so, what year (or years) should it be for (2020, 2025, 2030 etc)? How should the level be chosen?

- Stern reports that early action to reduce emissions is significantly more beneficial with respect to climate change and more cost effective; therefore setting an interim point target, based on agreed preliminary budgets, could be seen as a positive motivator for action. Similarly, wider environmental benefits are to be gained through effective early action on emissions reduction.

- Depending on the methods of emissions reduction implemented, mixed impacts are likely across all SEA topics under this option, with an increasing risk of adverse impacts if measures to meet targets are implemented at later stages.

SNH Consultation Comment:

Q12 (interim targets) is discussed on including a proposal for an interim target of a 40% reduction by 2025.

This is referenced to 2008 to give a slightly front-loaded emission reduction pathway (40% of the total target in the first 17 years and 25 years to meet the remaining 40%).

This is confusing because the consultation paper proposes baselines consistent with international agreements (1990 for CO2, N2O and CH4, and 1995 for F-gases to accord with the Kyoto Protocol and subsequent developments under the UN FCCC) – and we support this.

Referenced to 1990, a 40% reduction by 2025 produces a pathway more consistent with the less desirable upper curve in Fig 6 of the consultation paper (i.e. delayed emission reductions and greater cumulative emissions).

Interim targets of at least 40% by 2020 against a 1990 baseline are required to front-load emission reductions and move towards the lower, more desirable curve in Fig.6.

SEA Response:

It is accepted that the discussion of interim targets within the ER did not correlate with the discussion within the consultation document, and this is accepted as an error.

The ER discussion would have been improved by simply removing the last two bullet points in this section, which would have prevented any discrepancy and confusion.

The inclusion of this comment box and the removal of the discussed options, are considered sufficient to address SNH's comments.

Meeting the Target

Key	
+	Positive environmental effects
0	No foreseen effects (positive or negative)
+/-	Potentially positive or negative (mixed) effects
-	Negative environmental effects

Option	1. Biodiversity, Flora & Fauna	2. Air	3. Water	4. Soil	5.Human Health	6. Population	7. Material Assets	8. Landscape	9. Historic Environment (Cultural Heritage)
Energy Efficiency and Microgeneration	Assessed in DAMs see Appendix G								
Combined Heat and Power and District Heating Schemes	Assessed in DAMs see Appendix G								
Reducing Carbon Emissions from Existing Building Stock	Assessed in DAMs see Appendix G								
Waste Reduction and Recycling	Assessed in DAMs see Appendix G								
Carbon Storage	Assessed in DAMs see Appendix G								
Trading Schemes	Assessed in DAMs see Appendix G								
Q23. Introduce a duty on certain parts of the public sector (i.e. local authorities and large public bodies) to take specified actions on climate change or other specified environmental issues? Why?	+/-	+	+/-	+/-	+	+	+/-	+/-	+/-
Q24. What should such a duty (or duties) include?	General Comments see below								
Q25. Introduce statutory guidance for certain public sector bodies (i.e. local authorities and large public bodies) on specified climate change or other environmental measures? Why? Are there gaps in any existing guidance?	+	+	+	+	+	+	+	+	+
Q26. What should this guidance include?	General Comments see below								
Q27. Create a requirement for certain public sector bodies (i.e. local authorities and large public bodies) to make regular reports on specific measures they are taking to tackle climate change (whether mitigation or adaptation) or other environmental issues?	+	+	+	+	+	+	+	+	+
Q27. Why? What should be included in such reports?	General Comments see below								

Key		SEA Topic	1. Biodiversity, Flora & Fauna	2. Air	3. Water	4. Soil	5.Human Health	6. Population	7. Material Assets	8. Landscape	9. Historic Environment (Cultural Heritage)
+	Positive environmental effects										
0	No foreseen effects (positive or negative)										
+/-	Potentially positive or negative (mixed) effects										
-	Negative environmental effects										
Q28. As a potential non-legislative vehicle, should current Best Value guidance be amended to take specific account of climate change mitigation and adaptation?			+	+	+	+	+	+	+	+	+
Q28. How should Best Value guidance be amended?			**These options are more appropriately addressed through the Regulatory Impact Assessment (RIA) and only brief general comments are given below.**								
Q29. Are there any amendments to existing legislation or any enabling powers needed to allow for variable charging (for example by local authorities) to incentivise action or eliminate perverse incentives?											
Q30. Are there any provisions to help Scotland adapt to the impacts of climate change which should be included in the Scottish Climate Change Bill?											
Q31. Should provisions within the Environmental Assessment (Scotland) Act 2005, be amended in order to provide clearer links with the Climate Change Bill? If so, how should this be done?			+	+	+	+	+	+	+	+	+
Q32. What are the equalities implications of the measures in the proposals for the Scottish Climate Change Bill?			**These options are more appropriately addressed through the Regulatory Impact Assessment (RIA) and only brief general comments are given below.**								
Q33. Is there any existing legislation within the competence of the Scottish Parliament (devolved) which needs to be amended so that appropriate action can be taken by sectors in society to take action on climate change?											

Energy Efficiency and Microgeneration

- Assessed in Detailed Assessment Matrices, see Appendix G.
- Energy efficiency and demand reduction offers the most likely source of early gains in overall emissions reductions. With an energy saving ratio which can be as high as 13:1, ie. 13 units of energy consumed in the supply of 1 unit of energy demanded, real benefits are to be found in compelling businesses and households to limit all forms of energy demand. These benefits are significant across all environmental media, in Scotland and further afield.
- Renewable technologies and uptake of microgeneration will offer significant savings in the medium to long term, however this must be aligned with effective grid investment to allow feed-in from distributed sources. This will, in turn, reduce return on investment timescales, making the technologies more attractive to households and businesses.
- There may be localised impacts on landscape/ townscape associated with micro-renewables and other localised impacts associated with larger scale renewables projects, depending on location and environmental sensitivities.
- Long-term, if electricity demands are met by renewables, hydro, microgeneration and feed–in, the level of demand is not such an issue, as the level of emissions produced in supply becomes negligible. Appropriate phasing of investment could lead to the phase out of fossil fuel power generation.
- Ultimately, power generation in Scotland should be from a variety of renewable sources with only a small fraction provided by nuclear and fossil fuels, until such capacity is no longer required.

Combined Heat and Power

- Assessed in Detailed Assessment Matrices, see Appendix G.
- This option has the potential to reduce GHG emissions from centralised energy supply by improving local efficiencies, as well as using renewable local biomass and even processed wastes as fuel. Local impacts must be considered as air quality from combustion processes may be impacted.
- CHP and district heating offer highly energy efficient technologies, where the key is to make beneficial use of as much of the heat energy as possible. Developers, designers and architects should be encouraged to include these systems wherever and whenever possible, providing other environmental considerations are taken into account including local air quality impacts and appropriate fuel supply and transport requirements, to minimise emissions.
- New public buildings, or part financed by public money should be required to include CHP and heat recovery as standard. In general, distributed/ localised power/ heat generation is also more efficient in terms of reducing the transmission losses from centralised power generation.

Reducing Carbon Emissions from Buildings

- Assessed in Detailed Assessment Matrices, see Appendix G.
- Current guidance for new developments will help reduce energy demand for space heating, however the greater challenge is on how to reduce demand for existing, less efficient buildings. Appropriate measures will benefit human health, population, material assets and historic environmental factors.
- The built environment in Scotland is a major energy consumer. A contributory factor to this is the way in which raw materials are used. For example, cement imported from abroad produces significant quantities of CO2 in manufacture and transport but emissions do not count as Scottish emissions. Using this material might, on paper, seem a better carbon option than locally-produced, particularly traditional materials, where all the production carbon will be counted against our local total but this does not fit with a responsible and sustainable approach to addressing the global problem of climate change.
- Integrating the principal of embodied energy into policy development could be a useful way of seeking to address this issue. Scotland's policy framework needs to be sufficiently robust and sophisticated to mitigate against the "export" of emissions.
- Energy advice is available through the Carbon Trust, Energy Savings Trust and Envirowise (amongst others), and some grants are available through, for example, the Scottish Community and Householder Renewables Initiative, however the initial cost of improvements is likely to hamper the uptake of measures by those who are only able to afford the cost of energy spread throughout the year.

Waste Reduction and Recycling

- Assessed in Detailed Assessment Matrices, see Appendix G.
- As the number of households in Scotland increases, the levels of waste produced are likely to increase accordingly. The environmental impacts of Scotland's waste have been reduced somewhat by landfill restrictions, natural gas recovery and increased rates of recycling. The benefits in re-using wastes, wherever possible, are significant if approached in a systematic and sustainable fashion with the ultimate aim of maximising useful energy recovery from suitable waste.
- Localised environmental impacts from energy from waste are generally related to combustion processes. These can be minimised by employing suitable energy recovery systems such as anaerobic digestion or gasification, before incineration in combined heat and power systems.
- Widespread and integrated adoption of the waste management hierarchy requires continued pressure on manufacturers to minimise packaging and to utilise recyclable materials wherever possible. It also requires effective public education on the benefits of separation at source, energy potentials from organic wastes and the reduced energy demands of using recycled materials when compared with raw material extraction and primary production.
- Similarly, construction processes and infrastructure development must consider all means of reusing rubbles and demolition wastes as preferred to primary extraction of aggregate materials.

Carbon Storage

- Assessed in Detailed Assessment Matrices, see Appendix G.
- Carbon capture and storage (CCS) most often involves the end-of-pipe collection of waste CO2 gases from power generation and industrial plant, and its storage underground in spent fossil fuel (oil and gas) beds or appropriate geological formations.
- As a sustainable energy solution, CCS presents potential environmental impacts which could offset the potential benefits of minimising climate emissions. There is potential for wide ranging impacts when considering infrastructure, transport and actual storage effects; which are further exacerbated when the effects of continued fossil fuel extraction and use are considered, as opposed to the benefits possible by using alternatives to fossil fuels.
- The SCCB target should work to capitalise on Scotland's renewable energy potential and lead to medium to long-term phasing out of high carbon energy sources. Support for CCS should be considered in light of further research to identify and manage potential environmental impacts before it is implemented.
- An alternative use is in carbon capture during the production of hydrogen from coal or natural gas to provide hydrogen fuel. This is mainly a cost consideration as hydrogen can be produced without using fossil fuels, but may be more expensive. In order to seed the energy market for hydrogen fuels and produce enough hydrogen at acceptable costs to encourage a changeover, CCS may be more justifiable.

SNH Consultation Comment:

Table 6.1 discusses carbon capture and storage and highlights effects such as ocean acidification and adverse impacts on biodiversity, flora and fauna.

We presume this refers to deep ocean storage of CO2 and/ or to the potential for leakage from storage within depleted oil and gas reservoirs or saline aquifers and we strongly agree with this assessment.

Hence it is vitally important that carbon capture and storage is directed towards secure geological reservoirs and that the security of these is adequately monitored.

SEA Response:

It is accepted that the ER did not fully discuss the implications of CCS using suitably porous geological reservoirs (eg. appropriate sandstones) and that this is potentially a more secure/ viable option than ocean storage.

This is accepted as a limitation of the report; however, SNH comments on the use and continued monitoring of the security of such sites are fully supported by the SEA.

Similarly, although CCS may not be the most sustainable option for widespread use in Scotland, development of the technology and identification of appropriate sites could have transboundary benefits when transferred to other countries more reliant on coal fired power under, for example, the Clean Development Mechanism.

The inclusion of this comment box is considered sufficient to address SNH's comments.

Trading Schemes

- Assessed in Detailed Assessment Matrices, see Appendix G.
- Has the potential to realise high emission reductions across the major polluting industries with comparatively minor impacts associated with administration, regulation and verification. Also has the potential to be extended to transport industries.
- Market based instruments have captured the interest of environmental policy makers because of the potential advantages they present over command-and-control instruments. Rather than equating emission levels between firms, market based instruments rationalise the marginal abatement costs, and help keep the costs to society down by internalising the costs of emissions, offering a more cost effective method for management of reductions.
- Within the incentive-based instrument category, auctioned permits generally provide more incentive to reduce emissions than issued permits, and correctly designed and implemented trading schemes will allow a required level of emissions reduction to be realised for the least overall cost to society. Tradable permit schemes provide incentives for reduction in pollution levels by the firms that can achieve those reductions most cheaply; they can also provide possible double-dividends for individual companies by encouraging abatement and realising extra income from selling unused permits.

Q23. Should the Bill contain enabling powers to introduce a duty on certain parts of the public sector (i.e. local authorities and large public bodies) to take specified actions on climate change or other specified environmental issues?
Why?
Q24. What should such a duty (or duties) include?

- The SCCB should contain provisions for far-reaching enabling powers, as it is unlikely that purely voluntary measures will be sufficient to meet reduction targets. It is likely that statutory duties and enforcement will go further in driving action towards meeting the total target, as public sector bodies are compelled to prioritise emissions reductions and re-invest in further transport and energy demand limiting measures.
- It is likely that this would bring about significant environmental benefits as it would also compel all public bodies to act rather than just the more environmentally conscious. Appropriate government support should be considered.
- There are organisations that currently provide advice and support (eg. Carbon Trust, Energy Saving Trust, Envirowise), consideration should be given to developing an initial single point of contact to streamline advice and make it easier for service users to access the correct service.
- Specific duties could include measures to ensure sustainable procurement and supply chain management that focuses on embedded carbon or emissions minimisation. Such measures can drive long-term improvements across private sector suppliers, but these must be properly implemented and vetted.

- All of Scotland's 32 Local Authorities have signed up to Scotland's Climate Change Declaration, highlighting increased awareness and support for action, however this should be specifically targeted within each authority to identify local sustainable resources, cost-effective adaptation measures, as well as short, medium and long-term strategies for reducing emissions across all LA services.

- Some public bodies and authorities have identified sustainability or climate change officers, however the onus of action and responsibility should be set firmly with senior public officials and service managers, such that effective action on reducing emissions is driven from board level. Senior public officials and service managers could even have salaries linked to climate change action and emissions reductions, as a means of driving concerted action across the public sector.

- Many public bodies and authorities already procure energy supplies from 'green' providers and sources; however, the key is to continually improve and combine procurement with energy/resource efficiency and demand reduction across all services. Each public body could be compelled to produce an energy/ carbon management and demand reduction plan across all services and buildings, with identified actions, responsibilities and timescales.

- This option could lead to actions that have significant environmental effects both positive and negative. Due to the range of possible actions, and without further detail on what these actions might be, it is not feasible to look at all the potential environmental effects. Therefore, when more detail is known about the duties a more targeted SEA could be undertaken.

Q25. Should the Bill contain enabling powers to introduce statutory guidance for certain public sector bodies (i.e. local authorities and large public bodies) on specified climate change or other environmental measures?
Why? Are there gaps in any existing guidance?
Q26. What should this guidance include?

- Should enabling powers placing a duty on the public sector be introduced, it makes sense to include a provision for introducing statutory guidance if required. Introducing statutory guidance in its own right (ie. in the absence of placing a duty on public bodies) is likely to be more beneficial than non-statutory guidance, as any activity falling within the attention of the statutory guidance, effectively places a duty to act in accordance. Over time, appropriate guidance could be extended to the private sector, eg. construction and development.

- This option could lead to actions that have significant environmental effects, both positive and negative. The potential environmental effects will be dependent on the statutory guidance provided. Appropriate guidance must include information on the consideration and benefits of energy demand reduction, transport measures (including reductions in fuel use and aviation) and potential environmental consequences of ill-considered action.

- Guidance could also include information from the energy advisory bodies previously mentioned, on the costs/benefits of localised energy supply systems, improving energy efficiencies of current building stock, embodied energy and life cycle assessment options. Therefore it is recommended that if guidance is developed, a more targeted SEA is undertaken.

Q27. Should the Bill contain enabling powers to create a requirement for certain public sector bodies (i.e. local authorities and large public bodies) to make regular reports on specific measures they are taking to tackle climate change (whether mitigation or adaptation) or other environmental issues?
Why? What should be included in such reports?

- This option is likely to have significant environmental benefits if it helps increase uptake of measures to tackle climate change and should help with best practice, lessons learned and information sharing.

- A requirement for public sector bodies to report on specific measures should be recommended in conjunction with a statutory duty to act and statutory guidance. Reports should be designed to improve transparency on climate action (mitigation and adaptation) and to feed into national reporting systems.

- Single, one-off, actions are not sufficient; climate change mitigation and energy demand reduction should be a continuous process. Reporting at least establishes a requirement for action and awareness, and will maintain focus over time. However, care must be taken (possibly through statutory guidance) that reporting requirements do not promote focus on action simply to demonstrate progress, as any action taken could have significant localised effects.

- A requirement could be included for public bodies to report on any environmental effects of measures taken to tackle climate change and emissions, which could help build an evidence base for future review or other SEAs.

- Any sectoral targets could feed into public body climate/ energy/ carbon action plans and reports with information on actions, effects, benefits and targets.

Q28. As a potential non-legislative vehicle, should current Best Value guidance be amended to take specific account of climate change mitigation and adaptation?
How should Best Value guidance be amended?

- Currently, the Local Government in Scotland Act (2003), Best Value Guidance includes a Chapter on making a contribution to Sustainable Development, but makes no specific reference to climate change, greenhouse gas emissions, energy efficiency or energy demand reductions. The Guidance document makes no reference to transport or transportation. There is no guidance on making reductions of any kind, in fact the word 'reduce' does not appear throughout the document. There is one occurrence of the word 'waste' in the accountability Chapter (10) on value for money.

- Best Value Guidance should be reviewed to reflect the changing priorities of national policy on climate change and to provide Local Authorities with clear direction on the wide range of issues to be considered as being within the remit of Local Government. Climate change mitigation and adaptation, and environmental considerations as a whole, should become a central feature of Best Value guidance. This could have significant environmental/ sustainability benefits. An SEA should be undertaken of any new Best Value guidance, as it is being drawn, up to ensure that unforeseen impacts and effects are limited.

Q29. Are there any amendments to existing legislation or any enabling powers needed to allow for variable charging (for example by local authorities) to incentivise action or eliminate perverse incentives?

- The SCCB should contain enabling powers to introduce such powers as a wide range of available mechanisms and incentives will be required to meet the overall reductions target. Any amendments to existing legislation or enabling powers should undergo environmental and social, or equality, impact assessments before being introduced as they could result in unforeseen social and environmental impacts.

Q30. Are there any provisions to help Scotland adapt to the impacts of climate change which should be included in the Scottish Climate Change Bill?

- In light of a future Scottish Adaptation Strategy, the SCCB could include provisions that ease the planning process for appropriate adaptation measures.

- Maintenance and protection of Scotland's high carbon (peaty) soils should be a priority for adaptation, as these have been identified as having the potential to become large carbon emission sources, rather than carbon sinks, as a result of warmer, drier weather. The SCCB could include provisions designed to limit the exploitation and degradation of these important soils.

Q31. Should provisions within the Environmental Assessment (Scotland) Act 2005, be amended in order to provide clearer links with the Climate Change Bill? If so, how should this be done?

- Many SEAs pay little attention to GHG emissions and focus primarily on flooding as the key climate issue. Amending the Act could enable commitments on actual emissions reductions and monitoring methods to be required for all public PPS in the wake of the SCCB. Similarly, future monitoring under SEA should identify key indicators related to climate change, emissions reduction action/measures and potential environmental effects.

- The SCCB could initiate a requirement that all national plans and strategies in key areas (eg. finance, enterprise, tourism, land use, transport, energy efficiency and generation) are revised to include quantified, and measurable, carbon reduction budgets and targets, in line with the proposed interim carbon budgets and 80% target. Associated reporting regimes, informed by appropriately designed SEA monitoring frameworks, would enable Government to assess which sectors are contributing equitably, and better identify the environmental consequences of action.

- Amending the Environmental Assessment (Scotland) Act 2005 to provide clearer links with the SCCB could require greater consideration of both likely greenhouse gas emissions and climate adaptation measures required within all public policy and decision making across Scotland. The Act could be reviewed to require that SEAs assess how the particular policy/ strategy/ plan or programme will work to meet the 80% reduction target.

- Depending on the policy under consideration, some key environmental factors should be given greater attention with respect to identifying likely climate implications, especially the anticipated effects on soil resources and carbon stores, effects on biodiversity adaptation and appropriate migration, effects on material assets and embodied carbon and the consequences of policy or guidelines on development decisions likely to result in emissions.

- Climate issues and inter-relationships must be recognised more effectively in assessments, which will have benefits across SEA topics. The strategic policy review element of SEA could adopt a hierarchical approach with the SCCB target heading the list of associated environmental protection objectives to be considered, such that all future policies are developed within the context of the statutory target for reductions.

Q32. What are the equalities implications of the measures in the proposals for the Scottish Climate Change Bill?

- This question is more appropriately addressed through a dedicated Equalities Impact Assessment (EqIA), however as SEA requires an assessment of impacts on population, it is likely that some measures to reduce emissions may lead to increased fuel bills both for power and transport during the transition to low carbon systems; therefore some of the most price sensitive members of the population may be further disadvantaged.

- Extreme care must be taken to ensure that action to meet SCCB targets does not exacerbate the conditions of those already in fuel poverty. Increasing fuel costs must be matched with use of the Scottish Fuel Poverty Indicator, improved identification of those in need, and appropriate mechanisms for support.

- Difficulties lie in the fact that those who are fuel poor are already energy conscious and most likely minimising demand, whilst it is those members of the population and business community that can afford higher rates that may be the most wasteful.

- Government must be willing to consider the implications of the SCCB target for those on welfare, in healthcare and in social housing and identify means to support those in most need to reduce fuel bills, improve efficiencies and insulation.

- In the long-term, as different mechanisms on carbon pricing, personal carbon budgets and allowances are considered, equality assessments should advise the adoption of specific options to ensure equality impacts are minimised.

Q33. Is there any existing legislation within the competence of the Scottish Parliament (devolved) which needs to be amended so that appropriate action can be taken by sectors in society to take action on climate change?

See comments box below.

Consultation Response:

RSPB Scotland would like to see changes to the legislation covering muirburn under the Hill Farming Act 1946.

Recent published studies show the growing season starting up to three weeks earlier in much of Scotland since 1961, with predicted changes of a similar magnitude over the next decade, as a result of climate change. The breeding season for moorland birds is similarly advancing in spring and therefore it is important that the legislation allow for changes to the muirburn dates. It would be helpful therefore, if the Climate Change Bill could facilitate such changes.

SEA Response:

The ability to amend dates for Muirburn activities could be classed as an adaptation measure that allows flexibility in response to climatic and seasonal change in Scotland.

This SEA was restricted to consideration of emissions reduction measures and therefore such issues were not originally addressed.

At the specific request of the SCCB Team, provisions to allow amendment of muirburn dates were assessed as part of the Post Consultation stage of the SEA.

The assessments are attached as Appendix I to this revised Environmental Report, and will be referred to in the SEA Statement.

6. Anticipated Significant Effects

6.1 Significant Effects by SEA Topic

6.1.1 Potentially significant and cumulative effects have been identified through the series of high level and detailed option assessments noted above.

6.1.2 The results of these assessments have been analysed and the tables below briefly summarise the effects (both positive and negative) of the Bill consultation paper options and possible emissions reduction measures by SEA topic. These should be read in conjunction with Section 5 and Appendix G. A summary of cumulative effects is also provided.

6.1.3 It is evident from the assessment results that options proposed in the SCCB Consultation paper are likely to lead to significant environmental benefits in the long-term. However, it is also evident from the options presented that many effects will be related to direct or indirect impacts of measures implemented under the Bill. Reassessment at the implementation stage is crucial in terms of determining the actual impact of measures.

Table 6.1 Potential Significant Effects of the SCCB Proposals (and Emissions Reduction Measures)

SEA Topic	Significant Effects of the Options
Climatic Factors	
Positive effects	• The trajectory of global emissions reductions from current rates to meet relevant international target by 2050 will impact upon the future severity of climatic change – a steeper trajectory (earlier emissions reductions) is more beneficial. • Domestically, interim carbon budgets, emissions trading, reporting and scrutiny mechanisms will help maintain the focus on continual action to reduce emissions into the latter half of this century. • Energy efficiency measures that lead to demand reduction offer the greatest potential to result in significant emissions savings in the short-term.
Negative effects	• Due to the small proportion of global emissions, an 80% reduction target in Scotland alone will not affect climatic changes, as we are locked into a legacy of change from previous global emissions; therefore existing climatic effects persist. • CDM/JI projects may help to reduce direct emissions but may not account for the embedded carbon in transport, technology or knowledge transfer and potentially could have significant adverse local environmental effects. They also do not encourage domestic reductions. • Targeting CO2 alone may inadvertently encourage the use of other greenhouse gases as people look for alternatives. • Energy efficiency may lead to increased emissions if people buy and use more energy efficient products, eg. cars are now more efficient but the increase in numbers negates efficiency gains.
Cumulative Effect	The overall cumulative effect of the proposed SCCB target will be to reduce the GHG emissions burden and drive the adoption and integration of a low carbon economy in Scotland. It will also work to raise the profile of climate change and personal responsibility among the people of Scotland. This will result in long-term benefits across environmental media and, should other countries follow suit, significant progress towards limiting the worst effects of climate change by preventing catastrophic change.

SEA Topic	Significant Effects of the Options
Biodiversity, Flora and Fauna	
Positive effects	• Limiting resource use and the overall demand for energy will have beneficial impacts for biodiversity. Direct benefits will also occur from reduced mineral extraction activities associated with a reduction in overall non-renewable resource use and potentially less intensive farming methods. • Secondary benefits will arise from reduced pressure on air, soil and water resources and less pollution of those resources. • Energy generation can be extremely water resource intensive, so energy efficiency measures that reduce consumption and generation should provide positive impacts for the water environment and aquatic biodiversity through reduced abstraction. • Modal shift, resulting in reduced private car use and the potential for limiting growth in road infrastructure will have a significant beneficial impact on biodiversity with an improvement in roadside air quality, tranquillity, a reduction in noise pollution and the stabilisation of infrastructure development. • Emissions trading schemes and carbon offset projects can present significant biodiversity benefits in receiving countries, if they are appropriate to the local environmental conditions and well planned. For example, protection of endangered habitats such as rainforests and tree planting. • Measures to help ensure that the 80% reduction target is met should have secondary benefits for biodiversity as long as mitigation measures are well planned.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions; therefore existing climatic pressures on Scotland's biodiversity persist. • Localised impacts of renewable energy developments on habitats and ecology. • Inappropriate crop planting for biofuel could have significant adverse effects of biodiversity, flora and fauna and species of crop should be chosen carefully to reduce any negative impact. • Large scale on shore and off shore wind farms could potentially have significant impacts on bird populations, although these impacts are not yet fully understood. Offshore wind energy developments may negatively impact sensitive sea bed habitats. • Wave power and hydropower can cause disturbance to sea and river bed environments as well as disrupting sediment movements which can have catastrophic effects on nutrient supplies and consequently food supplies for aquatic fauna. • New infrastructure developments to provide facilities for a low carbon economy/society have the potential to negatively affect biodiversity. For example recycling plants and factories to produce new green technology, new railway, tram and bus infrastructure. • If projects resulting from emission trading schemes are poorly planned and the receiving countries environmental conditions poorly understood then biodiversity, flora and fauna could be significantly adversely affected. Often poor legislation or limited enforcement exists to ensure stringent controls on development and siting of schemes. • Poor planning for emissions reductions measures due to targets that are either too frequent (annually) or too long term (no interim targets) may result in extreme short term measures being introduced without sufficient regard for the impacts on biodiversity. • In order to be practical, carbon capture from large-scale point sources such as power stations will involve limiting the transport distance and the length of pipeline used. This could result in new power plants being built at locations near to storage sites, which would have a detrimental impact on biodiversity at those sites. Effects such as ocean acidification could have a severe negative impact on biodiversity, flora and fauna.
Cumulative Effect	The proposed SCCB is likely to have long-term cumulative beneficial impacts for Biodiversity. However, as the precise measures implemented to meet the target are as yet unknown, effective assessment and mitigation of localised impacts must take place, as some measures, if implemented inappropriately, could lead to significant adverse effects.

SEA Topic	Significant Effects of the Options
Water	
Positive effects	• Limiting resource use and the overall demand for energy will have beneficial impacts on water resources. Reduced water use aids energy efficiency through pumping and treatment energy savings. • A reduction in the use of fossil fuels will also have a significant beneficial impact on water resources through reduced mineral extraction. • Targeting all GHG's could be associated with a reduction in less intensive farming methods. This would have significant beneficial effects on the quality and quantity of water resources in both Scotland and producer countries through reducing diffuse pollution impacts. • Potential beneficial impacts in receiving countries from emissions trading schemes if schemes include reducing emissions and pollution to water resources. Also schemes such as habitat protection and tree planting can help protect and mange water resources.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions; therefore increased seasonal flooding and drought risks persist. • Localised impacts of energy projects, especially biomass conversion, with effects of irrigation on local water tables and potential diffuse pollution impacts through fertiliser use. Intensive biomass production can exacerbate soil erosion; surface runoff can be nutrient rich, leading to potential eutrophication of receiving water bodies. • Localised impacts of projects in other countries credited for emissions trading. • Ocean storage as part of a carbon capture programme could have significant adverse impacts on oceans; ocean acidification could be one side effect with negative consequences. • Hydro generation may disrupt water flows with knock on consequences for habitats and coastal and fluvial sedimentation processes with secondary effects on flooding etc. The construction phase of these technologies may also have implications on water quality. • Potential negative effects may be realised on waterbodies as a result of marine and water-based renewables projects.
Cumulative Effect	The proposed SCCB is likely to result in long-term cumulative benefits for Scotland's water environment, as a drive on resource efficiency will help people recognise the benefits of limiting their use of the water resource. Other benefits likely through reduced polluting incidents and diffuse pollution in general. As the precise measures to meet the emissions reduction target are unknown, effective assessments of impacts on water quantity and quality will be required at the appropriate stage of any development or land use decisions.

SEA Topic	Significant Effects of the Options
Air Quality	
Positive effects	• Reducing GHG emissions will have a significant positive impact on air quality across a number of emissions sources, including industry and transportation. • Emissions trading will result in beneficial air quality impacts, not only in Scotland, but also in receiving countries. Measures in receiving countries likely to be the installation of measures to improve emissions from industrial plants and also other schemes could provide low emissions public transport etc • The trajectory of domestic emissions reductions from current rates to meet the target by 2050 will impact upon future air quality – a steeper trajectory (earlier emissions reductions) is more beneficial. • A reduction in fossil fuel use and wider resource use in source countries for fossil fuels (e.g. coal from Eastern Europe) and goods.
Negative effects	• Localised impacts of CHP, energy from waste and combustion projects.
Cumulative Effect	The proposed SCCB is likely to have significant long-term cumulative positive impacts on air quality.

SEA Topic	Significant Effects of the Options
Human Health	
Positive effects	• Reducing GHG emissions will benefit air quality which will have a knock on benefit for Human Health, particularly through reduced incidence or risk of respiratory disease. • Associated measures to reduce transport emissions, driven by the statutory requirement of the Bill, such as improved modal shift will also reduce background and urban air pollution. • Modal shift may also increase the number of people walking and cycling and appropriate infrastructure and information to facilitate this will have beneficial impacts on obesity, heart disease and general levels of fitness. • Measures to reduce resource consumption and embedded carbon or GHG emissions may lead to increased awareness of environmental costs, less intensive farming methods in the long-term, and a move towards fewer processed foods, and therefore a beneficial effect on Human Health. • Reducing the carbon emissions from the existing housing stock through energy efficiency, including CHP and renewable energy production, has the potential to improve cold and damp, inefficient housing which can lead to detrimental health effects.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions; therefore current human health risks from flooding and heat effects persist. • Localised air quality impacts of CHP, energy from waste and combustion projects. • Rising energy costs may lead to health impacts for people in fuel poverty. • New energy efficiency and renewable energy technologies may have impacts that are presently little understood. Reports are emerging of side effects of energy efficiency light bulbs on those who suffer from migraines and epilepsy, and noise pollution from wind turbines has been linked to ill health. More work is needed to assess effects on health from these new technologies. • Potential for localised impacts and potential benefits of projects in other countries credited for emissions trading.
Cumulative Effect	Action to meet the proposed SCCB target is likely to have long-term, cumulative beneficial impacts on Human Health. An overall reduction in GHG emissions, implied resource/ materials/ waste and energy efficiency will all help improve human health conditions through reductions in pollution and improvements for people in fuel poverty. However, as precise measures to meet the target are as yet unknown, care needs to be taken as some measures, if implemented inappropriately, could lead to adverse effects on Human Health.

SEA Topic	Significant Effects of the Options
Population	
Positive effects	• Increased awareness of personal responsibility for emissions and embedded carbon consumption across all products may result in significant emissions reduction (long-term). • Reducing emissions may result in significant benefits for populations through improved quality of life, for example, improved public transport, less processed food through less intensive farming practices, improved visual amenity as a result of reduced landfill and extractive industries etc. • Energy efficiency measures have potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty and leading to a better quality of life. • CHP offers significant benefits if social housing and deprived communities are targeted as reducing fuel poverty will have direct benefits on human health especially to those who are most vulnerable. • Improving the carbon emissions from existing housing stock has the potential to improve cold and damp inefficient housing which will improve the quality of many peoples lives especially those on low incomes. Energy efficiency and micro generation may have potential financial benefits through reducing the need to buy as much energy and also the potential with micro generation to sell it back to the grid. • Potential benefits of projects in other countries credited for emissions trading. Schemes that

SEA Topic	Significant Effects of the Options
	bring improvements to the quality of the environment will benefit standards of living, and in subsistence farming communities protection of soil and water resources will bring significant benefits. Technology transfer, job creation and knowledge sharing can all have positive social and economic impacts. • If SCCB encourages other countries to take action, it will help to avoid the dangerous impacts of climate change and therefore increase quality of life, both locally, and globally.
Negative effects	• The SCCB is likely to have short to medium term negative effects on Scotland's population as prices and systems change, eg. more expensive food if less intensively farmed, and imports realistically priced to reflect embodied carbon and emissions costs. • The trajectory of domestic emissions reductions from current rates to meet the target by 2050 will impact upon Scotland's population – a steeper trajectory (earlier emissions reductions) is more environmentally beneficial, but may be more (financially) costly to business and the population. • Some vulnerable sections of society such as low income families, the disabled, the elderly and the rural poor may be financially penalised or may suffer from reduced accessibility to services if financial mechanisms are used, eg. to discourage energy use, car use and aviation. • Wider effects could result in a lower standard of living, with more expensive travel, fewer foreign holidays, less choice of out of season food, higher costs for food, as energy and transport fuel price rises means less to spend on luxuries. • Poorly planned emissions trading schemes for forestry plantation or protection need to ensure that they do not result in people being 'removed' from or denied access or prevented from using forest resources such as wood fuel or non timber forest products, which could have disastrous effects if not well managed.
Cumulative Effect	Action to meet proposed SCCB targets will have mixed cumulative effects on population.

SNH Consultation Comment:

Parts of Table 6.1 stray away from environmental effects.

For example, in the section dealing with population there are references to business costs, lower standards of living, expensive travel, foreign holidays, out-of-season food, food costs, fuel costs for transport and limits on expenditure on luxury items.

We agree that these are potential outcomes, though they will depend in detail on the mix of policy measures pursued.

However, we suggest that all of these lie outwith the scope of this SEA assessment.

We note that the potential population benefits of mitigating climate change – for example by avoiding floods, famine, storm damage, drought, heat mortality across the planet – are not identified within this SEA.

We accept that these not be identified, but to be consistent, neither should potential social disbenefits.

SEA Response:

As climate adaptation is to be considered under a separate study, adapting to climate change impacts were specifically excluded from this assessment.

The ER does state this as being a limitation to analysis; however, as this study was to focus on the environmental implications of emissions reductions, the statutory SEA requirement to discuss effects on population means that the particular range of impacts discussing quality/ standard of living can be justified in this case.

An Equality Impact Assessment of the proposals for the SCCB will be published prior to the Bill's introduction to the Scottish Parliament.

The inclusion of this comment box is considered sufficient to address SNH's concerns.

SEA Topic	Significant Effects of the Options
Soil	
Positive effects	• Limiting resource use and the overall demand for energy will have beneficial impacts on soil resources. A reduction in the use of fossil fuels will have a significant beneficial impact on soil resources (outside of Scotland) as coal mining causes serious disruption to the quantity and quality of soil resources. • A move to an overall reduction in resource use will help reduce the levels of mineral extraction activities in both Scotland and in countries that supply aggregates, etc., for Scotland's construction industry. Mineral extraction causes serious disruption and degradation to soil resources. • Targeting all GHG's would be associated with a reduction in overall non renewable resource use and less intensive farming methods by potentially reducing the use of nitrogen fertilisers and intensive cattle rearing. This would have significant beneficial effects on the quality and quantity of soil resources in Scotland. • Emissions trading schemes and carbon offset projects can bring significant benefits to receiving countries in terms of their soil resources if they are appropriate to local environmental conditions, well planned and take account of environmental resources. For example protection of habitats will also protect soils, and tree planting can reduce soil degradation (wind and water erosion and landslides). • Improving the environmental performance of industries will help reduce emissions and pollution, including those to soil.
Negative effects	• Localised impacts of renewable energy developments on soil resources. • Potential for enhanced GHG release from high carbon soils. • Inappropriate crop planting for biofuel could have significant adverse effects of soil resources, and the species of crop should be chosen carefully to reduce any negative impact. • Wave power and hydropower can cause disturbance to sediment movements in sea and fluvial environments, having a significant negative impact on soil resources in surrounding locations. • New infrastructure developments to provide facilities for a low carbon economy/ society have the potential to negatively affect soil resources. For example recycling plants and factories to produce new green technology, new railway, tram and bus infrastructure could all result in soil disruption and soil sealing. • If projects resulting from emission trading schemes are poorly planned and the receiving country's environmental conditions poorly understood then soil resources could be significantly adversely affected. Often poor legislation or limited enforcement exists to ensure stringent controls on development and siting of schemes. • Poor planning of emissions reductions measures due to targets that are either too frequent (annually) or too long term (no interim targets) may mean extreme short term measures are brought in without due regard for the impacts on soil. • New power plants being built at locations near to storage sites as part of carbon capture programmes would have a detrimental impact on soil resources at those sites.
Cumulative Effect	The proposed SCCB target will likely have long-term, positive cumulative impacts for soil resources through resource efficiency measures, action to maintain high carbon soils and prevent emissions and the potential for increased recycling of suitable organic wastes to land. Short-term mixed impacts are likely; dependent on the measures implemented under the auspices of the proposed Bill, and may result in significant adverse effects on soil resources. As the precise measures used to meet the target are as yet unknown, care needs to be taken to ensure soil resources are appropriately considered in any development or land use decisions.

SEA Topic	Significant Effects of the Options
Material Assets	
Positive effects	• Phasing out fossil fuel power stations will significantly reduce Scotland's emissions burden. • Reduced use of fossil fuels and increased efficiency in raw material use will reduce pressure on extractive industries. • Emissions from energy use in new buildings will improve through improved energy efficiency requirements. • Reducing emissions will lead to renewed investment in public transport as modal shift is encouraged. • Energy infrastructure development to allow distributed generation and integrated feed-in from distributed or microgeneration systems will have long-term benefits in reducing emissions. • A well managed, investment structure and phased replacement of fossil fuel generation with renewables, distributed generation and grid infrastructure development to encourage feed-in will result in long-term emissions reductions and balanced energy supply to meet demand.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions; therefore continued support for fossil fuel extraction and use will only exacerbate the rate and extent of change. • Renewable energy development will have embedded carbon in materials used and emissions associated with installation and access. • Public transport expansion, construction associated with new 'green technologies' and the production of the new green technologies themselves will all have embedded carbon in materials used and emissions associated with them. • Continued emissions from existing (older) building stock, some reductions feasible through remedial insulation and energy efficiency measures, although there can be difficulties with some retrofitting. • If energy demand becomes the only factor considered, may lead to demolition of existing inefficient buildings and a need for new materials to build a replacement. • Transport infrastructure, rail, air and maritime emissions continue to increase. • The UK grid was not designed for distributed energy generation and use with renewables. Centralised production and supply is too energy and emissions intensive. Infrastructure needs updating to allow feed-in from distributed sources or current trends continue. This may cause an increase in resource use
Cumulative Effect	The SCCB proposals are likely to lead to positive cumulative impacts on Material Assets but care will have to be taken to ensure that, should emissions reduction measures increase short term exploitation of assets, effective assessments of localised environmental effects and suitable mitigations are provided.

SEA Topic	Significant Effects of the Options
Cultural Heritage (including Historic Environment)	
Positive effects	• Long-term benefits likely in reducing GHG emissions as these and associated gases can have detrimental effects on historic buildings and features.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions, therefore current concerns and risks to the historic environment persist. • Although most energy efficiency measures will be internal to buildings, some measures may be out of character with historic buildings. Although designated buildings are afforded some protection against unsympathetic measures, it is those buildings that are not designated but still of local significance that are most at risk. • If energy demand becomes the only factor considered, may lead to demolition of existing inefficient buildings to the detriment of cultural heritage and the historic environment. • Emissions trading schemes if poorly planned could have a negative impact on the recipient countries historic environment, archaeology and cultural heritage. • A poor understanding of local conditions could lead to local cultural practices not being identified/ understood and inadvertently disrupted or adversely impacted by schemes designed to 'improve' the local environment. Local archaeology could also be adversely impacted if care is not taken to explore sites before development, as knowledge about archaeological sites may be poorly developed and limited legislation and enforcement may to exist to protect it.
Cumulative Effect	SCCB proposals will likely have a positive cumulative impact on Cultural Heritage, but emissions trading schemes need to be carefully planned to ensure that negative impacts do not result outside Scotland.

SEA Topic	Significant Effects of the Options
Landscape	
Positive effects	• Reduction in extractive industries as a result of reduced fossil fuel use and a reduction in the need for construction aggregates due to increased efficiency and recycling. • Phasing out fossil fuel power generation will improve landscape quality. • The SCCB may lead to strengthening planning measures to discourage the use of greenfield sites (soil disturbance) or without existing without public transport links (transport emissions), which could help prevent further landscape degradation.
Negative effects	• The 80% reduction target will not affect climatic change in itself as we are locked into a legacy of change from previous emissions; therefore concerns over changing land use (and resulting GHG emissions) and land management at the landscape or catchment scale persist. • Localised visual impact of renewable energy, turbines, biomass conversion, microgeneration and large scale CHP in townscapes, off-shore development effects on seascapes. • Difficult choices and decisions must be made on the effects on landscape when evaluated against benefits to climate systems and consideration of localised environmental sensitivities. • Although most energy efficiency measures will be internal to buildings, insulation measures such as double glazing and external cladding could have significant adverse effects as could the orientation and positioning of new build projects that have energy efficiency in mind. • New power plants being built at locations near to storage sites as part of carbon capture programmes would have a detrimental visual impact. • Potential that poor legislation or enforcement in recipient countries ensures stringent controls on development for emission trading schemes to ensure landscape character is protected. • Inappropriate forestry or bio fuel schemes or renewable energy schemes could adversely effect landscape /townscape character.
Cumulative Effect	The proposed SCCB will likely have mixed cumulative impacts on landscape with some gains made but new challenges likely to arise.

7. Recommendations for Mitigation and Enhancement

7.1 Maximising Environmental Gain in the SCCB

7.1.1 The previous assessments show that the proposed SCCB and measures likely to be implemented as a result of it, will generally promote significant environmental benefits. However care must be taken with legislation that deals with an environmental topic, as benefits will not be uniform and conflicts can exists across the environmental spectrum. Policies and action on reducing emissions will not necessarily be benign across all aspects of environmental media.

7.1.2 Annex 1 of the SEA Directive requires the Environmental Report to include measures to prevent, reduce or offset any significant adverse effects. Many of the environmental effects identified in this report are likely to be as a consequence of measures which may be brought forward as a result of the Bill, rather than a direct result of SCCB proposals, as any environmental effect will largely depend on the nature of the measure implemented. The recommendations here refer to such indirect effects of the Bill. Many of these measures were first mentioned in the assessment tables (Section 5) and have been further expanded on below in Section 7.2.

7.1.3 The following key points are important to note for future considerations of emissions reduction measures implemented under the Bill:

- Take account of the inter-dependencies of different aspects of the environment.
- Recognise the long term threat of climate change to the environment when making difficult decisions about environmental trade offs, but also that carbon reduction should not come at any cost; environment effects should be carefully considered.
- Apply long term thinking to problems as well as identifying quick wins; for example, investment in research and development may help identify long term solutions.
- More coordinated and better-integrated inter- and intra- sectoral action is required, as well as working towards policy harmonisation throughout and between Governments.
- Environmental, social and regulatory assessments may be needed at all stages of implementation (for example SEA, EIA, RIA, HIA, EqIA).
- The consequences of climate change are global, and could be catastrophic in nature. There is a growing need to reduce emissions, adapt to changes that are already happening and plan and prepare for other expected climate change effects (such as potential GHG release from Scottish soils). Over time, climate change adaptation and emissions reduction is more likely to require an integrated approach.

7.2 Mitigation and Enhancement by SEA Topic

7.2.1 The following section discusses potential prevention, reduction and offset measures for the significant adverse effects identified in Section 6. Some of these recommendations are within the remit of the Scottish Government while others presently are not. However they are included here as it is important to develop an understanding of where change needs to occur, such that the Scottish Government can seek to influence change, and also to understand what measures are needed from other public bodies, such that influence and guidance can be directed.

7.2.2 Comments presented below reflect the independent conclusions of the consultancy team.

Climatic Factors
(Annex 1 of the SEA Directive requires Climatic Factors to be assessed as a topic in its own right)

- Scotland holds roughly 0.1% of the world's population, but accounts for around 0.2% of global CO2 emissions, which is a disproportionate amount. Meeting the 80% target will have no real impact on climate unless other countries follow the example set. Although all reductions are important, regardless of source location, the more sustainable and responsible approach would be to drive action to meet the proposed SCCB target through domestic reductions, as far as possible, with mechanisms to credit Scotland's emissions overseas employed only to address the most difficult emissions to remove. Should other countries follow this example, and substantially limit their domestic emissions, then there may be real positive impacts on global climate change.

- It is vital that the SCCB drives integrated, cross-sectoral policy making and review at all levels, where potential conflicts with the target are identified and resolved, such that all policies work towards emissions reductions, limiting conflicts. A key factor will be effective resourcing for monitoring strategies that actually drive remedial action and review. Collecting data and commitments to monitoring must be augmented with the ability to take corrective action.

- The 80% reduction target should drive measures in Scotland to improve energy efficiency, reduce fossil fuel use and phase out high carbon processes.

- Reporting on actual emission levels and reductions should be encouraged. Credits and capped allowances should be counted, however to maintain transparency, these should be clearly distinguished from actual reductions.

- Introducing measures to report action and progress towards targets must be augmented with recommendations that suitable SEA/EIA and Life Cycle Assessments are employed to ensure that the most sustainable carbon and energy choices are made, in consideration of wider environmental implications and mitigation of impacts on other environmental receptors.

- To deliver SCCB targets, the measures discussed in the Scottish Climate Change Programme (2006) document should be reviewed to go further and newly developed policies should include commitments on emissions and identified reduction measures.

- Action to meet targets set by the SCCB should take account of, and drive adoption of, the adaptation strategies discussed in the Potential Adaptation Strategies for Climate Change in Scotland (2001) report and in any new Scottish Adaptation Strategy. As a guiding principle, adaptation measures should not increase emissions.

- An integrated rural strategy for Scotland, facilitating greater integration between land managers, public bodies and support mechanisms, could help drive appropriate coordinated action that improves soil and natural heritage management whilst limiting land use GHG emissions.

Biodiversity, Flora and Fauna

- The SCCB should drive suitable and appropriate action on renewables but not without due regard for biodiversity. Any action taken to meet SCCB targets should be mindful of potential impacts on natural habitats and the adaptation of habitats and species to changing climate. Best practice must be employed during renewables construction in order to minimise impacts on biodiversity. Appropriate EIA, which follows location guidance, should help minimise disturbance.

- Biodiversity breaks, inter-cropping and uncultivated boundary regimes should be a central focus when developing biomass resources. Moving to suitable woody biomass, or woodland pasture, with the provision of appropriate habitat connections will help facilitate species migration. Options for land use change to biomass production should be subject to appropriate EIA.

- The EU Habitats Directive (92/43/EEC) can have a major influence on the development process and could represent a constraint on emissions reduction measures driven by the SCCB. Adequate consideration of impacts affecting biodiversity should be considered at all levels, from strategic planning to project management and appropriate EIA/ SEA/ AA should help.

- The Scottish Forestry Strategy highlights the potential for forestry to make a significant contribution to mitigating and adapting to climate change over the coming decades. Action to meet SCCB targets should encourage measures including afforestation, biomass use, increased use of wood for construction, and reducing timber miles. However, these must be advised by appropriate assessments of impacts upon other environmental receptors, including biodiversity, long-term soil quality, the water environment and cultural heritage.

- Care should be taken to ensure that schemes such as tree planting only occur in appropriate habitats and with appropriate species where great care is taken to understand local conditions. Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing local biodiversity effects to avoid impact transference.

- Long-term thinking and planning actions will avoid short-term reactionary measures that could seriously impact biodiversity resources.

Water

- Options for land use change to biomass should be subject to appropriate EIA, assessing impacts on local water environments. Measures are included within the Biomass Action Plan, which must be properly adhered to and evaluated.

- Similarly, any action to improve the emissions impact of Scottish agriculture, advised by the upcoming sectoral Climate Change Action Plan, should help improve water environments by having a knock-on effect in reducing diffuse pollution effects. Agricultural best practice mitigation is required

throughout the life cycle of biomass production. Riparian zones and uncultivated field borders should protect water environments. Biomass production should not exacerbate intensive agriculture/ diffuse pollution/ fertiliser emissions.

- Provisions and actions brought forward as a result of the SCCB should not contribute to deterioration in water quality or lead to targets being missed e.g. compromise the number of water bodies reaching "good ecological status", targeted under the EU Water Framework Directive. This includes all scales and forms of hydro-generation projects. Consent applications for hydro projects must be accompanied by suitable assessments of low flow effects and impacts on ecology. Short term project mitigation and best practice is required to avoid construction impacts.

- Systemic water leakage should be addressed as a priority measure to improve energy efficiency and water resource efficiency. Education must reinforce linkages between water use/ efficiency and energy use/ efficiency.

- Careful testing and research needs to be undertaken to understand water resource effects before carbon storage is implemented.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing localised effects on water environments to avoid transference.

- The upcoming Flooding Prevention Bill may help address domestic adaptation strategies.

Air Quality

- Appropriate technology selection, based on life cycle analysis, EIA and the energy efficiency hierarchy should drive the introduction of combined technologies such as anaerobic digestion, gasification and CHP over purely electricity from direct waste incineration. Long-term carbon accounting and maximising fuel efficiencies should direct investment choice, rather than short term cost considerations.

- Air quality impacts of biomass/ waste combustion projects should be scrutinised appropriately through EIA and controlled through existing local air quality and pollution control regimes. CHP requires real heat recovery and use to maximise energy efficiencies. These issues apply even at the microgeneration scale.

- The SCCB target could help drive action on other environmental quality targets, by encouraging greater action on transport, waste management and other potentially polluting activities. Overall commitment to air quality should be taken into account, particularly in terms of potential influence of land use decisions, specific contributions of the transport sector and local air quality implications of energy choices. In particular, there is a need to focus on reducing vehicle use in order to improve air quality in Scotland's urban centres.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing local air quality effects to avoid impact transference. Programmes that improve local air quality by reducing emissions from existing industrial plants and transport should be a high priority.

Human Health

- Increasing healthcare needs and tourism numbers suggest priority for micro-renewables support for health and tourism facilities to reduce demand on primary energy production.

- Consent or grant applications for community heating, CHP, energy from waste or combustion projects should be accompanied by a suitable assessment, possibly a Health Impact Assessment, of air quality and human health effects.

- Financial incentives are required to drive energy efficiency improvements within older properties and to encourage widespread uptake. Individuals may not take action if initial costs are prohibitive. Energy efficiency incentives could also limit the impact of fuel poverty on high risk groups.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing local health effects to avoid impact transference. Projects need to take account of local health needs and take great care not to adversely affect the conditions of the local population who may often already be living in extreme poverty.

- Government should promote the long-term health benefits of moving to low carbon systems and limiting all GHG emissions, including transport emissions.

Population

- Energy efficiency and demand reduction present the best opportunities for reducing emissions in the short-term; however changing end user behaviour is difficult as it is not purely technical in nature. Efficiency initiatives must be accompanied by effective education to ensure people are informed and are aware of the cost and environmental benefits of efficient use.

- Significant investment in education is required, at all levels, to encourage personal responsibility and realise behavioural change. Opportunities to incorporate effective energy awareness amongst business leaders and senior managers will encourage buy-in at employer levels and develop an organic cascade of efficiency measures/ messages from the top-down.

- Financial costs associated with chosen emissions trajectories must be spread equitably and the polluter pays principle should be applied, with provision made for those in hardship and fuel poverty. Health Impact Assessment, Sustainability Assessment, Equality Impact Assessments should be utilised to ensure energy efficiency measures, implemented under the SCCB, are targeted effectively at low income and vulnerable groups. Future domestic trading schemes must not disadvantage those who are unable to afford, or have access to measures, or inadvertently impact upon vulnerable members of society, such as the elderly or disabled.

- Product prices must evolve to incorporate energy and embodied carbon costs to encourage behaviour change. Life cycle assessments and energy ratings for all consumer products should become the norm, with inefficient products and those with high embodied carbon phased out.

- Financial mechanisms are required to reduce vehicle use or stricter standards imposed on manufacturers to improve fuel efficiency, as voluntary modal shift is unlikely to deliver the high, long-term and continued savings required.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing effects on local populations to avoid impact transference. CDM must ensure transfer does not lead to local environmental degradation or have a negative impact on the local population, and their livelihoods, as many communities already live in extreme poverty. Ideally, transfer is based around the principles of sustainable livelihoods and long term, may lead to enhanced opportunity and new local industry.

Soil

- SPP6 and SNH provide location guidance for renewable energy developments, which should be strictly adhered to in order to avoid increasing risks of high carbon soils GHG release. Existing planning regime should offer protection to sensitive/ protected habitats, however soil issues and potential for increased GHG emissions should be expressly considered through EIA and in planning decisions for large installations or community sites.

- At the microgeneration scale, the planning regime could be reviewed to allow easier integration of measures not covered by permitted development. Cumulative soil impacts may be limited by providing additional guidance on positioning microgeneration technologies.

- SCCB targets and the Biomass Action Plan for Scotland (2007) should help encourage appropriate development of the biomass sector. Options for land use change to biomass should be subject to appropriate EIA and provide a suitable assessment of impacts on the local soil environment, as a condition of relevant grant criteria. Life-cycle assessments of the land use change would help identify the most sustainable options.

- Carbon sequestration in soils offers part of the long-term solution but may be impacted negatively by increasing temperature and droughts resulting in net emissions from peats. Requires appropriate evidence base and active habitat management to minimise risks.

- Hard standings and soil sealing for new infrastructure should be minimised as far as possible, with an increased emphasis on brownfield redevelopment. Any new development should incorporate SUDS systems to minimise the impacts of soil sealing as well as appropriate development EIA, planning and best practice measures.

- Promote the processing of waste soils and soil materials into secondary aggregates. Encourage the recovery of waste soil material as opposed to disposal and primary extraction at all opportunities.

- There is a need for Scottish agriculture to adapt and manage the risks associated with climate change and to make its contribution to mitigation. Actions to meet SCCB targets should seek to enhance the opportunities for the agriculture sector to both reduce its own emissions, while also offering potential mitigation strategies e.g. development of carbon sinks, reduction in livestock methane emissions.

- Appropriately managed organic waste recycling can improve soil carbon content, increase water retention and reduce flood risks and targeted inputs and NVZ guidance/ requirements could be extended to all agricultural businesses. SG/ERAD are in the process of producing an Agricultural Climate Change Action Plan, which may offer more informed detail and additional insight to help advise future action in the sector.

- The SRDP should help contribute to SCCB targets, particularly in terms of climate adaptation and wider environmental benefits. Land Management Contracts and measures to improve environmental stewardship within the land management sectors should help maintain soil resources.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice when assessing local effects on soils to avoid impact transference.

- Long-term planning will help avoid short-term reactionary measures that could seriously impact non-renewable soil resources. The upcoming Scottish Soil Strategy may help address domestic adaptation strategies and the maintenance of high carbon stores.

Material Assets

Energy

- Short-term investment in rapid renewables growth could lead to phasing out of conventional fossil fuel supply; however renewables projects should be subject to appropriate SEA/ EIA/ AA and planning consent to identify impacts and develop effective environmental mitigation strategies. In particular biomass projects should be subject to suitable EIA or AA as a pre-condition to any relevant grants or awards with effective mitigation strategies developed.

- Small-scale and micro-renewables will reduce loading and strain on the grid. Grid infrastructure should be updated to encourage distributed generation and feed-in to the network from community and micro-renewables to realise maximum benefit. This may be outwith the remit of devolved policy; however Government should lobby/ encourage forward planning for grid infrastructure investment and upgrades to support the supply/ demand and growth of all renewable energy forms. Must be done with minimum of disruption and environmental impact.

- Technological fixes such as carbon capture and storage do not reduce upstream energy emissions, and capturing end-of-pipe emissions may detract from investment in other more immediate and 'green' technologies. Emissions from fossil fuel power stations may be captured and stored through CCS, but this could present other environmental problems. Support for CCS should be considered in light of further research to identify and manage potential impacts before it is implemented.

Waste

- Investment decisions for waste facilities should consider maximising carbon efficiency in conjunction with BPEO. Pre-treatment of biomass to release natural gas will improve fuel efficiencies. Reduced waste to landfill will extend operations whilst improving energy security. The principles of the waste hierarchy must also include maximised energy potential and minimised GHG emissions.

- Landfill gas (methane) is now routinely collected, however separation of organic waste at source would allow more efficient treatment and gas collection. Anaerobic digestion of organic wastes followed by incineration allows win-win results with efficient collection of methane and CHP incineration to maximise calorific efficiency.

- The Scottish Government should encourage the most polluting waste management facilities to adopt alternative technologies and use grey water for waste processing activities. In the medium-long term, ensure all former and present inert waste management sites are re-developed with a view to enhancing the local environment and for the benefit of local populations.

- Regulatory measures and strategic drivers should encourage recycling in multiple occupancy dwellings and measures should be put in place to ensure the waste management needs of low income families are met.

- Ensure innovative methods of waste management are introduced for remote rural locations, such as community skips.

- Encourage consideration of possible waste production at the design stage by promoting lifecycle assessments for new products.

- Promote the use of secondary aggregates in new builds and other construction activities. Use procurement as a driver and a controlling mechanism for reducing waste and promoting resource management.

- A national level capacity and infrastructure study would facilitate better planning and communication of the need for waste management facilities. Recycling facilities need to be of appropriate scale and take into consideration landscape impact. Ensure that during and post operation efforts to integrate the facilities within the landscape have a beneficial impact.

Built Environment

- Building and engineering standards need strengthening to account for carbon emissions throughout the design, procurement, transportation and construction phases, and the planning system could require consideration of carbon issues to be accounted for in applications and decisions. The SCCB target could lead to carbon becoming a material consideration in planning and consent decisions, possibly through amendments to the Planning etc (Scotland) Act 2006.

- Life cycle or input-output analyses should apply to future development consents to encourage maximum energy and emissions efficiency throughout the development cycle.

- Sustainable design guidance/ requirements should be strengthened to require local sourcing wherever feasible, and maximise passive energy gain in all developments.

- Civil engineering and building standards/ codes need strengthened to prioritise linkages between activities, material choices and emissions/ efficiencies. Environmental and energy efficiency award schemes should be strengthened to incorporate whole project/ life cycle costs.

- EIA may not recognise cumulative development effects therefore SEA guidance should be strengthened to reprioritise consideration of emissions and climate implications.

Transport

- Fuel prices will continue to rise with global demand and diminishing supplies, alternative win-win fuels should be actively supported to encourage market penetration. The SCCB target will help drive biofuel adoption in Scotland, promoting uptake and integration of biofuel mixes and biodiesel. Biodiesel from waste should be seen as a win-win option and more eco-friendly than the primary production and extraction of fuel from biomass.

- The Renewable Transport Fuel Obligations Order (RTFO), whilst reserved to Westminster, is likely to be an important mechanism by which the targets of the SCCB can be realised. The SCCB target may help inform future incarnations of the Order as the potential for GHG mitigation in this manner is explored to help support entrants and innovation.

- Routinely screening imported biofuels to determine sustainable source and local impacts mitigation before sale in Scotland would be beneficial, although international trading rules may present barriers to selection and screening.

- Lobbying for rapid international agreement on aviation and maritime emissions would help maintain target credibility and buy-in from other sectors. May be possible to start accounting for UK domestic aviation and commercial maritime emissions and encourage entry to a UK ETS.

Cultural Heritage (including Historic Environment)

- Planning processes and appropriate EIA incorporating Landscape or Historic Land Use Assessments should address any historic environment issues; however provisions enabled by the SCCB should take account of, and should not negatively impact on, historic resources. Particularly when making locational decisions on renewables development.

- Energy efficiency measures and microgeneration options within conservation and non-designated, but locally important, areas must be sympathetic to local cultural heritage. However, in accordance with the need to reduce emissions widely, designations should not prevent progress, effective compromises between planning authorities and conservation bodies must be identified and new positive attitudes developed towards change and development in the landscape.

- Microgeneration may be allowed within permitted development, however planning authorities and Historic Scotland should agree an approach and advise. Cumulative impacts need to be considered within the Government's preferences/ priorities for emissions reductions measures against conservation of historic settings. Due to the fact that older buildings are more likely to be less energy efficient, microgeneration can go some way to reducing the energy burden of older building stock.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice and be sympathetic to local cultural requirements, involving appropriate local consultation, to avoid negatively impacting local cultural and historic environments.

Landscape

- There is a need to recognise the particular sensitivities of specific landscapes that may be impacted by climate change mitigation measures. Programmes resulting from the SCCB should reflect the aims of the EU Landscape Convention, by considering impacts of projects/ proposals on designated and non-designated landscapes, particularly in terms of potential loss of distinguishing features.

- Landscape is important for Scottish tourism and cultural heritage however; appropriate use of Scotland's wind resources must be seen as a valid imperative to mitigate wider environmental damage from GHG emissions, including microgeneration options.

- Careful consideration of the siting and species of plant grown for biomass production is required. Use of virgin or unimproved farmland should be avoided. Lowland arable sites present less visual impact. Shrubs and trees can be used to limit the effects of sudden changes. Wildlife corridors should be maintained.

- Appropriate EIA including Landscape Character Assessments should be a pre-requisite of any renewables or biomass project or grant application and mitigation of landscape impacts should follow Forestry Commission and SNH guidelines. Similarly planning processes, locational guidance and appropriate EIA should address landscape and soil issues to minimise disturbance of either.

- Landscape assessments are subjective and localised NIMBY-ism may be outweighed in the long-term by a higher imperative to reduce emissions. These issues must be considered against other energy option impacts including re-investment in nuclear or coal fired generation. Emissions reduction will lead to some difficult landscape choices.

- Improved guidance on land management at the catchment or landscape scale, as opposed to farm boundary scales, should help address some landscape issues. Action and guidance will be driven by Land Management Contracts, River Basin Management Planning, Flood Prevention and Climate Adaptation Strategies.

- Future infrastructure development should be advised by appropriate landscape assessments and planning to minimise visual impacts.

- Overseas emission reduction projects that are funded or supported by Scotland must be subject to UK/EU standards and best practice and sympathetic to local landscapes, involving appropriate local consultation, to avoid negatively impacting potentially poorly protected landscapes.

8. SEA Monitoring Framework

8.1 SEA Indicators and Monitoring

8.1.1 The SEA Directive requires monitoring of the significant environmental effects of the implementation of the plan under consideration, in order to identify at an early stage any unforeseen adverse effects and to be able to undertake appropriate remedial action. The Directive also recognises that additional monitoring requirements may place heavy demands on responsible authorities and specifically mentions that existing monitoring arrangements may be used, if appropriate, to avoid duplication of effort.

8.1.2 As this is the first ever SEA on proposals for primary legislation in Scotland, it presents an unusual conundrum over the monitoring requirements. The SEA is carried out on the *proposals* for the Scottish Climate Change Bill, where the actual implementation of the 'plan' under consideration is therefore its process through the Scottish Parliament and that process, in itself, will not lead to any significant environmental effects.

8.1.3 This draft Environmental Report identifies that significant environmental effects are likely to be direct or indirect effects from measures brought forward as a result of the SCCB, rather than direct effects of the proposals themselves. Therefore when the SCCB comes into force as an Act, environmental elements would be more appropriately monitored through lower level plans, programmes and strategy frameworks, such as those discussed in Section 3 of this report.

8.1.4 Ensuring that environmental monitoring takes places as close to the policy or measure which directly affects the environment would better enable remedial action to be taken should any unforeseen environmental impacts result. Given that measures brought forward as a result of the Scottish Climate Change Bill may affect each of the environmental topics and may affect all of Scotland, the use of existing monitoring arrangements becomes especially relevant. It is highly likely that appropriate indicators exist already and are being regularly monitored and even repeatedly used for distinct strategies. Trying to monitor at the strategic level of the Bill would essentially result in a report on the general state of the Scottish environment, rather than improving transparency and enabling particular effects of specific measures to be identified.

8.1.5 Statutory Consultees, and other key stakeholders, have a significant role to play in providing information to the Scottish Government from their existing data gathering activities. The Statutory Consultees may be better placed to advise whether SEA/ environmental monitoring at the strategic level of the proposed Bill (or adopted Act) is required, or whether indicators for monitoring significant environmental effects of measures to meet the SCCB targets are indeed more appropriately addressed through lower level policies, plans and strategies.

8.1.6 Table 8.1 below presents a series of potential environmental indicators that could be used to monitor the significant environmental effects of action to meet the proposed SCCB target. It is intended to be a thought piece to initiate discussion on the type of indicators that could be used and it does not represent a final monitoring framework.

Table 8.1 Potential Indicators and Data Sources

SEA Topic	Potential Indicators	Potential Data Sources
Climatic Factors	• Change in emissions by GHG • Fuel prices/ availability – petrol, gas, oil, biodiesel options • Climate change, flooding events, drought, temperature • Area of woodland, peatland, wetlands • Energy balance – renewable energy produced (windfarm, biomass, etc) minus energy used/ input • Area of land developed for energy use, eg. biomass cropping, windfarm development • Carbon footprinting – preferably by sector (long term)	Disaggregated Greenhouse Gas Inventories for Scotland www.airquality.co.uk or http://www.naei.org.uk/ Oil Space Partnership of corporations and business associations monitoring oil prices and collating energy market data: http://www.oilspace.com/eng/partners/content.php Renewable Transport Fuel Obligation – progress indicators Renewables Obligation Scotland – progress indicators SEPA – flood data SNH and Forestry Commission Scotland Woodland, peat land and wetlands inventories (http://www.snh.org.uk/) Ecological/ Carbon Footprinting (http://www.Scotland's-Footprint.com)
Biodiversity, Flora & Fauna	• Number/ area of biomass projects granted in Scotland • Change in abundance of monitored species around biomass projects • Number of large scale renewable energy projects granted planning permissions • Change in monitored habitat quality around large scale energy projects • Change in condition of protected areas around granted projects • Number of Appropriate Assessments • Change in total wooded area	Scottish Government Biomass Support Scheme – Provides that grant conditions must promote best environmental practice (http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/BioSupport/BioSupportIntro) and/ or Renewables and Consent Policy Unit (Scottish Govt.) The Scottish Biodiversity Forum (www.biodiversityscotland.gov.uk) EIA provides for monitoring on a project level and may provide some data for the area around specific projects. Information on the number of appropriate assessments submitted may be available from SNH as statutory consultees SNH Website - http://www.snh.org.uk/about/ab-facts.asp Change in total wooded area - www.forestry.gov.uk/scotland
Soil	• Total area of land converted to biomass production • Number/ area of energy projects granted on high carbon soils • Soil quality and quantity – pH of soils converted to biomass production • Soil organic matter/ carbon content • Total area of soils sealed by energy installations and access roads • Extent of soil erosion • Development on previously developed/ undeveloped/ agricultural land • Land managed under LMC energy schemes	Land Management Contract Awards for biomass projects (Potentially through SG/ ERAD) The majority of associated soil data should be available through National Soils Inventory (NSI) (www.macaulay.ac.uk) SEPA/ SNH/ ECOSSE Project Significant synergies with information to be monitored for renewable energy strategies and associated SEAs. Upcoming Scottish Soil Strategy may identify more applicable soil/ climate indicators. Scottish Environment Statistics. SG/ ERAD – under the Biomass Action Plan are responsible for the support of biofuel crops under LMC contracts and would likely hold this data.
Water	• Compliance with WFD objectives • Volume of water extracted under CAR licences for biomass irrigation • Water quality and quantity • Number of offshore energy developments (wind and wave) • Number of hydro/ in-river schemes introduced • Length of river/ area affected • Effects on low flows and aquatic biodiversity	The Scottish Government produces an annual report to Parliament on WFD progress http://www.scotland.gov.uk/Topics/Environment/Water/17316/8084 CAR Abstraction licensing controlled by SEPA (http://www.sepa.org.uk/wfdreg/Abstraction.htm). Scottish Government Renewable energy web pages Offshore wind and hydro schemes included at:: (http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-Consents/Applications-Database/application/17852-1) SEPA – "Low Flows In Scotland Reports" (http://www.sepa.org.uk) (under publications)

SEA Topic	Potential Indicators	Potential Data Sources
Air	• Emissions of key pollutants/ GHG's by sector (GHG Inventory) • Air pollution, odours, nuisance from bio-energy/ CHP/ energy from waste installations • Local authority/ SEPA air quality monitoring • Change in number of local, rural processing facilities	Disaggregated Greenhouse Gas Inventories for Scotland www.airquality.co.uk or http://www.naei.org.uk/ Local Authority Odour reports register http://www.scottishairquality.co.uk/ Data from the Agricultural Business Development Scheme or the Agricultural Processing and Marketing Grants Scheme
Human Health	• Change in food/ timber miles • Change in energy efficiency of housing stock • Quality and affordability of housing • Change in fuel poverty • Visits to the countryside • Incidence of disease (proxy for vector change) • Change in health and well being related to heat/ cold/ flooding, etc.	Food/ timber miles may be difficult to quantify Energy Savings Trust Website, Scottish Fuel Poverty Indicators http://www.energysavingtrust.org.uk/housingbuildings/calculators/povertyindicator/ Tourism, housing and health data available on the national statistics website (http://www.statistics.gov.uk/CCI/SearchRes.asp?term=scotland)
Population	• Number and security of Scottish jobs • International competitiveness • Tourism indicators • Number of micro-generation units sold • Change in aviation/ passenger numbers from Scottish airports	Employment figures and tourism indicators – National Statistics (http://www.statistics.gov.uk/CCI/SearchRes.asp?term=scotland) Scottish Government Statistics (http://www.scotland.gov.uk/Topics/Statistics/) Scottish Government Business Statistics: http://www.scotland.gov.uk/Topics/Statistics/Browse/Business Scottish Government Economic Statistics: http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy Energy Consents Unit http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-Consents
Material Assets	• Energy demand by sector • Input-output analyses • Availability and cost of raw materials • Availability of resources from abroad • Amount of waste used to treat land • Percentage of wastes recovered, recycled, composted, landfilled • Number of energy from waste recovery installations/ amount of energy recovered	Scottish Energy Studies http://www.scotland.gov.uk/Publications/2006/01/19092748/0 Scottish Government Statistics Input/output tables and multipliers. (http://www.scotland.gov.uk/Topics/Statistics/) SEPA Waste Data Digest http://www.sepa.org.uk/nws/data/data_digest.htm Scottish Government Statistics – Travel and Transport (http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel) Scottish Government Renewable Heat Strategy and Biomass Support Scheme Indicators
Landscape	• Access to countryside, recreation • Change in landscape character and historic indicators • Uptake of joint LMC measures addressing landscape enhancement • Landscape measures implemented under LMC (eg. trees, planting, wetland creation, etc.)	SNH and Historic Scotland Landscape Character Assessments (LCA) Historic Land Use Assessments (HLA) Local Authority Core Path Plans and reports SG/SEERAD Land Management Contracts indicators and records
Historic Environment	• Number of historic sites/ listed buildings/ conservation areas affected by renewables, biomass development or microgeneration	Historic Scotland (http://www.historic-scotland.gov.uk/).

9. Next Steps in the Process

9.0.1 The SEA has appraised the options presented within early drafts of the Consultation Proposals for the Scottish Climate Change Bill. These options have been assessed to identify potential environmental effects and the implications of possible emissions reduction measures.

9.0.2 Following the consultation on the Bill proposals the SEA has assessed the potential addition of muirburn proposals as a significant change, and will close with the submission of the Scottish Climate Change Bill to the Scottish Parliament. At that point an SEA Post Adoption Statement will identify where the SEA has resulted in changes to the Bill proposals.

9.1 Consultation Period and Responses

9.1.1 The Scottish Climate Change Bill consultation closed on the 23rd of April 2008.

9.1.2 This Environmental Report (ER) represents the key output of the SEA. The European SEA Directive requires that significant changes or additions to a plan or programme, resulting from consultation processes be appraised in a manner consistent with the original assessment methodology.

9.2 Responding to the Consultation

9.2.1 The Consultation is now closed.

9.2.2 This re-issue of the Environmental Report has taken into account and addressed comments received during the consultation period. Other than the potential addition of muirburn proposals, no significant changes were identified as necessary to the Environmental Report and the Consultation Authorities were content with the scope of the SEA and assessments applied.

9.2.3 New Appendices have been added that address:

- Muirburn Assessments.
- Comments received on the Environmental Report.

9.2.4 The SEA Statement will provide a more accessible summary of key findings, as recommended by the Consultation Authorities.

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix A

Scoping Report Consultation Responses

No.	Reference	Comment	Response	Action
Scottish Environment Protection Agency (SEPA) – received 26-09-07				
1	1. General Comments	The scoping report is clear in its intentions to undertake a high level assessment based around the 80% target. This is broadly accepted, although we do feel that it would also be useful in the Environmental Report to provide a degree of direction to other plans and programmes in terms of the requirement to assess matters in more detail.	An extensive policy review has been undertaken in line with the Scottish SEA Gateway Guidance and Templates, which considers existing plans, programmes and strategies. A key element in reaching the ambitious 80% reduction target will be the appropriate revision of existing targets/ commitments as current policies/ strategies are renewed.	The SEA will discuss effective policy renewal across all sectors to take account of the 80% target. The SEA will recommend strong action to meet the challenge of emissions reductions in all sectors; the SEA will also identify the need for further assessment at lower strategic tiers.
2	1.General Comments	One issue that is peculiar to SEA of a Bill consultation is how the SEA will embrace the parliamentary process. As the Bill progresses through parliament, it may be subject to change and some of those changes may lead to significant environmental effects. It would be useful to know – and for this to be explained in the Environmental Report – how SEA and the parliamentary process will work. We appreciate that this may not have been bottomed out yet and that this is the first Bill consultation to be subject to SEA, but some discussion on this issue would be helpful.	Noted. The SEA will specifically appraise the options included in the Consultation Proposals for the Scottish Climate Change Bill; it is not intended to assess the Bill itself. These proposals will be assessed to make recommendation on the best environmental options for Scotland. After consultation on the proposals, the SEA will assess any resultant significant changes, and will close with the submission of the Scottish Climate Change Bill to the Scottish Parliament. At that point an SEA Post-Adoption Statement will be produced setting out how the SEA process has informed the development of policies for the Bill.	An overview of the process will be included in the Environmental Report.
3	1. General Comments	It would be helpful if the Environmental Report (unlike the scoping report) were paragraph numbered.	Noted.	The ER will have numbered paragraphs.
4	2. Detailed Comments -Context	SEPA notes that it is not intended to re-iterate the background to climate change, although it is not clear if that is for just the scoping report or if this is intended to be the case for the Environmental Report also. While SEPA is content with this approach for the scoping report, it would be worthwhile providing some background information on Scotland's contribution to climate change and the effects it may in turn have on Scotland's environment and people. This would significantly aid consultation on the Environmental Report and also help you to meet the requirement to report relevant aspects of the state of the environment as set out in Schedule 3 of the Act.	Noted. To meet the requirements of Schedule 3 of the Act, an overview of Scotland's contribution to Global Emissions (currently approximately 0.2%) and the likely effects of climate change in Scotland will be included. The summary of effects will be based on established UKCIP scenarios and the SNIFFER Handbook of Climate Trends across Scotland. SEPA have been kind enough to forward a copy of their CCP Scoping Report for reference.	Will be incorporated into the Baseline chapter of the ER.

No.	Reference	Comment	Response	Action
		Such a brief summary is provided in SEPA's recent scoping report on its Climate Change Plan, which you would be welcome to utilise if helpful.		
5	2. Detailed Comments -Description of Consultation Proposals	This section concisely sets out the proposals in the Bill consultation. You may find that it is useful to use the SEA to help address some of the issues described on page 4. For example, studying the environmental effects of including (or not) international credits, aviation and shipping may help to resolve these issues. This may also be the case for helping decide whether interim targets should be a budget or percentage reduction or whether banking and borrowing should be permitted. Accordingly, you may wish to analyse these as options.	Due to the time constraints on this project, a simplified high-level evaluation of the options listed on Pg4 of the Scoping Report will be included. These appraisals will be informed by Government cost/benefit analysis (RIA) of various options, but may well result in different conclusions by considering the options from a purely environmental viewpoint.	Will be incorporated in the environmental assessment sections of the ER.
6a	2. Detailed Comments -Scope of the Proposals	Table 1 is useful in identifying which parts of the Bill consultation are intended to be included within the scope of the Environmental Report. SEPA agrees that the 80% target and the interim periods should be assessed.	Noted.	As above.
6b	2. Detailed Comments -Scope of the Proposals	The proposed requirement for mandatory annual reporting and establishing a source of independent advice in themselves SEPA would agree are unlikely to lead to significant environmental effects, however there may be indirect effects depending on the extent to which these will inform future target setting. The fact that these will directly contribute and report progress on the 80% target should mean that effects will be considered through this, but it may be worth briefly commenting on how the annual reports and independent advice will link into the process.	Annual reporting is not considered to have significant environmental impacts in itself, and it is considered that the processes governing the linkages between annual reports and independent advice are not best addressed in this SEA. Our recommendation would be that these issues may be better addressed through the regulatory impact analyses.	None
6c	2. Detailed Comments -Scope of the Proposals	SEPA considers that the framework of enabling provisions to deliver climate change policies could lead to significant effects, but would agree with your assertion that this will depend upon the nature and extent of detail of the enabling provisions. It would be worth clarifying in the Environmental Report whether and how enabling provisions may be captured in the assessment process and how their environmental effects will be considered.	Due to the draft nature of the proposals, detailed information on enabling provisions were not available, in fact the consultation will be asking for input from the public on which enabling provisions should be included. Therefore, specific enabling provisions may have been captured in the high level options assessment, but have not been directly addressed as such.	None.

No.	Reference	Comment	Response	Action
6d	2. Detailed Comments -Scope of the Proposals	SEPA would agree that all of the SEA issues need to be scoped into the assessment at this stage as per your Table 2. This is consistent with our own approach to assessment of SEPA's climate change plan.	Noted. All SEA topics will considered throughout the assessment process.	N/A
7	2. Detailed Comments - Relevant plans and programmes	Appendix A sets out those plans and programmes (and indeed a whole range of initiatives from targets through to different renewable energy technologies) which are already linked into the climate change agenda. While SEPA notes the attempt to show how these initiatives might positively or negatively effect the environment in Appendix A, it is not clear how this either provides information about the content of relevant plans and programmes and their relationship to the Bill consultation nor about how this may contribute to the assessment. Further clarification of this might be helpful.	We will provide a PPS review consistent with the approach outlined in the Scottish SEA Gateway Guidelines and Templates. This review will highlight policies for which it may be appropriate to consider strengthening elements aimed at reducing emissions in order to help meet targets set by the SCCB. This PPS review, in conjunction with baseline evidence will inform the SEA assessments and recommendations.	Full PPS review to be included as an appendix to the ER. Key issues will be highlighted within ER section on relevant plans and programmes.
8	2. Detailed Comments -Baseline environmental information	As noted above, SEPA recommends that it would be worthwhile providing some background information on Scotland's contribution to climate change and the effects it may in turn have on Scotland. This would aid consultation on the Environmental Report and help you to meet the requirement to report relevant aspects of the state of the environment set out in Schedule 3 of the Act. Brief, relevant extracts from key documents such as the Climate Change Programme, the SNIFFER handbook of climate trends across Scotland and from SEPA's State of the Environment Report.	Noted. Each SEA Topic will be addressed through summary paragraphs outlining the key environmental issues under the topic heading, at the national scale. An appreciation of climate change pressures will be included.	SEA Topic summaries and issues will be included within the baseline section of the ER. The UKCIP02 High Emissions scenario will be adopted as the basis for the likely evolution of the environment, in the absence of the SCCB.
9	2. Detailed Comments - Reasonable alternatives	It appears that consideration of reasonable alternatives is being carried out at an early stage and there appears to be good scope for strategic level assessment. This is supported. The five alternatives identified would appear to be appropriate. As noted above, you may find it helpful to include some of the issues pondered on page 4 as alternatives in order to assist your consideration of these matters during preparation of the Bill consultation.	The alternatives listed in the Scoping Report were based mainly on varying target settings. These were not considered appropriate for the SEA in the light of the fact that the highest target, in aiming to result in greatest emissions reductions, would be seen as the preferred environmental option and could lead to bias in the assessment of other, lower targets. Some of the options on Pg4 were identified as more suitable for assessment as alternatives within the SEA, as recommended.	Alternatives assessed with full matrices provided in Appendix F.
10	2. Detailed	It is not clear whether it is intended to build the national level carbon footprint approach into the assessment.	It is NOT intended to build the national level carbon footprint approach into the assessments.	Recommendation on Carbon Footprint measures to be included.

No.	Reference	Comment	Response	Action
	Comments -Reasonable alternative	Similar to above, you may find it helpful to include such discussions in the assessment	The SEA will recommend that this measure be considered for assessing suitable policies at the appropriate strategic tier, where sufficient time has been built into the project to allow footprinting methodologies to be employed.	
11	2. Detailed Comments - Methodological framework	SEPA acknowledges that as the Bill consultation will be very high level that the assessment will reflect this. It is important, however, that where lower level plans and programmes (and also enabling provisions where appropriate) are better placed to do more detailed assessment that this is recommended where appropriate in the Environmental Report.	Noted. The SEA will assess the potential for a more holistic approach to be taken to climate change mitigation and adaptation in the short-medium term to help realise reduction targets as soon as possible, but in a managed, sustainable and equitable manner.	Recommendations on lower level assessments to be included. Comments on future work/ research needs/ enabling provisions.
12	2. Detailed Comments - Methodological framework	What would be useful in the assessment is to capture and summarise the typical environmental effects of technologies aimed at reducing greenhouse gas emissions – for example, renewables, biomass fuels. Much of this could be sourced from similar high level assessments of (for example) Scottish marine renewables, Scottish Planning Policy 6 and Scottish Natural Heritage's Biomass Policy.	Noted. An appreciation of the environmental implications of some key technological options will be included in alternatives assessments. This assessment will build on the PPP/PPS review and baseline details to help develop an overarching picture of the likely implications of emissions mitigation methods.	Will be included within the environmental assessment section and Appendix F of the ER.
13	2. Detailed Comments - Methodological framework	SEPA notes that further work on developing the method to be used to undertake the assessment will take place following the appointment of a contractor. While it may have been useful to have had some of this detail in the Scoping Report (eg is it intended to use objectives ?), the basic principles of what is described in the second paragraph appear appropriate. It is not clear, however, how you might use the scoring system to assess the environmental effect of the target on other plans and programmes and what value this will provide. SEPA would be very pleased to discuss methods with you as your thinking on this progresses.	We have decided to follow the advice of Historic Scotland and adopt a modified Dutch E-Test methodology as the principal means of assessing likely future implications of the SCCB target. Combining this assessment tool with other assessments within the SEA, will help ascertain key recommendations that may be appropriate to specific sectors, as well as at the national government level. We will NOT be using specific SEA Objectives in this case.	Outline explanation of modified e-test methodology will be included in the ER. The choice of assessment methodologies will be covered within the ER.
Historic Scotland – received 18-10-07				
14	1.3 Scope of assessment and level of detail	I agree that the environmental assessment should explore the environmental implications that may arise from the 80% statutory emissions reduction target, and suggest that the assessment should identify the positive environmental effects that may arise from reducing the impacts of climate change, and also the potentially negative effects that could arise from measures proposed to reduce and adapt to climate change.	In order to limit the scope, this SEA will focus on the effects of emissions mitigation, within the context of continuing climate change to 2050/ 2080 from the UKCIP and SNIFFER scenarios. The positive environmental effects of reducing the impacts of climate change are beyond the scope of this SEA, as concerted global action is not guaranteed.	In order to limit the scope, this SEA will focus on the effects of emissions mitigation. Climate change adaptation may be referred to in conjunction with other environmental mitigation strategies, as a result of considerations.

No.	Reference	Comment	Response	Action
			Effects, local to Scotland, of emissions reduction will be discussed and highlighted.	
15a	1.4 Scope of assessment and level of detail	Undertaking environmental assessment at this high level is challenging and I welcome the intention to carry out an environmental assessment of the Scottish Climate Change Bill consultation. One of the key outcomes of the environmental assessment process will be the identification of measures to mitigate any potentially adverse or uncertain effects identified in the assessment; for example, how the potentially negative effects that may arise from the 80% target will be avoided through secondary legislation and lower plans, programmes and policies e.g. Scottish Planning Policies. This should be clearly documented in the Environmental Report.	Noted. The SEA will assess the potential for a more holistic approach to be taken to climate change mitigation and adaptation in the short-medium term to help realise reduction targets as soon as possible, but in a managed, sustainable and equitable manner. However, it is anticipated that at this high-level, the SEA will recommend that such secondary legislation and lower level plans should be subject to appropriate environmental assessments to identify applicable mitigation measures at the appropriate location and scale.	Recommendations on lower level policy and secondary legislation assessments to be included. Comments on future work.
15b	Annex A: Detailed Comments - Context, environmental problems, current environmental situation (2)	Climate change may directly affect historic environment features, for example increases in storminess or rising sea levels may affect coastal or riverine sites that may be vulnerable to erosion. In addition, direct effects on historic environment features may arise from changes in weather patterns for example damage to historic buildings from flooding or extreme weather events, or adverse effects on buried archaeology from changes in hydrology. Impacts on the historic environment may also arise from measures to reduce emissions and adapt to climate change, for example renewable energy developments (wind farms, biomass, micro-renewables), flood defences etc.	Noted. These potential impacts will be recorded within the Historic Environment section of the ER baseline and in the consideration of emissions reduction measures.	Include within baseline sections and appraisal of emissions reduction options.
15c	Annex A: Detailed Comments - Description of the consultation proposals (3)	This section clearly sets out the proposals that are likely to be included in the Bill consultation. I note that there are a number of areas where further analysis is required before the Government comes to a view, and it may be useful to use the SEA to help consider these options.	Noted. Areas listed requiring further analysis will be appraised through a high-level options analysis.	Include in environmental assessment sections of the ER.
16a	Annex A: Detailed Comments -Scope of the	I consider that it would be useful to explore the environmental implications of the enabling provisions in the SEA. I accept that the environmental impacts of the enabling provisions will depend on their nature and that these are not	Noted. Initial enabling provisions may include powers to introduce: Carbon Trading Schemes	These will be included in the high level options and alternatives assessments.

No.	Reference	Comment	Response	Action
	proposals	yet known, however it would be useful in the ER to identify any generic environmental issues and/or the environmental issues that require further consideration at a more detailed level of policy-making.	Duties for Public Bodies Statutory Guidance Regulatory Regimes Charging Schemes	
16b	Annex A: Detailed Comments -Scope of the proposals	Table 2 sets out the scope of the environmental assessment in terms of the environmental parameters identified in Schedule 3 of the Act and I note that the historic environment has been scoped into the assessment. Simply for information, the "historic environment" is defined in Section 16(3) of the Public Appointments and Public Bodies etc. (Scotland) Act 2003 as "… any or all of the structures and places in Scotland of historical, archaeological or architectural interest or importance". SHEP 1 (para 2.3) builds on this definition by identifying that the historic environment encompasses built heritage features (ancient monuments, archaeological sites and landscapes, historic buildings, townscapes, parks, gardens and designed landscapes, as well as marine heritage) and the context or setting in which they sit, and the patterns of past use, in landscapes and within the soil, and also in our towns, villages and streets. The historic environment also has less tangible aspects recognised as the historical, artistic, literary, linguistic and scenic associations of places and landscapes.	The definitions provided will be incorporated within the relevant sections of the ER.	Include descriptions within baseline and appropriate environmental assessment sections of the ER.
17a	Annex A: Detailed Comments - Relevant plans and programmes and strategies	I note that the consultation proposals will not include information on the measures to deliver the required reduction in emissions, and that any emissions reductions are likely to arise from the continued or increased use of the delivery mechanisms set out in Scotland's Climate Change Programme, and through the development of new policies. Appendix A identifies the policy areas and programmes that are already linked to the climate change agenda and begins to identify the environmental issues associated with each policy/action. There are a number of measures included in this table where potential impacts on the historic environment should be recognised, and I consider that further discussion is required on this point before the environmental assessment is	Noted. The consultancy team forwarded a copy of the modified e-test methodology and invited Historic Scotland to attend the participatory workshop where concerns may have been discussed.	None.

No.	Reference	Comment	Response	Action
		undertaken.		
17b	Annex A: Detailed Comments - Relevant plans and programmes and strategies	Simply for information I have set out below a list of some of the potential issues for the historic environment that may arise from the measures included in Appendix A: • onshore wind energy developments may have adverse effect on the site and setting of historic environment features depending upon their location. • offshore wind farms are less likely to significantly affect the historic environment. • biomass energy developments may have adverse impacts on the historic environment. For example planting energy crops may directly affect buried archaeological remains, depending on the crop type, the previous land use and on the current state of survival of the historic remains. • planting biofuel or energy crops may also alter the level of the water table, which can affect archaeological remains that have been preserved in waterlogged areas. • microrenewable energy developments may adversely affect historic environment features and the wider historic character of settlements. • a key issue is likely to be the cumulative effect of small scale impacts on the character of historic environment features such as Conservation Areas	Noted. These impacts/ implications will be noted within the appropriate sections of the ER.	Utilise these issues within the baseline and environmental assessment sections of the ER.
18	Annex A: Detailed Comments -Baseline environmental information	The Environmental Report should provide information on the environmental baseline that is relevant to the assessment. Given the high level of this SEA, I would not expect detailed baseline information to be provided for the historic environment; however the ER should provide an understanding of what constitutes the historic environment and how it may be affected both by climate change and by the consultation proposals. You may wish to review the baseline information set out in the Scoping Report prepared for the National Planning Framework.	Noted. We will consider the definitions/ descriptions within the NPF Scoping Report, in conjunctions with those provided by Historic Scotland above.	Include within relevant sections of the ER.
19	Annex A: Detailed Comments	I agree that the environmental assessment will need to be undertaken at a high level to reflect the high level nature of the Scottish Climate Change Bill consultation. I note the assessment methods will be considered further once	Noted and agreed. We have decided to take this advice on board fully and investigated further the applicability of the e-test	Incorporate an explanation of the modified E-Test methodology and include sectoral assessment tables within the appendices to the ER.

No.	Reference	Comment	Response	Action
	-Methodological framework for assessment of environmental effects	a contractor has been appointed and I would welcome further discussion at this stage. You may wish to consider using a modified version of the e-test, rather than the matrix based approach often used in SEA. The e-test is designed to be used at a high level such as this and in my view will give you better results and the light touch that may be appropriate for this level of policy.	methodology. We are agreed that the recommended method works as an exceptional appraisal tool at this strategic level and, when combined with other assessments in this SEA will help provide an excellent overview of likely implications of the SCCB.	
20	Annex A: Detailed Comments -Methodological framework for assessment of environmental effects	In considering the environmental effects of the 80% I would expect the assessment to identify the environmental implications of the key measures that are likely to be required to deliver this target, for example renewable energy developments, energy efficiency measures. As noted above, Appendix A begins to do this with a number of the measures, however the reasons for assigning a particular score are not provided and consideration of historic environment interests does not seem to be consistent. The environmental assessment should be undertaken systematically and the conclusions reached in the ER should be presented in a transparent manner.	Noted. An appreciation of the environmental implications of some key technological options will be included. This assessment will build on the PPP/PPS review and baseline details to help develop an overarching picture of the likely implications of emissions mitigation methods.	Will be included within the environmental assessment section of the ER.
21	Annex A: Detailed Comments -Methodological framework for assessment of environmental effects	A key outcome of the SEA will be the identification of the measures proposed to mitigate the potentially significant effects that may arise from the consultation proposals. As you will be aware, mitigation measures may involve making changes to the consultation proposals as well as identifying other lower level plans that may act to mitigate any potentially adverse effects of the proposals. Given the high level nature of the Scottish Climate Change Bill consultation it is likely that the policies included in lower level plans and strategies will act to mitigate any adverse effects arising from the consultation proposals e.g. land-use planning policies. This should be clearly identified in the ER along with any expectations or recommendations for lower level policies or plans.	Noted. The SEA will assess the potential for a more holistic approach to be taken to climate change mitigation and adaptation in the short-medium term to help realise reduction targets as soon as possible, but in a managed, sustainable and equitable manner.	Recommendations on lower level assessments to be included. Comments on future work.
22	Annex A: Detailed Comments - Next Steps	It would be helpful in the ER to describe how the remaining stages of the SEA process will be managed as the Bill progresses through the parliamentary process.	Noted. The SEA will specifically appraise the options included in the Consultation Proposals for the Scottish Climate Change Bill; it is not intended to assess the Bill itself. These proposals will be assessed to make recommendation	An overview of the process will be included in the Environmental Report.

No.	Reference	Comment	Response	Action
			on the best environmental options for Scotland. After consultation on the proposals, the SEA will assess any resultant significant changes, and will close with the submission of the Scottish Climate Change Bill to the Scottish Parliament. At that point an SEA Post-Adoption Statement will be produced setting out how the SEA process has informed the development of policies for the Bill.	
23	Annex A: Detailed Comments - Next Steps	The Environmental Report should provide information on the methods proposed for monitoring the significant environmental effects of the Scottish Climate Change Bill consultation. I would be happy to discuss suitable indicators for the historic environment if you would find it helpful.	The ER will include a section on indicators and monitoring proposals, however at this early stage, these may present options for consideration only. Further work is required by the Scottish Government on identifying relevant indicators and monitoring methods.	Include indicators and monitoring proposals for further consideration by the Scottish Government.
Scottish Natural Heritage (SNH) – received 09-10-07				
24	Scope of assessment and level of detail	Subject to the specific comments set out below, Scottish Natural Heritage is content with the scope and level of detail proposed for the Environmental Report.	Noted.	N/A
25	Scope of assessment and level of detail	The scoping report acknowledges fully the seriousness of the issues around climate change facing Scotland now and for future generations, and draws on the most recent and reputable predictions of future greenhouse gas concentrations. The proposal to include a target of an 80% reduction in emissions of all greenhouse gases from a baseline of the 1990 levels, by 2050 is challenging, but necessary, and in order to ensure that this is achieved SNH considers it essential that interim targets are set and met. There is an acknowledged lack of clarity at this stage as to how such a significant reduction will be achieved with the plan that any provisions needed to deliver the 2050 target will be taken forward through future secondary legislation.	Interim targets will be assessed for their likely influence on the environment; however, at this stage it seems likely that the targets will act as more of an economic driver for emissions reductions. Climate predictions suggest that change within the first half of this century is locked in, due to the legacy of previous emissions. Most significant reductions made earlier within the period to 2050 will help reduce the likely severity of climate change during the latter half of this century and into the next, if co-ordinated at the global scale. Interim targets will not really affect Scotland's local environment unless they drive the early uptake of emissions reduction measures globally.	Targets and interim budgets will be discussed within the environmental assessment section of the ER.
26	Scope of assessment and level of detail	This lack of any plans, and programmes, and strategies (PPS) to deliver the required reduction in emissions make it difficult to comment on the potential impact on the Scottish environment and its biodiversity that any such measures may have. Furthermore whilst it is important and commendable that such challenging targets are set by Scotland, if the measures taken	Noted. The SEA will consider likely emissions reduction technologies and strategies within the context of continuing climate change. The SEA will therefore not specifically consider climate adaptation, but will make recommendations based on	The SEA will take into account existing climate pressures on species and habitats and make recommendation based on the assessment of additional issues to be considered following the introduction of the 80% target.

No.	Reference	Comment	Response	Action
		are to have any effect at the global scale (and by default for Scotland) then many other countries, including the largest polluters will also have to follow suit. The implications for Scottish Natural Heritage from any measures taken need to be seen in the context of this larger picture whereby additional pressures may be put on our natural heritage through local mitigation to meet the 80% reduction in Scottish emissions but with no equivalent reduction in climate change effects.	additional environmental mitigations which may be required as Scotland takes the lead on emissions reduction.	
27	Scope of assessment and level of detail	The long list of policy areas and programmes already linked to the climate change agenda that are given in Annex/Appendix A of the Scoping Report merely serves to reinforce the scale and complexity of the challenge in meeting the 80% reduction in emissions by 2050 and any interim targets. In preparing the Environmental Report it will be necessary to review this list and identify any other options that merit consideration such as further hydro schemes and nuclear generation.	Noted. The SEA will provide high-level considerations of the environmental cost/benefits of these technologies. The Scottish Government does not support nuclear power generation in Scotland and the UK Government does not currently propose to build any new nuclear power stations in Scotland.	A high-level assessment of likely emissions reduction technologies will be included within the environmental assessment section of the ER.
28	Scope of assessment and level of detail	In the absence of a clear set of PPS for how the target will be met, it is not possible at this stage to comment on the possible environmental impacts. In order for the consultation on the Environmental Report to be meaningful SNH considers it will be necessary to at least offer some detail. This should include both indications of the potential measures that could be used to help meet the target and also perhaps offer a variety of scenarios comprising different combinations of mitigating measures for which the environmental implications can be assessed.	This aspect of difficulty in assessing the Scottish Climate Change Bill proposals is noted and agreed. The consultants will develop a methodology based on assumptions about the future; therefore there are many uncertainties in this SEA. The consultants have therefore opted to concentrate on known and emerging technologies, but will not look at a range of scenarios with differing combinations of measures due to time constraints.	A 'business as usual' scenario will be considered as part of the environmental assessment and baseline sections of the ER. The UKCIP02 high emissions scenario, in line with adoption of the precautionary principle, will inform the business as usual.

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix B

Full Plans, Programmes and Strategy (PPS) Review

Halcrow

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
INTERNATIONAL TIER			
1	EC Directive on the assessment of the effects of certain plans and programmes on the environment Strategic Environmental Assessment (SEA) Directive (2001/42/EC) http://ec.europa.eu/environment/eia/sea-legalcontext.htm	The objective of this Directive is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development. Aims to identify and mitigate significant environment effects arising from certain plans and programmes. Emphasis is placed on integrating sustainability considerations into the preparation and adoption of plans and programmes.	Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated. The Environmental Assessment (Scotland) Act 2005 transposes the directive into Scottish legislation SEA.
2	Kyoto Protocol (1998) http://unfccc.int/resource/docs/convkp/kpeng.html	United Nations international treaty on climate change. The Protocol entered into force in February 2005. Developed countries that have ratified the Protocol are committed to reducing their emissions of greenhouse gases. Commitment signed by 38 countries (plus the EU) to introduce legally binding targets to limit or reduce greenhouse gas emissions by at least 5% of 1990 levels in the period 2008 – 2012. The UK has committed to an 8% reduction on 1990 levels between 2008 and 2012.	The SCCB will need to take account of existing obligations to 2012. The targets in the Protocol will inform the SCCB's operation.
3	European Climate Change Programme (2005) http://ec.europa.eu/environment/climat/eccp.htm	The European Commission's main instrument to discuss and prepare the further development of the European Union's climate policy. Member states must identify and develop the necessary elements on a strategy to deliver EU Kyoto Protocol commitment on greenhouse gas reductions to 8% below 1990 levels by 2008 – 2012.	As above
4	Limiting Global Climate Change to 2°C (2007) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0002:EN:NOT	This Communication identifies options for realistic and effective measures in the EU and globally that will allow the 2ºC objective to be met. The GHG emissions trajectory set out in the impact assessment represents a cost-effective scenario to meet the 2ºC objective. It also shows that emissions reductions by developed countries alone will not be sufficient. Developing country emissions are projected to surpass those of developed countries by 2020, which will more than offset any reductions possible in developed countries beyond that date. Effective action on climate change therefore requires reduced growth in the GHG emissions of developing countries and reversing emissions from deforestation. Encourages more sustainable and efficient forest policy. It supports an emissions reduction target for developed countries of 30 % by 2020 compared to 1990 emission levels.	The SCCB should take account of accepted wisdom, as outlined in this report. It may be necessary to exceed the 2020 target outlined (depending on the trajectory supported by the Bill).
5	EC Directive on Greenhouse Gas Emission Allowance Trading Within the Community and Amending	This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner.	The overarching aim of the SCCB will be to drive emissions reduction in Scotland'. Emissions trading will be an important mechanism for achieving

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	Council Directive 96/61/EC (2003) (2003/87/EC) http://www.scotland.gov.uk/Resource/Doc/1050/0002288.pdf	The Directive applied to the following greenhouse gases • Carbon dioxide (CO_2) • Methane (CH_4) • Nitrous Oxide (N_2O) • Hydrofluorocarbons (HFCs) • Perfluorocarbons (PFCs) • Sulphur Hexafluoride (SF_6)	this and consideration must be given to how any emissions trading scheme established by provisions in the SCCB operates in conjunction with emissions trading across and within Europe.
6	European Union Emissions Trading Scheme (EU ETS) http://www.scotland.gov.uk/Topics/Environment/Climate-Change/16327/euets/Home	All installations covered by the scheme must hold a greenhouse gas permit, or be liable to financial penalties. Although the scheme may be expanded in the future to cover other greenhouse gases, initially it only covers carbon dioxide. Permit enquiries should be made to SEPA. The scheme is based on Directive 2003/87/EC, which entered into force on 25 October 2003. The aim of the EU ETS is to help EU Member States achieve compliance with their commitments under the Kyoto Protocol. Emissions trading does not imply new environmental targets, but allows for cheaper compliance with existing targets under the Kyoto Protocol. Letting participating companies buy or sell emission allowances means that the targets can be achieved at least cost. The idea is that Member States limit CO_2 emissions from the energy and industrial sectors through the allocation of allowances, thereby creating scarcity, so that a functioning market can develop later and overall emissions are then really reduced.	Emission trading encourages emissions abatement across industry/ sectoral actors at least total cost. The initial proposals for the SCCB imply that the Scottish Government does not intend to regulate Scottish traders within this scheme any further. The SCCB consultation discusses whether the actual emissions or permitted emissions of Scottish traders within the EU ETS should be monitored and entered into the emissions inventory. SEA assessment would suggest that actual emissions are monitored, as purchased credits may reflect reduced emissions in the EU overall, but do not count towards domestic reductions. From an environmental viewpoint, it is actual reductions, made in Scotland, that are key to realising progress towards the Bill targets.
7	EC Directive amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms with EEA relevance (2004) (2004/101/EC) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0101:EN:NOT	The European Parliament and Council issued Directive 2004/101/EC on 27 October 2004 to cover the text of the Kyoto Protocol with relevance to the EEA. This Directive effectively amended the original Directive 2003/87/EC which set up the EU ETS. *Objectives and approach* The Linking Directive, as it is known, allows emissions credits generated by Kyoto project-based mechanisms (through Joint Implementation and the Clean Development Mechanism) to be used to meet EU ETS obligations. Specifically, the Directive allows the use of certified emissions reductions (CERs) from 2005 and emission reduction units (ERUs) from 2008. The use of CERs and ERUs will take place in the same way as use of EUAs. In Phase II of the EU ETS, a limit on the use of CERs and ERUs will be set in each Member State's National Allocation Plan	As above. CDM & JI credits are logically acceptable in demonstrating emissions reduction/ accounting at a wider scale, however the SCCB should primarily focus on actual emissions reductions in Scotland. The consultation document suggests that Government will not address the emissions of traders within the EU ETS (about 50% of Scotland's emissions) as it does not want to increase the regulatory burden. From an environmental viewpoint, reporting on emissions should therefore reflect the actual emissions of these companies, rather than utilise accounting methods representing actual reductions in other countries.
8	EU Action Plan for Energy Efficiency 2007-2012: Realising the Potential (2006)	Outlines a framework of policies and measures with a view to intensify the process of realising over 20% estimated savings potential in EU annual primary energy consumption by 2020. The Commission considers the biggest energy savings are to be made in the following	The SCCB will put into statute an ambitious target that should consolidate the Scottish approach to realising energy efficiency savings.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	http://europa.eu/scadplus/leg/en/lvb/l27064.htm	sectors: • residential and commercial buildings (tertiary), with savings potentials estimated at 27% and 30% respectively, • the manufacturing industry, with the potential for a 25% reduction, and • transport, with the potential for a 26% reduction in energy consumption. These sectoral reductions of energy consumption correspond to overall savings estimated at 390 million tonnes of oil equivalent (Mtoe) each year or 100 billion per year up to 2020. They would also help reduce CO2 emissions by 780 million tonnes per year. These potential savings come in addition to an estimated 1.8% (or 470 Mtoe) reduction in annual consumption which would partly stem from other measures already adopted and normal replacements of material.	
9	EU Renewable Energy Road Map Renewable energies in the 21st century: building a more sustainable future (2006) http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=COMfinal&an_doc=2006&nu_doc=848	The Road Map sets out the Commission's long-term strategy for renewable energy in the European Union (EU). The aim of this strategy is to enable the EU to meet the twin objectives of increasing security of energy supply and reducing greenhouse gas emissions. The Road Map provides for each Member State to adopt mandatory targets and action plans in line with its potential. These action plans must include specific measures and objectives for the three following sectors: electricity, biofuels and heating and cooling. This flexible approach will leave Member States enough room for manoeuvre. It also proposes creating a new legislative framework to enhance the promotion and use of renewable energy. In the Road Map, the Commission proposes setting a mandatory target of 20% for renewable energy's share of energy consumption in the EU by 2020 and a mandatory minimum target of 10% for biofuels.	SCCB primary legislation and targets should drive the adoption of measures outlined in the Road Map. Where opportunities exist to adopt the targets in the Road Map, the SCCB may help to drive more ambitious targets.
10	EC Directive on energy end-use efficiency and energy services (2006) (2006/32/EC) http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2006/l_114/l_11420060427en00640085.pdf	A directive on energy end-use efficiency and energy services was adopted in December 2005. The directive requires member states to draw up national action plans to achieve 1% yearly energy savings in the retail, supply and distribution of electricity, natural gas, urban heating, and other energy products including transport fuels. The 1% target is only indicative but the national action plans will need approval from the Commission and will be reviewed every three years. The process will be spread over nine years, starting in January 2008.	The SCCB target and associated legislation will promote energy efficiency and should drive those measures outlined in the Directive.
11	EC Directive on the Energy Performance of Buildings (2002) (2002/91/EC) http://ec.europa.eu/energy/demand/legislation/buildings_en.htm	In force since January 2003 aiming to realise ambitious increases in the energy performance of public, commercial and private buildings in all Member States. Estimates project cost-effective savings potentials realisable by 2010 of around 22% within the building sector - if this potential was realised, around 20% of the EU Kyoto commitment could be met. The Directive is set to promote the improvement of energy performance of buildings with four requirements to be implemented by the Member States :	Energy performance of buildings is likely to be an important feature in meeting the SCCB targets. Further work on energy performance and standards is progressing throughout government.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		• General framework for a methodology of calculation of the integrated performance of buildings • Setting of minimum standards in new and existing buildings • Energy Certification of Buildings • Inspection and assessment of heating and cooling installations.	
12	Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979) http://www.coe.int/t/e/cultural_co-operation/environment/nature_and_biological_diversity/Nature_protection/	Aimed to promote co-operation between European states to protect biodiversity.	Requirement to protect these sites from loss or damage by development (e.g. that may occur from renewables development). The SCCB should drive suitable and appropriate action on renewables but not at the expense of biodiversity interests.
13	EU Habitats Directive (1992) (92/43/EC) http://europa.eu.int/comm/environment/nature/nature_conservation/eu_nature_legislation/habitats_directive/index_en.htm	The main aim of the EC Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species at a favourable conservation status, introducing robust protection for those habitats and species (listed in Annex I and II) of European importance. In applying these measures Member States are required to take account of economic, social and cultural requirements and regional and local characteristics.	The SCCB should be mindful of the potential impact of climate change mitigation on natural habitats. The Directive has a major influence on the development process which could represent a constraint on mitigation measures driven by the SCCB.
14	The Pan-European Biological and Landscape Diversity Strategy (1995) http://www.coe.int/t/e/cultural_co-operation/environment/nature_and_biological_diversity/Biodiversity/	The Strategy aims to reverse the decline of landscape and biological diversity, by promoting innovation and proactive policy making. It supports preceding measures for protecting natural heritage, and aims to supplement this by further supporting a number of action themes relating to different environmental resources.	The SCCB should support the Strategy and national policies and programmes that have emerged as a result. The emphasis on maintaining diversity and distinctiveness should be borne in mind as far as possible.
15	EU Air Quality Directive (1996) (96/62/EC) http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1996/L/01996L0062-20031120-en.pdf	This Directive revises existing legislation and introduces new air quality standards for previously unregulated air pollutants, setting the timetable for the development of subsequent directives on a range of pollutants. Mandatory standards set for air quality together with limits and guidance.	Overall commitment to air quality should be taken into account, particularly in terms of potential influence of land use decisions, specific contributions of the transport sector and local air quality implications of energy choices.
16	White Paper- European Transport Policy for 2010 (2001) http://ec.europa.eu/transport/white_paper/index_en.htm	Outlines what has been achieved to date at the EU and member state level, and what the key targets are for the future. Series of principles presented including: • Revitalise the railways • Improve quality in the road transport sector • Balance growth in air transport and the environment • Turn intermodality into reality • Improve road safety • Policy on effective road charging • Develop high quality urban transport • Develop medium and long-term environmental objectives for a sustainable	The White Paper suggests measures to 2010 by which time the SCCB will be implemented.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		transport system	
17	EC Industrial Pollution Prevention and Control Directive (1996) (96/61/EC) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0061:EN:NOT	The IPPC Directive provides an integrated approach to establish pollution prevention from stationary "installations", as listed in the Directive, with a wide range of polluting activities included. The Directive is similar to the UK regime of Integrated Pollution Control (IPC), but covers more aspects of the environment. The Directive defines the basic obligations to be met by all the industrial installations concerned, whether new or existing. These basic obligations cover a list of measures for addressing discharges to water, air and soil and for tackling waste, wastage of water and energy, and environmental accidents. They serve as the basis for drawing up operating licences or permits for the installations concerned. Accordingly, the Directive: • lays down a procedure for applying for, issuing and updating operating permits; • lays down minimum requirements to be included in any such permit (compliance with the basic obligations, emission limit values for pollutants, monitoring of discharges, minimisation of long-distance or transboundary pollution).	The SCCB could inform the development of future IPPC legislation e.g. to increase the focus on, and reduce emissions of, GHGs. The IPPC Directive includes energy efficiency requirements which are designed to minimise pollution arising from consumption of energy in industrial processes. Energy efficiency strategies driven by the SCCB will therefore enable industry to easier comply with the requirements of the Directive. Guidance on energy efficiency through IPPC should be strengthened to reflect the priority concerns.
18	Water Framework Directive (2000) (2000/60/EC) http://europa.eu.int/comm/environment/water/water-framework/index_en.html	The most substantial piece of EU water legislation to date. Central to the framework is an integrated approach through River Basin Management Planning (RBMP) which will consider the cumulative impacts of all activities within a river basin and district and the risk posed to the environment. Environmental objectives will be set for each water body. The aim is to prevent deterioration in status and to achieve “good” ecological status in all surface and groundwater bodies by 2015 and limit the quantity of groundwater abstraction to that portion of overall recharge not required by ecology.	The Directive will inform strategies stemming from the SCCB, in that mitigation of climate change is also an important protective measure for UK waters. Provisions enabled by the SCCB should not contribute to deterioration in water quality or lead to targets being missed e.g. compromise the number of water bodies reaching “good ecological status”.
19	EU Waste Framework Directive (2006) (2006/12/EC) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0012:EN:NOT	The Waste Framework Directive • sets out a system for the coordinated management of waste within the community • sets out the foundation for sustainable waste management • defines waste and introduces the principles of the waste hierarchy, proximity principle and self sufficiency The Waste Framework Directive requires that Member States • ensure that waste is recovered or disposed of without endangering human health and the environment • take the necessary measures to prohibit the abandonment, dumping or uncontrolled disposal of waste Holders of waste must • ensure the disposal or recovery of their waste themselves in accordance with the provisions of the Directive or • have it handled by an authorised collection-, disposal- or recovery undertaking	Policies adopted to help meet targets set by the SCCB should recognise the waste sector as a potential area for GHG savings. Effective education programmes, coupled with realistic incentives to encourage greater participation in energy, resource and waste efficiency would also help achieve ambitious targets.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		Any establishment undertaking or carrying out waste disposal or recovery operations must have a permit and be inspected at regular intervals.	
20	EU Thematic Strategy on Air Pollution (2005) http://ec.europa.eu/environment/air/cafe/index.htm	Sets out interim objectives for improving air quality. Notes that existing legal instruments will be merged to form single Directive on Air Quality. States that air pollution can have consequences for health and ecosystems, primarily by processes of acidification and eutrophication. Sets targets for reducing specific pollutants.	The SCCB could help to contribute to these targets, by encouraging appropriate policies for greater action on transport, waste management and other potentially polluting activities.
21	EU Thematic Strategy for Soil Protection (2005) http://ec.europa.eu/environment/soil/index.htm	Notes that soil has important functions but that degradation of its quality is accelerating, partly due to wind and water erosion and also as a result of depletion of organic matter content. It sets out commitments to improving quality as a result, including development of a New Directive.	A Scotland wide strategy for soil will be developed in the near future. The SCCB should drive action to improve the maintenance of Scottish high carbon soils, to prevent conversion from carbon sink to emissions source.
22	The Convention on Biological Diversity (1992) http://www.cbd.int/convention/convention.shtml	Established three main goals: • the conservation of biological diversity • the sustainable use of its components • the fair and equitable sharing of the benefits from the use of its genetic resources Requirement for each country who has signed the declaration to develop national strategies, plans or programmes for the conservation and sustainable use of biodiversity.	Programmes resulting from the SCCB must consider biodiversity within their objectives. Adequate consideration of impacts affecting biodiversity should be considered at all levels, from strategic planning to project management. Appropriate EIA/ SEA/ AA should help.
23	Council of Europe, European Landscape Convention (2000) http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm	States that landscapes across Europe make an important contribution to quality of life and cultural identity, but that they are being transformed as a result of a number of factors, including town planning, transport, built infrastructure and the economy. Requires Member States to develop more comprehensive frameworks to protect and enhance landscapes.	Programmes resulting from the SCCB should reflect the aims of the Convention, by considering impacts of projects/ proposals on designated and non designated landscapes, particularly in terms of potential loss of distinguishing features. Appropriate EIA/ SEA/ LCA should help.
24	European Sixth Environmental Action Programme 2002-2012 (2002) http://europa.eu/scadplus/leg/en/lvb/l28027.htm	Sets out a strategy for the environmental component of sustainable development in Europe. States that climate change, nature and biodiversity, health and quality of life and natural resources and waste should be prioritised. Provides a framework for new national level environmental legislation, and encourage involvement and integration of environmental issues across wider policy sectors.	The SCCB should encourage action on emissions reduction, however this action must reflect these aspects of sustainability, by helping to deliver on the thematic strategies that have been prepared under the programme.
25	EU Biofuels Directive (2003) (2003/30/EC) http://ec.europa.eu/energy/res/legislation/doc/biofuels/en_final.pdf	Aims to promote the use of biofuels or other renewable transport fuels as substitutes for fossil fuels in the transport sector. Requires member states to set indicative targets for biofuel sales in 2005 and 2010. Given the single UK fuel market, UK wide targets have been set for the uptake of biofuels. The target for 2005 was set at 0.3% of total sales, with a target of 5% being agreed for 2010.	The target in the Directive should be seen as a starting point for initiatives driven by the Bill. Biodiesel from waste should be seen as a win-win option and more eco-friendly than primary production and extraction of fuel from biomass.
26	Taking sustainable use of resources forward: A Thematic Strategy on the	One of several sectoral focused strategies produced under the Environmental Action Programme.	Recycling of materials has the potential to offer GHG savings. The SCCB should drive greater action on innovation in

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	prevention and recycling of waste (2005) http://ec.europa.eu/environment/waste/strategy.htm		separation, collection and effective re-use of wastes.
UK NATIONAL TIER			
27	UK Climate Change Programme (2006) http://www.defra.gov.uk/ENVIRONMENT/climatechange/	The UK Government has identified climate change as the most serious environmental problem facing the world today and one that will inevitably become more serious in the short to medium term. Outlines the UK's contribution to the global response to climate change. The programme sets out a strategic package of policies and measures across all sectors of the economy to achieve the targets set. To deliver the UK's commitment of a 12.5% reduction in greenhouse gas emissions from 1990 levels by 2008 – 2012. Programme is designed to move the UK towards its domestic target of 20% reduction in 1990 levels of CO2 emissions by 2010.	May be superceded by the new UK Climate Change Bill target of 60% CO2 reductions by 2050. The measures outlined in the Programme may be used further or strengthened to drive action on the 60% target. These options may apply to reserved and devolved policies. The SCCB will implement legislation in devolved policy areas designed to help achieve the Scottish 80% emissions reduction target.
28	Climate Change and Sustainable Energy Act (2006) http://www.opsi.gov.uk/ACTS/acts2006/ukpga_20060019_en_1#pb2-l1g2	Provisions on the reduction of emissions of greenhouse gases, the alleviation of fuel poverty, the promotion of microgeneration and the use of heat produced from renewable sources, compliance with building regulations relating to emissions of greenhouse gases and the use of fuel and power, the renewables obligation relating to the generation and supply of electricity and the adjustment of transmission charges for electricity; and for connected purposes. Targets will be set between 1st November 2008 to 31st March 2009 for the number of microgeneration systems installed in the UK.	The number of microgeneration systems targeted will impact on the trajectory towards SCCB carbon reduction targets.
29	Meeting the Energy Challenge: A White Paper on Energy (2007) http://www.berr.gov.uk/files/file39564.pdf	We face two long-term energy challenges: • tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and • ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel. This White Paper, published on 23 May 2007, sets out the UK Government's international and domestic energy strategy to respond to these changing circumstances, address the long term energy challenges we face and deliver on four energy policy goals.	Energy strategy outlined in the White Paper will have an impact on the delivery of targets outlined in the SCCB. The SCCB is likely to encourage uptake of renewables outlined in the White Paper. Distributed generation and microrenewables will provide an element, and consideration should be given to grid investment where required.
30	UK Energy Act (2004) http://www.opsi.gov.uk/acts/acts2004/20040020.htm	Following the introduction of the Energy Act 2004, a new regime for renewable energy sources was introduced. This provides for the designation of 'renewable energy zones' in which rights under Part V of the UN Convention may be exercised to exploit water or wind energy.	Renewables development will be central to meeting the targets set by the SCCB. The regime outlined in the Act will provide the framework for this process.
31	The Energy Challenge: Energy Review Report (2006) http://www.berr.gov.uk/files/file31890.	Appraisal of current UK energy policy, with particular focus on climate change and security of supply. Introduction of further measures to further energy policy goals. In total by 2020, it is estimated that the measures proposed on energy efficiency could be saving of 6 – 9 MtC (million tonnes of carbon), around 4 – 6% of total emissions in	The proposals outlined in the report offer savings additional to the UK Climate Change Programme. These measures have potential for adoption in Scotland, and the SCCB could drive uptake and integration.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	pdf	2005, on top of the 12 MtC saving that will come from the policies announced in the 2006 Climate Change Programme by 2010.	
32	Sustainable Energy Act (2003) http://www.opsi.gov.uk/acts/acts2003/20030030.htm	Requires Government to report annually to Parliament on the 135 commitments in the Energy White Paper on reducing emissions and ending fuel poverty. • Government to set an energy efficiency aim for residential sector. • Enables Government to set binding targets for local authorities falling short of targets under the Home Energy Conservation Act (1995). • Government to set a target for Combined Heat and Power (a way of using 'Waste heat' to generate electricity) in Government buildings. • Requires Ofgem (the gas and electricity regulator) to publish environmental impact assessments of its actions. • Releases £60 million for developing renewable sources of energy.	The reporting requirements of the UK Act could feed into and inform Scottish reporting requirements enabled by the SCCB.
33	Our Energy Challenge- Microgeneration Strategy: Power from the People (2006) http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/page27594.html	The objective of Government's Microgeneration strategy is to create conditions under which microgeneration becomes a realistic alternative or supplementary energy generation source for householders, communities and small businesses. Technologies includes solar (photovoltaics (PV) to provide electricity and thermal to provide hot water), micro-wind (including rooftop mounted turbines), micro-hydro, heat pumps, biomass, micro combined heat and power (micro CHP) and small-scale fuel cells. A DTI study from the Energy Saving Trust (EST) suggested that by 2050, microgeneration could provide 30-40% of the UK's electricity needs and help to reduce household carbon emissions by 15% per annum.	Microgeneration will contribute to progress towards SCCB carbon reduction targets. Enabling powers in the SCCB could, in appropriate circumstances, allow the planning system or require the system to fast-track micro-renewables applications. Historic environment and Conservation Areas may present barriers to this process. The SCCB may inform consultation between planning authorities and Historic Scotland to reach agreement/ solutions/ guidelines for installations in older buildings.
34	Home Energy Conservation Act (1995) http://www.opsi.gov.uk/ACTS/acts1995/Ukpga_19950010_en_1.htm#content	Makes provisions for the drawing up of local energy conservation reports in relation to residential accommodation; to give the Secretary of State functions in connection to; and for related purposes. Requires local authorities to set out a report of energy conservation measures considered practicable, cost-effective and likely to result in significant improvement in the energy efficiency of residential accommodation in the area.	Gains in home energy saving will be central to achieving SCCB targets. The Act is the main piece of legislation in this area. Reporting requirements on energy efficiency could be reviewed and key features related to wider action or initiatives under the SCCB captured.
35	One future-different paths: The UK's Shared Framework for Sustainable Development (2005) http://www.sustainable-development.gov.uk/publications/pdf/SD%20Framework.pdf	The UK Government and Devolved Administrations launched their new Strategic Framework on 7 March 2005 in conjunction with the UK Government's new strategy for sustainable development "Securing The Future". The framework document sets out what those are, and is an affirmation that, although we have devolved government, we will work to common goals without compromising the strengths which our diversity of approach offers. Introduces a new set of high-level indicators – the 'UK Framework Indicators', to give an overview of sustainable development and the priority areas in the UK. The UK Framework indicators are intended to cover key impacts and outcomes that reflect the priority areas we share across the UK. The indicators are: 1. Greenhouse gas emissions: Kyoto target and CO_2 emissions 2. Resource use: Domestic Material Consumption and GDP	Measurement of progress under the SCCB should take account of sustainable development indicators as the two issues are uniquely inter-related.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		3. Waste: arisings by (a) sector (b) method of disposal 4. Bird populations: indices (a) farmland birds (b) woodland birds (c) birds of coasts and estuaries 5. Fish stocks: fish stocks around the UK within sustainable limits 6. Ecological impacts of air pollution: area of UK habitat sensitive to acidification and eutrophication with critical load exceedances 7. River quality: rivers of good (a) biological (b) chemical quality 8. Economic output: Gross Domestic Product 9. Active community participation: civic participation, informal and formal volunteering at least once a month 10. Crime: survey and recorded for (a) vehicles (b) domestic burglary (c) violence 11. Employment: people of working age in employment 12. Workless households: population living in workless households (a) children (b) working age 13. Childhood poverty: children in relative low-income households (a) before housing costs (b) after housing costs 14. Pensioner poverty: pensioners in relative low-income households (a) before housing costs (b) after housing costs 15. Education: 19 year olds with level 2 qualifications and above 16. Health inequality: (a) infant mortality (by socio-economic group) (b) life expectancy (by area) for men and women 17. Mobility: (a) number of trips per person by mode (b) distance travelled per person per year by broad trip purpose 18. Social justice: (measures to be developed) 19. Environmental equality:(environmental measures to be developed) 20. Well being: (measures to be developed if supported by the evidence)	
36	Securing the Future: The UK Government Sustainable Development Strategy (2005) http://www.sustainable-development.gov.uk/publications/pdf/strategy/SecFut_complete.pdf	This is the UK strategic framework for sustainable development up to 2020 which has been agreed with the devolved administrations. The framework includes: • a shared understanding of sustainable development • a vision of what is to be achieved and the necessary guiding principles • sustainable development priorities for UK action at home and internationally • indicators to monitor key issues on a UK basis Priority areas are: • sustainable consumption and production • climate change and energy • natural resource protection and environmental enhancement • sustainable communities Indicators for the UK Strategy include all 20 of the UK Framework indicators and a	The SCCB will operate within this Framework; however, in Scotland this Strategy only covers non-devolved issues. Devolved issues are addressed in 'Choosing Our Future, Scotland Sustainable Development Strategy'. The Bill will likely inform the development of future strategies – these should always include commitments to action (at all levels), identify responsibilities for action and consequences for not achieving targeted action. Action, targets and consequences must be realistic and achievable but challenging. Any action related to the SCCB must take account of the inter-dependencies of environment, social and economic issues however, the environmental aspects of dangerous climate change must act as a key driver to address future development choices in order to redress the sustainability balance to limit

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		further 48 related to the priority areas. Four key goals detailed within the White Paper: • To develop a path to cut the UK's carbon dioxide emissions, the main contributor to global warming, by 60% by about 2050 with real progress by 2020; • To maintain the reliability of energy supplies; • To promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and • To ensure that every home is adequately and affordably heated. The package of policies in the White Paper could save between 84 – 121 MtCO2 by 2020.	impacts and achieve an equitable future.
37	The Renewable Transport Fuel Obligations Order (2007) http://www.opsi.gov.uk/si/si2007/20073072.htm	The RTFO Order 2007 came into force on 26 October 2007, and will begin operation in April 2008. The RTFO Order imposes obligations on those who refine, import and supply hydrocarbon oil in the UK. The RTFO will also be of interest to producers and suppliers of biofuels, vehicle manufacturers and those looking to invest in "green" technologies. The RTFO is a requirement on transport fuel suppliers to ensure that by 2010, 5% of all road vehicle fuel supplied to the UK is from sustainable renewable sources, thereby creating demand for 2.5 billion litres of biofuel per year. The obligation will apply across the whole of the UK to any road transport fuel supplier who supplies more than 450,000 litres of fossil fuel per annum.	The RTFO is likely to be an important mechanism by which the targets of the SCCB can be realised. Biofuel imports must be properly scrutinised to ensure they do not result in transferred environmental degradation.
38	The Future of Air Transport White Paper (2003) http://www.dft.gov.uk/about/strategy/whitepapers/air/	Sets out the strategic framework for the development of airport capacity in the UK over the next 30 years, against the wider context of the air transport sector. It does not authorise or preclude any particular development, but sets out a policy framework which will inform decisions on future planning applications, and against which the relevant public bodies, airport operators and airlines can plan ahead.	The Scottish Government must consider measures within devolved powers to address emissions from the air transport (and maritime) sector while allowing for acceptable development of capacity.
39	The Pollution Prevention and Control Act (1999) http://www.opsi.gov.uk/ACTS/acts1999/19990024.htm	Sections 1 and 2 of the Act confer on the Secretary of State power to make regulations providing for a new pollution control system to meet the requirements of European Council Directive 96/61/EC on Integrated Pollution Prevention and Control (the "IPPC Directive") and for other measures to prevent and control pollution. Generally these powers are also conferred to the Scottish Government.	The Act establishes the pollution control framework that the action to meet SCCB targets will operate within. Provisions driven by the Bill have the potential to impact pollution regulated by the Act.
40	The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) http://www.defra.gov.uk/environment/airquality/strategy/	Describes the plans drawn up by UK Government and devolved administrations to improve and protect ambient air quality in the UK in the medium-term. • sets out a way forward for work and planning on air quality issues • sets out the air quality standards and objectives to be achieved • introduces a new policy framework for tackling fine particles • identifies potential new national policy measures which modelling indicates could give further health benefits and move closer towards meeting the Strategy's objectives. Standards set for 10 main air pollutants of particular concern to human health:	Action to meet SCCB targets should contribute to these aims where possible. Reducing pollution by reducing vehicle use is closely aligned with savings in GHG emissions resulting from reducing transport emissions.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		• benzene; • carbon monoxide; • nitrogen dioxide; • particles (PM 2.5 and 10) • polyaromatic hydrocarbons; • 1,3- butadiene; • lead; • ozone; • sulphur dioxide; • ammonia The standards are purely health based and objectives are to be derived from these, taking into account practicality, technical feasibility and economic factors.	
41	The UK Forestry Standard: The Government's Approach to Sustainable Forestry (2004) http://www.forestry.gov.uk/pdf/fcfc001.pdf/$FILE/fcfc001.pdf	The two central aims of the Standard are • the sustainable management of our existing woods and forests; and • a steady expansion of tree cover to increase the many diverse benefits that forests provide. Within this, key objectives include: • Maintaining or improving the stability of soil condition (forest soil condition) • Protect or improve water quality (water quality, yield and discharge) • Protect and enhance value of forests as carbon sinks and stores (net carbon sequestration and air pollution) • Maintain contribution of timber production to the economy • Conserve and enhance biodiversity in and around woodlands (nature conservation • Safe and efficient workforce activities • Opportunities are enhanced for rural development; access and recreation; quality of life; awareness and participation; community involvement; and skills training. • Protect and enhance cultural heritage and landscape quality	Presents wide ranging benefits over and above emissions reduction. Mitigation by forestry must be considered as a carbon neutral option as any use of woodfuel would re-introduce sequestered carbon to the atmosphere. The forestry sector can play an important role when biomass for energy reduces fossil fuel consumption. Long-term afforestation for natural heritage management rather than sustainable yields would go some way to mitigating emissions by acting as a natural sink for carbon.
42	UK Biodiversity Action Plan (1994) http://www.defra.gov.uk/wildlife-countryside/biodiversity/ukbap/index.htm	Published in response to the Convention on Biological Diversity. The plan highlights a number of priority habitats and species with associated action plans at the species, habitat and local level.	Actions under the SCCB must be mindful of the potential impact of emissions mitigation on natural habitats. The Plan has a major influence on the development process which could represent a constraint on mitigation measures driven by the Bill.
SCOTTISH NATIONAL TIER			
43	Changing our Ways: Scotland's Climate Change Programme (2006) http://www.scotland.gov.uk/Publications/2006/03/30091039/0	This updates the Programme published in 2000 and represents a stepping up of Government action and ambition to tackle climate change. Provides a framework for achieving carbon savings through the identification of the Scottish Share of UK climate change commitments and the setting of a Scottish Target	Programme policies will help contribute to achieving targets established in the SCCB. Suitable SEA/EIA and Life Cycle Assessments should be incorporated to ensure that the most sustainable carbon choices

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		to exceed this share by 1 million tonnes (C equivalent) by 2010. Shows how the Government is promoting an appropriate adaptation response to the inevitable impacts of climate change. Recognises the contribution that the agriculture sector can make to tackling climate change. Highlights the opportunities it presents in terms of business development and the important role the LMC approach and the Scottish Rural Development Programme will make. Reflects on the role of biomass energy and the need to encourage it to help it become more economically viable. Emphasises the need for forestry based mitigation to be undertaken in relation to the wider rural development policy agenda. Supports the planting of woodland which delivers a range of benefits (economic, social and environment), including its role as a carbon sink. Highlights challenges arising from timber transportation, particularly as production levels continue to rise. Reduction in 2010 CO2 against 1990 levels of 2.7 million tonnes per year.	are made in conjunction with wider environmental implications. Action to introduce emissions reduction measures to show progress towards targets must be tempered with suitable mitigation of impacts on other environmental receptors.
44	Potential Adaptation Strategies for Climate Change in Scotland (2001) http://www.scotland.gov.uk/cru/kd01/lighgreen/pascc-00.asp	Identifies full range of potential adaptation strategies for Scotland, including those specifically relating to agriculture, forestry, fishing and biodiversity. Emphasises the importance of flexible resource management and the need to move on from defining conservation objectives on the basis of single species or fixed locations as these may no longer be achievable. The Strategy notes that: *'…the fragmented and often overlapping nature of policies for forestry, agriculture and biodiversity impedes appropriate adaptation strategies.* *In the medium-term, drivers of change from agriculture, from mitigating greenhouse gas emissions, from sustainability issues and from the protection of biodiversity may lead to a blurring and perhaps complete removal of the distinctions between policies for forestry, agriculture and biodiversity.'*	Action under the SCCB should take account of, and drive adoption of the adaptation strategies discussed in this report. There may be further calls for an integrated rural strategy for Scotland that facilitates greater integration between land managers, public bodies, support mechanisms and available advice/ incentives to drive appropriate action that improves natural heritage management and significantly reduces land management and land use change GHG emissions. As a ruling principle, adaptation measures should take account of the desire to reduce emissions.
45	Scotland's Climate Change Declaration http://www.sustainable-scotland.net/climatechange/index.asp?pg=2	Scotland's Climate Change Declaration acknowledges the reality and importance of climate change and is a means of demonstrating local leadership and commitment to action. The Declaration includes commitments both to mitigate the impact of Local Authorities on climate change through reducing greenhouse gas emissions and to adapt to predicted climate change impacts.	The participation of Local Authorities is particularly important if targets set out in the SCCB are to be realised. The measures outlined in the declaration provide a methodology of how the Authorities intend to contribute to climate change mitigation. Reporting on action under the SCCB could provide a platform for Local Authorities to develop their climate change strategies, share best practice and maintain the long-term focus on continual re-investment of energy savings in developing greater efficiencies and reducing energy demand.
46	Scotland and UK Energy Policy, statement by Energy Minister on the UK Energy White Paper (2007)	A Statement to Parliament on the UK Energy White Paper by Energy Minister Jim Mather. Key points include:	Current Administration does not see a role for nuclear power to deliver GHG emissions reductions in Scotland.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	http://www.scotland.gov.uk/News/News-Extras/scotlandukenergypolicy	• Commitment to mitigation of climate change • Nuclear power is not seen as an appropriate GHG reduction measure in Scotland • Renewables focus should be on Scotland's abundant wind, wave and hydro sectors • Opportunity exists for Scotland to take a lead in carbon capture technology • Current transmission charging scheme works against the development of renewables • Need for increased support for wave and tidal power	SCCB is likely to focus on development of renewables. The SCCB may drive the development of carbon capture. Carbon capture is an end-of-pipe solution, which may offer means of reducing some GHG emissions to atmosphere, but it will not discourage fossil fuel use. Strategic short-term focus should be on energy efficiency and significant investment in proven renewables technologies.
47	Securing a renewable future: Scotland's Renewable Energy (2003) http://www.scotland.gov.uk/Publications/2003/03/16850/20555	Notes the Scottish Government's target of achieving 18% of electricity generation in Scotland from renewables by 2010. Includes a commitment to biomass generation in Scotland and notes the importance of the industry's role in achieving targets. Also discusses opportunities arising from biofuel initiatives, including short rotation coppice and co-products from timber operations and agriculture.	The Scottish Government has recently announced new targets of 31% by 2011 and 50% by 2020. The SCCB may include enabling mechanisms to deliver further rapid development of renewable energy past 2010.
48	Energy Efficiency and Microgeneration Strategy (Draft) (2007) http://www.scotland.gov.uk/Resource/Doc/169519/0047225.pdf	Strategy identifies measures for Government to encourage more households, the public sector and businesses to take up opportunities, and outlines a package of policies to drive an increase in energy efficiency and encourage the uptake of microgeneration across these sectors of the economy. The Government have finished consulting on this strategy but have not finalised it at the time of writing.	The number of microgeneration systems delivered will have a major impact on the trajectory towards SCCB carbon reduction targets. The SCCB will encourage the implementation of microgeneration projects, but must be supported by distributed generation capacity in the national grid.
49	Forum for Renewable Energy Development in Scotland: Promoting and Accelerating the Market Penetration of Biomass Technology in Scotland (2005) http://www.scotland.gov.uk/Publications/2005/01/20616/51406	Concluded that a Scottish biomass industry has the potential to supply as much as 450 MW of electricity from sustainable wood fuel resources while employing over 2,000 people and stimulating other sectors of the Scottish economy. Report states that this is a conservative estimate. The successful development of biomass technology in Scotland using energy crops as the fuel source would further boost electrical output and employment. However, it could take 5 years to lay the foundations for this industry. Considers establishment of basic infrastructure required and the partnership between Government and industry needed to deliver this potential. Government targets 18% electricity generated in Scotland by 2010 should be from renewable sources, rising to 40%by 2020. Government is committed to meeting targets by promoting a range of technologies, and biomass has the potential to play an important role.	The Scottish Government has recently announced new renewables targets of 31% by 2011 and 50% by 2020. The ambitious SCCB target should drive development and investment in the land use and woodfuel/ CHP sector. Projects must be assessed for suitability for land-use change and wider impacts on local environmental receptors through appropriate EIA/ AA/ SEA. Life cycle assessment may also be of use; however the key factor is the introduction of appropriate woody species in appropriately resilient habitats.
50	The Renewables Obligation (Scotland) Order (2007) http://opsi.gov.uk/legislation/scotland/ssi2007/20070267.htm	The Renewables Obligation (Scotland) Order, or ROS, is a key measure in terms of increasing the level of renewable generating capacity in Scotland. It imposes an obligation on electricity suppliers to provide an increasing percentage of supply from qualifying renewable energy sources. Level is 6.7% for 2006/07, rising under current legislation to 15.4% in 2015/16.	The ROS can provide an important contribution to the targets of the SCCB. The SCCB may inform and strengthen future ROS targets in order to facilitate achievement of long term objectives.
51	The Scottish Ministers' Wave and Tidal Energy Support Scheme	The aim of the Scheme is to provide grants to businesses to support the installation and commissioning / deployment of pre-commercial wave and tidal electricity	Scotland missed out on developing wind energy technologies to current market leaders (mainly due to lack of investment on the

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/WTSupportScheme/WTSupportSchemeIntro	generating devices. The scheme supports components of projects requiring testing e.g. mooring systems, foundation installation systems etc. that will lead to reduced project cost and/or improved operation and maintenance for the industry. Key objectives • To support the early development of wave and tidal technologies that need to complete pre-competitive R&D through deployment and demonstration in Scotland; • To capture key data on the resource, costs (construction, installation, commissioning, operational and maintenance) and energy performance and revenue; • To produce in a clear, transparent and unambiguous report, an economic evaluation of all projects supported by the scheme, whilst maintaining the confidentiality of commercially sensitive information; • To promote the development of a diverse renewables supply; • To secure the increased learning benefits and cost reductions from the initial deployment of these devices; and • To increase carbon savings in line with the Scottish Ministers' commitment as set out in 'Changing our Ways: Scotland's Climate Change Programme' published in 2006.	introduction of North Sea gas and energy supplies). R&D is of vital importance to the successful adoption of wave & tidal renewable energy in Scotland, and to create export opportunities. Action to meet the SCCB target should recognise the importance of such schemes and seek to drive development of this and other such initiatives. However, action on current proven technology must be supported to meet rising energy demands.
52	Building (Scotland) Regulations (2004) http://www.opsi.gov.uk/legislation/scotland/ssi2004/20040406.htm	Main requirements (with certain exemptions) are: • every building must be designed and constructed in such a way that the insulation envelope resists thermal transfer • every building must be designed and constructed in such a way that the heating and hot water service systems are designed, installed, and capable of being controlled to achieve optimum energy efficiency, having regard to the thermal transfer of the insulation envelope • every building must be designed and constructed in such a way that temperature loss from heated pipes, ducts and vessels, and temperature gain to cooled pipes and ducts, is resisted • every building must be designed and constructed in such a way that artificial or display lighting must operate and be capable of being controlled to achieve optimum energy efficiency • every building must be designed and constructed in such a way that the form and fabric of the building minimises the use of mechanical ventilating or cooling systems for cooling purposes, and the ventilating and cooling systems are designed, installed, and capable of being controlled to achieve optimum energy efficiency • every building must be designed and constructed in such a way that services which use fuel or power for heating, lighting, ventilating and cooling the internal environment and heating the water, are commissioned to achieve optimum energy efficiency	The built environment in Scotland is a major energy consumer. A contributory factor to this is the way in which raw materials are used. For example, cement imported from abroad produces significant quantities of CO2 in manufacture and transport but emissions do not count as Scottish emissions. Using this material might, on paper, seem a better carbon option than locally-produced, particularly traditional materials, where all the production carbon will be counted against our local total but this does not fit with a responsible and sustainable approach to addressing the global problem of climate change. Integrating the principal of embodied energy into policy development could be a useful way of seeking to address this issue. Scotland's policy framework needs to be sufficiently robust and sophisticated to mitigate against the "export" of emissions. The SCCB target should act as a driver for continued strengthening of building standards in terms of energy efficiency. Consideration could be given to requiring carbon accounting throughout design, development, materials selection, procurement, transportation and construction processes.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		• the occupiers must be provided by the owner with written information on the operation and maintenance of the building services and a forecast of the energy consumption of the building • Every building must be designed and constructed in such a way that provision is made for energy conservation in accordance with the Building Standards Circular on Energy, 2004.	Medium term goals should be to improve overall energy efficiency and reduce fossil fuel consumption across the building and civil engineering sectors.
53	Scottish Building Standards Agency, Building Standards Circular on Energy (2004) http://www.sbsa.gov.uk/pdfs/energy_circular.pdf	It is the intention of the Scottish Government to maximise the contribution that the building standards can make to the conservation of fuel and power and the consequent reduction in emissions of CO_2. New buildings, conversions, extensions to buildings and alterations should therefore be designed and constructed so that the energy performance is 25% more efficient than would have been the case if the construction or conversion had been under the standards in force on 3 March 2002.	The targets set by the SCCB will inform future standards for energy performance.
54	The Home Energy Efficiency Scheme (Scotland) Regulations (2006) http://www.opsi.gov.uk/legislation/scotland/ssi2006/20060570.htm	These Regulations provide for grants for insulation and energy efficiency works and to install, repair or replace central heating systems. They replace the Home Energy Efficiency Scheme Regulations 1997 (S.I. 1997/790), as amended. Extend the central heating programme to allow for persons entitled to claim the guarantee element of pension credit and extend eligibility for measures to families with disabled children.	Installation, repair and replacement of domestic heating systems can reduce energy consumption across the sector. With an ageing population, and housing stock, support through this scheme will require long-term commitment by Government.
55	Scottish Community and Householder Renewables Initiative http://www.energysavingtrust.org.uk/schri/	SCHRI is operated by the Energy Savings Trust, as a one-stop shop offering grants, advice and project support to assist the development of new community and household renewable schemes in Scotland. SCHRI is funded by the Scottish Government and managed jointly by the Energy Saving Trust and Highlands and Islands Enterprise (HIE). The objectives of SCHRI are: • To support the development of community scale renewable projects • To support the installation of household renewables • To raise awareness of renewable technologies and benefits to Scotland	Adoption of small scale renewable energy technologies can provide an important contribution to the GHG reduction targets in the SCCB. Actions under the SCCB should seek to promote participation in SCHRI and may drive future expansion of the initiative.
56	Loan Action Scotland http://www.energysavingtrust.org.uk/housingbuildings/funding/scottishbusiness/financialassistance/	Loan Action Scotland (run by Energy Saving Trust) provides loans from £5,000 to £100,000 at 0% fixed interest to help finance energy saving measures. The scheme is aimed at Scottish companies that fall within the EC definition of Small & Medium sized Enterprises (SMEs). Registered charities can also apply.	Schemes such as Loan Action Scotland could provide important contributions to the targets set by the SCCB.
57	National Transport Strategy (2006) http://www.scotland.gov.uk/Publications/2006/12/04104414/0	The National Transport Strategy was published in 2006 following the conclusion of a public consultation. The NTS provides a long-term strategic framework to all Scottish transport developments across all modes of transport. It will build on the 2004 Transport White Paper, *Scotland's Transport Future,* by showing how transport will contribute to five key priorities:	The NTS aims to contribute to the overarching goals of supporting economic growth, communities and the environment by providing efficient transport infrastructure. The SCCB targets will be taken into account as future transport policies are developed.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		• economy; • environment; • social inclusion; • safety; and • integration - over the medium to long term.	
58	Scotland's Transport Future- The Transport White Paper (2004) http://www.scotland.gov.uk/library5/transport/stfwp-00.asp	Sets out the vision for Scotland's transport future and associated strategies and structures. The aim is to create safer, higher quality, more accessible and better integrated services. The main aims are to: • promote economic growth by building, enhancing, managing and maintaining transport services, infrastructure and networks to maximise their efficiency; • promote social inclusion by connecting remote and disadvantaged communities and increasing the accessibility of the transport network; • protect our environment and improve health by building and investing in public transport and other types of efficient and sustainable transport which minimise emissions and consumption of resources and energy; • improve safety of journeys by reducing accidents and enhancing the personal safety of pedestrians, drivers, passengers and staff; • improve integration by making journey planning and ticketing easier and working to ensure smooth connection between different forms of transport.	Environmental protection is a feature of this White Paper. Action on making transport sustainable and reducing emissions from the sector will be influenced by the SCCB targets.
59	Strategic Locational Guidance for Onshore Wind farms in respect of the Natural Heritage (2002) http://www.snh.org.uk/pdfs/polstat/ar-ps01.pdf	Policy Statement sets out a number of principles that should guide the location of onshore wind farm projects so as to minimise effects on the natural heritage. This guidance provides SNH's broad overview at a Scottish level of where there is likely to be greatest scope for wind farm development, and where there are the most significant constraints, in natural heritage terms, in order to safeguard Scotland's most valued natural heritage.	Development of onshore wind farms is likely to contribute significantly to GHG targets outlined in the SCCB. Such developments will be guided at a project level by EIA and the advice in this Policy Statement.
60	A forward Strategy for Scottish Agriculture: Next Steps (2006) http://www.scotland.gov.uk/Publications/2006/03/01142456/13	This document builds on 'A Forward Strategy for Scottish Agriculture' published in 2001. While the original strategy remains valid, it has been updated to reflect progress made and in particular focuses on the importance of sustainable development and climate change. The report includes a series of indicators which could be used to monitor success of the strategy and a monitoring strategy has been prepared. A working/ advisory group on climate change has been formed under the Strategy.	The Strategy recognises the need for Scottish agriculture to adapt and manage the risks associated with climate change and to make its contribution to mitigation in a range of ways. SCCB targets will inform future policy development.
61	The Pollution Prevention and Control (Scotland) Regulations (2000) http://www.legislation.gov.uk/legislation/scotland/ssi2000/20000323.htm	Regulations to ensure that Part A installations are operated such that there are no emissions to land, or where there are emissions to land, that no significant land, water or air pollution results. Also works to ensure that Part A installations are returned to a satisfactory state upon cessation of activities; and that installations are operated such that no significant land	The Regulations establish the pollution control framework for Scotland that the SCCB will operate within. Provisions driven by the Bill have the potential to impact pollution regulated by PPC.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		pollution arises from emissions to air.	
62	Scottish Forestry Strategy (2006) http://www.forestry.gov.uk/sfs	The Strategy is the Scottish Government's framework for taking forestry forward through the first half of this century and beyond. It sets out a vision of a forestry sector that is • diverse and strong; • in tune with the environment; • employing many people in a wide range of enterprises; and • providing the many other services and benefits that people need, now and for the future. Three outcomes are sought: • Improved health and well-being of people and their communities; • Competitive and innovative businesses contributing to the growth of the Scottish economy; and • High quality, robust and adaptable environment	The Strategy highlights the potential for forestry to make a significant contribution to mitigating and adapting to climate change over the coming decades. Action driven by the SCCB targets should include consideration of afforestation, biomass use, increased use of wood for construction, and reducing timber miles. However, these must be advised by appropriate assessments of impacts upon other environmental receptors, including long-term soil quality aspects and impacts on the water environment.
63	Scottish Natural Heritage Policy Statement- Energy and the Natural Heritage (06/02) http://nnr-scotland.com/pdfs/polstat/EnergyPolStat.pdf	Sets out SNH policy on interaction between energy and the natural heritage. Energy policy should seek to comply with the principle of "living within environmental limits", and embrace the need to: • use resources wisely and efficiently • reduce emissions of greenhouse gases • minimise the more local impacts which are determined by the scale and location of developments associated with the supply, distribution and use of energy • use best scientific knowledge, both in the technologies for energy use and generation and in assessing their impact on natural heritage	Energy sector development must be subject to appropriate EIA/ AA/ LCA to assess impacts on wider environmental receptors in order to maintain natural heritage resources. The 'higher' environmental imperative of reducing emissions must be properly assessed to determine indirect impacts and identify environmental mitigation strategies at the appropriate location and scale.
64	Scotland's Biodiversity- It's In Your Hands. A strategy for the conservation and enhancement of biodiversity in Scotland (2004) http://www.scotland.gov.uk/Publications/2004/05/19366/37239	Vision: 'It's 2030: Scotland is recognised as a world leader in biodiversity conservation. Everyone is involved; everyone benefits. The nation is enriched' Aim: "To conserve Biodiversity for the health, enjoyment and well being of the people of Scotland now and in the future". Objectives: sets out five main objectives relating to: • Species and habitats; • People; • Landscapes and ecosystems; • Integration and Ecosystems; and • Knowledge. Specifically, • conserve what we have; • sustain healthy ecosystems; • create networks and connections not a piecemeal approach; • engage more people;	The SCCB should be mindful of the potential impact of emissions reduction measures on natural habitats. The Biodiversity Strategy could influence the development process (e.g. in renewables/ biomass capacity development) which could represent a constraint on reduction measures driven by the Bill. Appropriate EIA/ AA/ LCA and consultation on effective environmental mitigation strategies should be a prerequisite of land use change measures to ensure minimal damage and maximise biodiversity adaptation.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		• promote sustainable development. The strategy also underlines the need to promote understanding and appreciation of natural heritage.	
65	Biomass Action Plan for Scotland (2007) http://www.scotland.gov.uk/Publications/2007/03/12095912	Sets out a coordinated programme for the development of the biomass sector in Scotland. Summarises various existing activities, and provides a framework under which they will be coordinated and supplemented by further action. Plan has been informed by EU Biomass Action Plan, and shares the aims of promoting economic growth, commitment to renewables and diversification of supply.	Biomass is likely to contribute significantly to meeting the SCCB targets. Action driven by the SCCB provisions should seek to encourage appropriate development of the biomass sector, having regard for locational suitability, biodiversity and water environment implications.
66	Natural Heritage Futures (2002) http://www.snh.org.uk/futures/Data/index.htm	Natural Heritage Futures aims to stimulate the wider debate necessary to establish a broad vision for sustainable development in Scotland, and to translate it into action. Key Objectives are: • to increase awareness of our natural heritage and its values and promote sustainable use; • to enhance the role of forests and woodlands in environmental processes, particularly in safeguarding water, air and soil resources; • to increase opportunities for all to enjoy woodlands and to enhance the contribution of forests and trees to the landscape; • to improve the ecological value of all forests and other tree cover, balancing woodland expansion with retention of open ground habitats.	These priorities, and others defined more locally, should be taken into account when preparing the likely enabling provisions of the SCCB. In particular, there is a need to recognise the particular sensitivities of specific landscapes that may be impacted by climate change mitigation measures.
67	Passed to the Future: Policy for the Sustainable Management of the Historic Environment (2002) http://www.historic-scotland.gov.uk/pasttofuture.pdf	Sets out the Scottish Government's policy for the sustainable management of the historic environment. It notes the irreplaceable nature of historic environment features, but also sets out the following key principles to guide the parameters in which change can take place: • recognising value – in terms of quality of life and as a means of meeting social, environmental and economic needs • good stewardship – taking into account capacity for change and the sustainable use of resources • assessing impact – following the precautionary principle where impact is not clear • working together – to reduce damage, resolve conflict and maximise benefit.	Provisions enabled by the SCCB should take account of, and should not negatively impact on, historic environment resources.
68	Scottish Historic Environment Policy (SHEP) (2007) http://www.historic-scotland.gov.uk/index/policyandguidance/sheps/shep1.htm	SHEP 1 is the overarching policy statement for the historic environment. It provides a framework for more detailed strategic policies and operational policies that inform the day to day work of a range of organisations that have a role and interest in managing the historic environment. These include the Scottish Government, local authorities and the range of bodies that are accountable to Scottish Ministers. SHEP 1 and the subsequent documents in the series are intended to sit alongside and complement the Scottish Planning Policy series and other relevant Ministerial policy documents. They are also intended to be relevant documents in the statutory planning,	Provisions enabled by the SCCB should take account of, and should not negatively impact on, historic environment resources. Development decisions/ actions under the SCCB should be subject to appropriate SEA/ EIA/ AA and LCA to ensure minimisation of damage and full integration of mitigation measures.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
		Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) processes.	
69	Choosing our Future: Scotland's Sustainable Strategy (2005) http://www.scotland.gov.uk/Publications/2005/12/1493902/39032	Sustainable development is a priority that is shared across the UK and the international community. Scotland signed up to a new UK shared framework for sustainable development, One future - different paths. The framework sets out a common goal for sustainable development across the UK, and a new set of principles which underpin the approach in Scotland	Action under the SCCB will contribute to wider sustainable development objectives by encouraging reduced energy consumption, better energy efficiency and less waste.
70	National Planning Framework for Scotland (2004) http://www.scotland.gov.uk/Publications/2004/04/19170/35317	Non-statutory framework to guide the spatial development of Scotland to 2025. The key aims of the strategy are: • to increase economic growth and competitiveness; • to promote social and environmental justice; and • to promote sustainable development and protect and enhance the quality of natural and built environments.	Provisions enabled by the SCCB will operate within the existing planning regime.
71	Planning etc (Scotland) Act 2006 http://www.opsi.gov.uk/legislation/scotland/acts2006/pdf/asp_20060017_en.pdf	Sets out arrangements for the preparation and publication of the National Planning Framework, a spatial plan for Scotland. Describes the procedure for Parliamentary consideration of the Framework, and its laying before Parliament. The second National Planning Framework, due for publication in 2008, will cover the period till 2030.	The SCCB targets will be an important consideration in future planning policy. If necessary and appropriate, the SCCB could contain provisions which amend the Planning etc. (Scotland) Act 2006.
72	SPP1 The Planning System (2002) http://www.scotland.gov.uk/Publications/2002/11/15751/12817	The planning system guides the future development and use of land in cities, towns and rural areas in the long term public interest. The aim is to ensure that development and changes in land use occur in suitable locations and are sustainable. The planning system must also provide protection from inappropriate development. Its primary objectives are: • to set the land use framework for promoting sustainable economic development; • to encourage and support regeneration; and • to maintain and enhance the quality of the natural heritage and built environment.	As above.
73	SPP2 Economic Development (2002) http://www.scotland.gov.uk/Publications/2002/11/15782/13586#1	Clearly supports the role of planning in delivering FEDS. States that planners should respond positively to change and reflect the needs of the market. Sets out the importance of ensuring industrial and business land supply is kept up to date, with regular reviews of marketability. Provides an overview of existing national sites, and does not anticipate that substantial additional allocations will be required.	The SPP seeks to ensure that development is managed in such a way as to enable economic development while maintaining a degree of environmental protection. The SCCB may enable development of emissions reduction measures which will be developed within these frameworks.

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
74	Planning Advice Note 45: Renewable Energy Technologies (2002), incorporating Planning for Micro Renewables Annex to PAN 45 Renewable Energy Technologies (2006) http://www.scotland.gov.uk/library/pan/pan45.pdf http://www.scotland.gov.uk/Publications/2006/10/03093936/0	Planning Advice Note (PAN) 45: Renewable Energy Technologies supports the policies in NPPG 6 (now SPP6) by providing information and best practice on renewables developments, particularly larger installations such as wind farms and waste to energy plants. The Annex to the Note provides advice on siting and design of micro-renewable technologies such as wind, solar thermal, photovoltaic, heat pumps and biomass.	Development of renewable capacity is vitally important for the success of the SCCB. Implementation of new renewables projects will be guided by this advice note.
75	SPP6 Renewable Energy (2007)# http://www.scotland.gov.uk/Publications/2007/03/22084213/22	Updates and replaces NPPG6. Sets out how the planning system should manage the process of encouraging, approving and implementing renewable energy proposals when preparing development plans and determining planning applications. Planning authorities should use the development plan process to support and encourage the continued growth of all renewable technologies. In particular, plans should set out a spatial approach for considering wind farm proposals over 20 megawatts. Spatial policies should not be used to restrict development on sites where the technology can operate efficiently and environmental and other impacts can be addressed.	As above.
76	SPP17 Planning for Transport (2004) http://www.scotland.gov.uk/library5/planning/spp17-00.asp	Sets out relationship between land use planning and transport. Planning can help to reduce the need to Travel through appropriate land allocations and settlement strategies, help to achieve a shift to more environmentally sustainable modes of transport, and help to reduce environmental impacts. Transport Assessments should be used early in the development process to build an understanding of potential impacts of development decisions.	The SCCB targets will be an important consideration in future transport policy and could contain relevant enabling powers if considered appropriate.
77	NPPG 14 Natural Heritage (2002) http://www.scotland.gov.uk/Publications/1999/01/nppg14	Sets out land use Planning considerations relating to natural heritage, including the conservation and possible enhancement of: • the overall populations and natural ranges of native species and the quality and range of wildlife habitats and ecosystems; • geological and physiographical features; • the natural beauty and amenity of the countryside and the natural heritage interest of urban areas; and • opportunities for enjoying and learning about the natural environment Aims to ensure that the natural heritage is conserved and enhanced for present and future generations. Also stipulates that planning authorities should take particular care to avoid harm to protected species (includes badgers, bats, otters and red squirrels).	Actions under the SCCB should reflect this approach to natural heritage conservation, and recognise the positive role it can provide in achieving enhancement. The potential for negative impacts on natural heritage from mitigation measures driven by the Bill should be fully considered in appropriate SEA/ EIA/ AA etc.
78	NPPG 18 Planning and the Historic	Sets out Government planning policies in relation to the historic environment with a	Actions under the SCCB should take these policy commitments

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	Environment (1999) http://www.scotland.gov.uk/Publications/1999/04/nppg18	view to its protection, enhancement and conservation. Aims to provide effective protection of all aspects of the historic environment. The historic environment can be damaged through new infrastructure development and indirect effects associated with transport.	into account as far as possible, particularly by ensuring that the historic environment is taken into account when making locational decisions for renewables development. Should be addressed through appropriate SEA/ EIA/ LCA etc.
79	SPP10 Planning and Waste Management. (2007) http://www.scotland.gov.uk/Publications/2006/08/11100231/0	Supports a planned approach to the identification of sites for installations using a range of technologies. Focusing on industrial land, the SPP promotes a model policy for planning authorities to adopt in their development plans. Landfill will continue to be required and should continue to be safeguarded by development plans. Development management decisions should reflect development plan and National Waste Plan policies supported by other guidance referenced in the SPP including SEPA's guidance on thermal treatment of municipal waste.	The SPP requires planning authorities to make provisions for waste treatment, focusing on the use of industrial land for new installations. The waste sector is an important source of GHG. If appropriate, the SCCB could be used to drive the adoption of measures which reduce its emissions e.g. limiting biodegradable waste reaching landfill and encouraging investment in higher energy efficiency management and recovery systems.
80	National Waste Strategy (2003) http://www.sepa.org.uk/nws/index.htm	Strategy sets out a framework within which Scotland can reduce the amount of waste it produces and deal with the waste that is produced in a more sustainable way. It covers all household, commercial and industrial waste. More than 85% of the waste produced in Scotland is sent directly to landfill – a massive misuse of resources and a major source of greenhouse and other gases. The National Waste Strategy aims to reduce this practice and outlines how we can work towards a culture of reducing, reusing and recycling our rubbish. Aims to stop growth in municipal waste by 2010. Indicates that if growth should slow to 1.5% from 2010 to 2020, arisings of municipal solid waste could increase to 4.38 Mt. by 2020. It sets out the best practicable environmental option (BPEO) for municipal waste for each of 11 Waste Strategy Areas and describes actions at a national level to improve the management of non-municipal solid waste. The National Waste Strategy brings together Area Waste Plans for the different Waste Strategy Areas. The Scottish Government has allocated over £350 million to the Strategic Waste Fund to help local authorities develop the infrastructure needed to implement these plans.	The waste sector is an important contributor to GHG emissions so the SCCB should compliment the Strategy. The 85% to landfill figure is now down to around 70% and is expected to reach the Government's 60% target by 2010. On 24 January 2008 the Scottish Government announced new waste policies including: • a target to increase to 60 % the amount of municipal waste being recycled or composted by 2020 and a new target of 70 per cent by 2025; • a target to reduce landfill from municipal waste to 5% by 2025; and • a commitment that no more than 25 % of municipal waste will be used to generate energy by 2025 and large, inefficient incinerators are to be rejected.
81	Going for Green Growth: a Green Jobs Strategy for Scotland (2005) http://www.scotland.gov.uk/Publications/2005/06/1693437/34386	This green jobs strategy complements and adds to A Smart, Successful Scotland (SSS), and will have a similar function in that it will be the green enterprise strategy for Scotland and provide strategic guidance for the Enterprise Networks. It supports the commitment to sustainable development in SSS and also takes into account the other crosscutting themes, namely closing the gap in economic opportunities and promoting equal opportunities, enabling all communities to benefit.	A number of sectors, particularly renewable energy, waste management, recycling and use of recyclates are identified as having particular opportunities for development in Scotland. Other areas such as sustainable biofuels, construction and sustainable design, organic farming, tourism and cleaner technologies also have a lot of potential. Action under the SCCB should encourage development in these sectors as they have the potential to contribute to objectives.
82	The Government Economic Strategy (2007)	The Government Economic Strategy supports the delivery of the Purpose, that is, to focus the Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable growth.	The Strategy covers key areas relevant to the SCCB such as emissions reduction, promotion of innovation, business research and development, transport infrastructure,

	Name of plan / programme / legislation/guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	http://www.scotland.gov.uk/Publications/2007/11/12115041/0	The Strategy has emissions reductions as one of its targets, providing a key yardstick by which the commitment to sustainable economic growth will be judged.	development of a more efficient planning regime. Economic growth is traditionally associated with emissions growth, breaking that linkage is key meeting the SCCB target. Action under the SCCB targets can drive these developments, and indeed its success may depend on them.
83	Scottish Rural Development Programme 2007-2013 (2007) http://www.scotland.gov.uk/Publications/2007/07/20145359/0	The programme will contribute to each of the three objectives set out in Article 4 of Regulation 1698/2005: • improving the competitiveness of agriculture and forestry by supporting restructuring, development and innovation (Axis 1); • improving the environment and the countryside by supporting land management (Axis 2); and, • improving the quality of life in rural areas and encouraging diversification of economic activity (Axis 3). The SRDP addresses five key outcomes: • Improved business viability; • Enhanced biodiversity and landscape; • Improved water quality; • Tackling climate change; and, • Thriving rural communities.	The SRDP should help contribute to SCCB targets, particularly in terms of climate adaptation and wider environmental benefits. The Programme offers Land Management Contracts and measures to improve environmental stewardship within the land management sectors.

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix C

Environmental Baseline Details

Halcrow

Introduction

Part 2 of Schedule 3 (in relation to Section 14) of the Environmental Assessment (Scotland) Act 2005 establishes that environmental reports should record,

> *"The relevant aspects of the current state of the environment and the likely evolution thereof without the implementation of the plan or programme."*

This section presents a brief summary of the state of the environment with respect to the key areas that the SEA is required to cover. Due to the wide geographic and far-reaching nature of the issues covered within the SCCB, it is not considered appropriate or necessary to provide a great level of detail in this baseline.

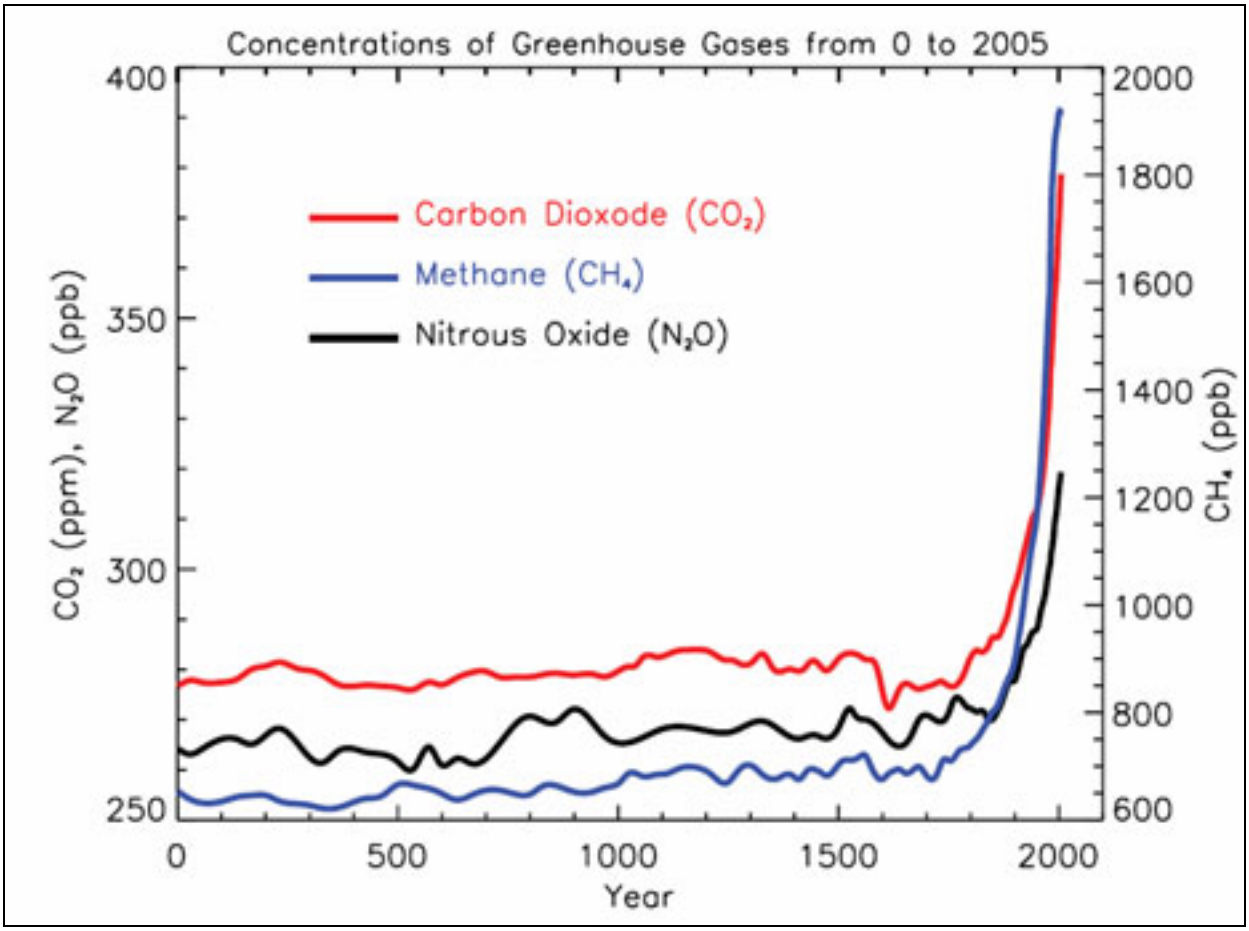
A brief summary of the state of the environment for each of the environmental receptors is provided with a discussion of the potential impacts of climate change. Key reference sources included:

- SEPA, State of the Environment Report, 2006;
- SEPA, Climate Change Plan, SEA Scoping Report, 2007
- National Atmospheric Emissions Inventory (online);
- SNIFFER, Handbook of Climate Trends across Scotland (online).
- Scottish Government, Key Environment Statistics, 2006/7;
- Scottish Government, Rural Scotland Key Facts, 2006/7;

Climate Change in Scotland – Context and Observed Impacts

Our climate depends on the Earth's temperature. Due to rapidly increasing concentrations of carbon dioxide (CO_2) and other greenhouse gases in the atmosphere, the temperature of the planet is rising quickly compared with relatively stable temperatures throughout the past millennium. Atmospheric carbon dioxide concentrations remained relatively constant at around 280 parts per million (ppm) for at least a thousand years, but concentrations have risen since the mid-1700s, reaching 377ppm in 2004 (see Figure C1).

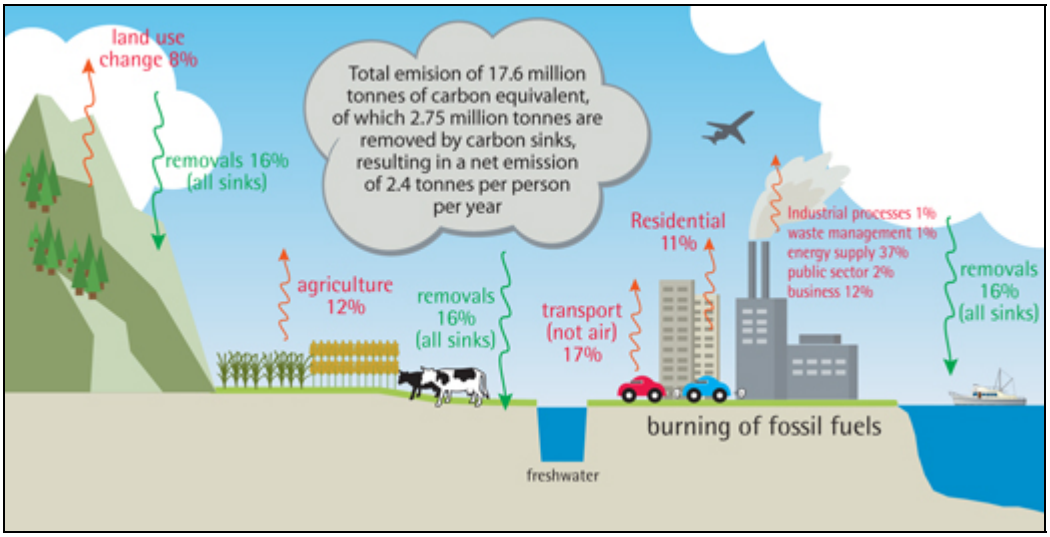
Figure C1: *Atmospheric concentrations of important long-lived greenhouse gases over the last 2,000 years. Increases since about 1750 are attributed to human activities in the industrial era. Concentration units are parts per million (ppm) or parts per billion (ppb), indicating the number of molecules of the greenhouse gas per million or billion air molecules, respectively, in an atmospheric sample.*



Source: IPCC (2007) Fourth Assessment Report of Working Group 1 - The Physical Science Basis

The increasing use of fossil fuels for energy generation and transport purposes means carbon dioxide is the most critical greenhouse gas. The main sources of greenhouse gases in Scotland are shown in Figure C2 below.

Figure C2: Main sources and sinks of carbon emissions in Scotland



Source: SEPA (2006) State of the Environment Report, (Fig. C2)

Annual emissions of the six main greenhouse gases (CO_2, CH_4, HFC, N_2O, PFC, SF_6) expressed as CO_2 equivalents are shown in Table C1 below. Although Scotland's CO_2 emissions fell by 12.5% between 1990 and 2005, our energy demands for transport, businesses and homes increased significantly during the same period. Despite methane emissions falling by 38.2% between 1990 and 2005, significant volumes of carbon dioxide and methane could be released from soils as a result of increased temperatures or changes in land use. For example, Scotland's peat uplands are vulnerable to changes in climate and land management and, if only 0.1% is released as carbon dioxide, Scotland's emissions will double.

Table C1: Scotland's greenhouse gas emissions compared to base year, 1990–2005

	CO_2	CH_4	HFC	N_2O	PFC	SF_6	Total
1990	**(Base Year)**	**(Base Year)**		**(Base Year)**			**(Base Year)**
1995	-2.7%	-5.3%	**(Base Year)**	-9.7%	**(Base Year)**	**(Base Year)**	-3.47
1998	-1.6%	-12.0%	216.6%	-11.3%	27.6%	29.7%	-3.22
1999	-7.6%	-18.4%	247.1%	-13.7%	34.3%	58.2%	-8.77
2000	-1.8%	-20.8%	305.5%	-15.4%	27.1%	68.4%	-4.65
2001	-1.9%	-25.8%	354.0%	-15.7%	-26.2%	54.3%	-5.37
2002	-8.0%	-31.7%	399.0%	-15.5%	-8.1%	71.0%	-10.66
2003	-7.1%	-37.2%	427.7%	-16.6%	-10.8%	68.0%	-10.77
2004	-11.1%	-38.1%	444.1%	-18.6%	-14.3%	92.2%	-14.13
2005	-12.5%	-38.2%	456.7%	-20.7%	-19.8%	125.1%	-15.39

All reductions are expressed in comparison to the base year (1990 for CO_2, CH_4, N_2O; 1995 for HFC, PFC, SF_6)
Source: National Atmospheric Emissions Inventory

When we consider that the aim of the SCCB is to reduce greenhouse gas (GHG) emissions by 80% from 1990 to 2050, the implied trajectory for the total GHG emissions is encouraging; however it is likely that reductions will become more difficult with time. It is also possible that certain gases have already been reduced as far as is possible using currently available measures (e.g. CH_4 is now routinely captured from landfill); the remainder could be much more difficult to reduce.

Table C2 shows the total emissions (expressed as kilotonnes of CO_2 equivalent for the same period). The proportion of the total arisings of non-CO_2 gases suggests that, were the SCCB to consider the basket of six gases for targeted reduction; these could present an improved opportunity for Scotland to meet its obligations. This could be significant as the SCCB will commit to an additional 20% GHG reduction (over the UK Bill commitment to reduce CO2 by 60%), and Scotland should seek to maximise reduction opportunities wherever they exist.

Table C2: Scotland's greenhouse gas emissions, 1990–2005

Year	CO_2	CH_4	HFC	N_2O	PFC	SF_6	Grand Total
1990	49,951	8,185	No data	6,169	113	20	**64,439**
1995	48,624	7,753	132	5,573	88	31	**62,200**
1998	49,127	7,199	417	5,470	112	40	**62,366**
1999	46,162	6,680	458	5,323	118	49	**58,789**
2000	49,040	6,483	535	5,221	111	52	**61,442**
2001	48,994	6,071	599	5,202	65	48	**60,978**
2002	45,972	5,593	658	5,213	81	53	**57,569**
2003	46,380	5,143	696	5,147	78	52	**57,496**
2004	44,396	5,070	717	5,019	75	59	**55,337**
2005	43,698	5,060	734	4,891	70	69	**54,522**
Source: National Atmospheric Emissions Inventory							

Greenhouse Gases

The majority of greenhouse gases arise from natural sources but are also contributed to by human activity. The major greenhouse gases with anthropogenic origins are described below.

Carbon Dioxide (CO_2)

CO_2 is an atmospheric gas comprised of one carbon and two oxygen atoms. CO_2 derives from multiple sources including volcanic outgassing, the combustion of organic matter and respiration processes of aerobic organisms. It is also produced by various micro-organisms through fermentation and cellular respiration. Plants utilise carbon dioxide during photosynthesis, using both the carbon and the oxygen to construct carbohydrates. Conversely, plants also release oxygen to the atmosphere, which is subsequently used for respiration by heterotrophic organisms, forming a major component of the carbon cycle. CO2 is present in the Earth's atmosphere at a low concentration (though this is steadily and rapidly increasing) and acts as a greenhouse gas.

Methane (CH4)

CH_4 is the simplest alkane, and the principal component of natural gas. It is a relatively potent greenhouse gas with a high GWP. The NAEI states that each kg of CH_4 warms the Earth 21 times as much as the same mass of CO_2 (based on the Third assessment report of the IPCC). However, the Fourth assessment report of the IPCC has recalculated this to include indirect effects and states that the relative impact of CH_4 to CO_2 averaged over 20 years is 72. The reason for this discrepancy is that CH_4 in the atmosphere is eventually oxidised, producing carbon dioxide and water. As a result, CH_4 in the atmosphere has a half life of seven years (every seven years, the amount of CH_4 halves).

A significant proportion of agricultural emissions are of CH_4. The Macaulay Institute estimate that 69% of Scotland's CH_4 emissions arise from agriculture, with cattle responsible for 49%[1]. Ruminant livestock are a significant methane source in Scotland. Reductions in CH_4 emissions in Scotland have largely been the result of capture of landfill gas, and a reduction in livestock numbers.

Hydrofluorocarbons (HFC)

HFCs are man-made chemicals, many of which have been developed as alternatives to ozone-depleting substances for industrial, commercial, and consumer products. GWPs of HFCs range from 140 (HFC-152a) to 11,700 (HFC-23). The atmospheric lifetimes for HFCs vary from just over a year for HFC-152a to 260 years for HFC-23. Most commercial HFCs have atmospheric lifetimes under 15 years; eg., HFC-134a (used in vehicle air conditioning and refrigeration), has an atmospheric life of 14 years.

Perfluorocarbon (PFC)

PFCs are commonly used in refrigerating units and "clean" fire extinguishers. However, PFCs are extremely potent greenhouse gases, and can persist for up to 50,000 years. PFCs have extremely stable molecular structures and are largely immune to chemical processes in the lower atmosphere that break down most atmospheric pollutants. Not until the PFCs reach the mesosphere, about 60 kilometres above Earth, do very high-energy ultraviolet rays from the sun destroy them. This removal mechanism is extremely slow and as a result PFCs accumulate in the atmosphere and persist for several thousand years. The estimated atmospheric lifetimes for CF_4 and C_2F_6 are 50,000 and 10,000 years respectively.

Nitrous Oxide (N2O)

Unlike other nitrogen oxides, nitrous oxide is a major greenhouse gas. While its radiative warming effect is substantially less than CO_2, the persistence of N_2O in the atmosphere, when considered over a 100 year period, per unit of weight, has 310 times more impact on global warming than that of CO_2. Control of N_2O is included in efforts to curb greenhouse gas emissions, such as the Kyoto Protocol.

Agriculture is the main source of human-produced N_2O: cultivating soil, the use of nitrogen fertilisers, and animal waste handling can each stimulate naturally occurring bacteria to produce more N_2O. The livestock sector (primarily cows, chickens, and pigs) produces the majority of human-related N_2O. Industrial sources make up only about 20% of all anthropogenic sources, and include the production of nylon and nitric acid, and the burning of fossil fuel in internal combustion engines.

Despite its relatively small concentration in the atmosphere, N_2O is the third largest greenhouse gas contributor to overall global warming, behind CO_2 and CH_4. (The other NO_x gases contribute to global warming indirectly, by contributing to tropospheric ozone production during smog formation).

Sulphur Hexafluoride (SF6)

The global warming potential of SF_6 is 23,900, making it the most potent greenhouse gas the IPCC has evaluated. SF_6 is a colourless, odourless, non-toxic, non-flammable gas. SF_6 is used for insulation and current interruption in electric power transmission and distribution equipment, in the magnesium industry to protect molten magnesium from oxidation and potentially violent burning, in semiconductor manufacturing to create circuitry patterns on silicon wafers, and as a tracer gas for leak detection.

Like the other high GWP gases, there are very few sinks for SF_6, so all man-made sources contribute directly to its accumulation in the atmosphere.

[1] The State of Scotland's Farm Environment 2005 http://www.macaulay.ac.uk/LINK/

Scottish Climate Change Impacts to Date

This section sets out observed patterns of climatic change in Scotland over the past 50 years as reported in two key documents:

- The Scotland & Northern Ireland Forum For Environmental Research (SNIFFER) 2006 publication, Handbook of Climate Trends Across Scotland

- SEPA's State of the Environment, 2006 Report

The SNIFFER Handbook presents recorded changes in Scotland's climate in the last century and provides a benchmark against which we can measure future climate change and develop strategies to cope with its impact. The Handbook includes analysis of historic data relating to temperature, rainfall, snowfall, air-pressure and sunshine.

The State of the Environment report concludes that climate change is evident in Scotland from observed trends in temperature, rainfall and snow cover, higher river flows and sea levels. It also notes other climate-related phenological changes, including shifts in growing, breeding and migration seasons and in species abundance and diversity.

Significant observations described in these two documents with respect to temperature, rainfall, changes in the marine environment and in Scotland's coastline are described below:

Temperature
Scotland's temperature records indicate average spring, summer and winter temperatures rising by more than 1^{o}C since 1961. This has been particularly prevalent in southern and eastern Scotland. Average temperature increases are smallest in autumn.

24 hour maximum temperatures have similarly been increasing, on average by over 1^{o} since 1961. This is particularly marked in winter and spring. The rise in maximum temperatures has been relatively constant across the country.

Since 1914 there has been an upward trend in minimum temperatures in both east and west Scotland for all seasons. Minimum temperatures in northern Scotland while increasing are doing so at a slower rate than the rest of the country and some areas not having experienced much increase at all. Minimum temperatures have not increased at the same rate as maximum temperatures.

Since 1961, the growing season across the whole of Scotland has lengthened by 33 days. This is particularly marked in coastal areas, in western Scotland where the growing season is now nearly 37 days longer than in 1961 and the Shetland Islands where it has been extended by over two months. The increase is most influenced by an early start which, on average, now occurs 21 days earlier.

Since 1961 there has been a 26% reduction in the number of days each year of air frost. This reduction has been constant across the country, although some small areas in northern Scotland have witnessed an increase. The reduction is most noticeable in the spring and autumn seasons. Since 1961 there has been a 28% reduction in the number of days each year of ground frost, although most of these reductions have occurred since the early 1980s.

Rainfall

Scotland over the year is, on average, 20% wetter than it was in 1961. Winter precipitation shows a clear upward trend since this time, with a 58% increase recorded across the country. This is most marked in the north (nearly 70% increase) and less marked in the east (36% increase). There is less variability in precipitation across the other seasons and patterns are less clear. The key trends for non winter months appear to be that the east has become slightly drier during the summer and the west wetter in spring.

There has been a trend of increasing heavy rainfall in winter, particularly in the north and west. There is a link between the number of days of heavy rain and overall rainfall.

The number of days of snow cover has reduced across the country. This is particularly prevalent in autumn where decreases of over 70% have been recorded (nearly 83% in western Scotland).

There has been very little change in the maximum number of consecutive dry days with little long term trends recorded since 1961. Overall there is a clear contrast in the number of consecutive dry days between east and west Scotland, but there would appear to be no significant change since 1961.

There is a clear trend of an increase in the levels of maximum five day precipitation (ie. maximum recorded precipitation over a five day period in any year) of around 20%. A steady increase has been recorded across all Scotland. Increases in prolonged precipitation and rainfall intensity may lead to greater flooding.

Other

There is no clear trend in wind speeds or number of gale days across the country. Since 1961, the number of sunshine hours in a day has increased slightly over the year, but a more significant increase is recorded across Scotland during autumn. While there are significantly different patterns of sunshine across the country, changes in those patterns appear not to show any trends.

The Marine Environment

The seas around Scotland have warmed by $1^{o}C$ over the last 20 years. Warmer seas have prompted changes in composition, abundance and distribution of a number of marine species including plankton, fish, sea birds, whales, mammals, dolphins and porpoises.

Warm water fish such as red mullet, sardines and anchovies have been caught off Scotland's coast since 1995. Some plankton species, which form the basis of the marine food web, have migrated north by up to 10 degrees latitude (about 700 miles). Changes in plankton distribution and abundance have serious consequences not only for the marine ecosystem but for the ability of the oceans to absorb carbon dioxide and ultimately regulate the Earth's climate.

Coastline

Sea level is rising all around the UK coastline, but at a slower rate around Scotland because the Scottish mainland is still rebounding following the last ice age. Nonetheless, all Scottish mainland gauges have recorded a sea level rise over the long term, with the longest individual record at Aberdeen indicating an average sea rise of 0.6mm per year since 1862. Sea level rise increases the risk of flooding of coastal and estuarine towns and leads to erosion of intertidal habitats and loss of biodiversity. This, combined with evidence of increasing storminess and wave height in the North East Atlantic, suggests that future storm surges will probably become more severe, leading to increased risk of coastal flooding.

The Current Environment and Predicted Climate Change Impacts

This section sets out the possible effects of predicted climate change on Scotland, with particular reference to the SEA topics. For each SEA topic, the current state of the environment is briefly described and commentary is provided on potential effects of climate change. SEPA's State of the Environment Report 2006 forms the basis of much of this section.

General Climate Change Impacts

The speed and impact of climate change will be become more severe if the world remains heavily dependent on fossil fuels. Indeed, temperatures in Scotland may rise by up to 4^{o}C by the end of the century, with consequences including milder and wetter winters, hotter and drier summers, more extreme weather events and rising sea levels.

Climate Change Scenarios for the United Kingdom: The UKCIP02 Scientific Report[2] presents four climate change scenarios. These scenarios are based on global emission scenarios from the Intergovernmental Panel on Climate Change (IPCC) and outputs from Hadley Centre climate models. Due for release in 2008, UKCIP08 will introduce probabilities to climate predictions for the first time in order to improve risk assessment and management of climate change.

UKCIP02 predicts a number of impacts that may occur in the UK by 2080. The key findings suggest:

- 1.5 to 2^{o}C warmer in winter; up to 3.5^{o}C warmer in summer; and possibly 4^{o}C warmer in autumn. Summers will suffer some significant heat waves.
- Milder temperatures in winter will result in wetter conditions, with extremes of rainfall leading to serious flooding events.
- Precipitation will increase by over 30% in the east of the country and up to 20% in the west during the winter season. Conversely, summer rainfall will be around 40% less, particularly in the south and east of Scotland.
- Daily winter rainfall will increase by at least 20% for storms that normally occur only once every two years.
- Summer cloud cover will decrease by 10%, with a slight increase in winter cloud cover.
- Daily average wind speed is not likely to change significantly, although it could be up to 3% higher, particularly in the north west of Scotland. Meanwhile, the two year daily mean average wind speed could be up to 4% higher. If this increase applies to storm gusts, considerably more damage to infrastructure will be inevitable.
- Snowfall across much of Scotland will decrease by over 90%.
- Sea level will rise by approximately 60cm around Scotland's coastline and storm surges could be up to 0.7m higher, resulting in higher risks of coastal flooding.
- Sea surface temperature will be 1^{o}C to 2.5^{o}C warmer; the greatest increase being off South East Scotland.
- The frequency of high impact weather events will increase with rising average global temperature

[2] http://www.ukcip.org.uk/scenarios/ukcip02/documentation/ukcip02_scientific_report.asp

Water

Scotland has generally high quality water environments although human activity can result in damage. The state of the water environment is influenced by changes taking place in water itself and in the climate, as well as inputs from land and air. Human activities which result in changes and inputs can harm the water environment affecting water resources and damaging ecosystems.

There are indications that:

- overall quantity of water in Scottish rivers is increasing;
- spells of very wet weather are occurring more frequently and with it the risk of flooding;
- some rivers in the east may be experiencing lower flows, particularly during the summer.

These indicators are of particular relevance to climate change.

There is extensive monitoring of rivers, lochs, estuaries and coastal waters and, to a more limited extent, groundwater. Monitoring covers a wide range of chemical parameters but it also includes biological parameters and aesthetic appearance. The monitoring results are combined such that a body of water is placed into one of four or five classification bands (depending on river, estuarine or coastal classification), which describe the current condition ranging from excellent or good quality, through fair and poor quality to seriously polluted for rivers and through excellent, good, unsatisfactory and seriously polluted for estuaries and coastal classifications.

2005 data shows that some 78% of rivers, 98% of estuaries and 99% of coastal waters in Scotland were classified as either excellent or good quality. The situation has continued to improve from that reported by SEPA in 1996 and 1999. The number of poor quality or seriously polluted (class C and D) rivers, estuaries and coastal waters declined by 16%, 44% and 57% respectively from 2000 to 2005.

A SEPA analysis of the pressures on water quality in Scotland in 2005 concluded that point and diffuse pollution posed a risk of failing to meet the objectives of the Water Framework Directive to:

- 36,264 km^2 of groundwater (equivalent to 46% of Scotland's land area);
- 7,947 km of rivers (31% of total river length);
- 350 km^2 of lochs (35% of total loch area);
- 759 km^2 of estuaries (76% of total estuary area);
- 3,441 km^2 of coastal waters (7% of total area of coastal waters)

The physical structure (morphology) of the water environment has been progressively changed by human activity. Once changed it may take decades or centuries for the system to return to a natural condition. Results of SEPA risk assessments concluded that pressures on morphology posed a risk to:

- 8,827 km of rivers (35% of total river length);
- 509 km^2 of lochs (51% of total loch area);
- 558 km^2 of estuaries (56% of total estuary area);
- 1,272 km^2 of coastal waters (3% of total area of coastal waters).

Potential Climate Change Impacts

It is likely that with increased average rainfall, increased rainfall intensity and prolonged periods of rain, that more frequent and more severe river flooding will occur. It is estimated that this may affect more than 70,000 properties, many of which are concentrated within particular areas of risk. In addition, with higher sea levels and increased wave height, it is predicted that coastal flooding in Scotland will become both more frequent and more severe. It is predicted that a further 30,000 properties could be at risk from this source of flooding. Flooding can have very significant effects on property, businesses, agriculture as well as being a risk to human life.

Long term predictions are for an increased likelihood in summer droughts. While the observed impacts in Scotland have not borne this prediction out, if realised, this could result in river water quality problems (caused by lack of flow), limitations on abstraction of water (particularly for agricultural use) and even possible problems with water supply.

Increased flood events and the potential for summer time droughts may result in water quality issues that need to be addressed. For example, reduced river flows during drought periods will provide less dilution for aquatic discharges which may increase pollution risk. Reduced river flows may also affect abstraction for drinking water or for commercial use. Conversely, increased flooding may increase run off of pollutants (e.g. from agricultural land) into waterbodies and which may affect their status e.g. run off impacting on bathing water quality.

It is predicted that sea levels will rise, that there may be increased wave heights (particularly during storms) and that sea temperatures around Scotland will also rise. Whilst the consequences of these are difficult to predict, it is likely that increasing rates of coastal erosion will result from higher sea levels and wave heights. This in turn may lead to terrestrial land and habitat loss. Within the marine environment, higher sea temperatures may result in changes to the distribution and abundance of marine biodiversity. This may result in the increase of some species and the decrease or even loss of others (with warmer water species replacing colder water species). This may in turn affect other species e.g. the recent poor breeding of Scottish Island seabirds. Changes in marine species may also affect economic activities such as commercial fisheries.

Biodiversity, Flora and Fauna

The state of Scotland's biodiversity is a litmus test of the state of the environment; whatever changes take place in the land, air and water environments ultimately affect biodiversity.

Scotland's environment supports some 90,000 species of animal, plant and microbes. These species inhabit a wide range of habitats; Scotland's climate, geology and physical landscape combining to provide a tremendous variety of natural habitats which have subsequently been altered and modified by human activity. Scotland's landscape is a mosaic of habitats reflecting various influences over time, from the seas and coastal waters, to rivers and lochs, farmland and forests, mountains and moorland.

Many of the habitats are internationally important; of the 159 conservation priority habitats listed in the European Habitats Directive, Scotland has 65. In terms of protected sites, the importance of these areas in a European context is recognised in the designation of around 240 Special Areas of Conservation (SACs).

In addition to these European designations, Scotland has a network of over 1450 Sites of Special Scientific Interest (SSSIs), covering some 13% of Scotland. SSSIs represent the best examples of Scotland's natural heritage and are designated by Scottish Natural Heritage (SNH) for their plants, animals or habitats, their rocks or landforms. At a UK level, Scotland has 41 of the 45 habitats and 261 of the 391 species identified as priorities for action in the UK Biodiversity Action Plan. In 2005 a list of species and habitats was published (www.biodiversityscotland.gov.uk) identifying those considered by the Scottish Ministers as important for biodiversity conservation in Scotland. It includes 177 terrestrial and freshwater habitats, 197 marine species and habitats, and 1806 terrestrial and freshwater species (including 61 endemic to Scotland).

Potential Climate Change Impacts

Climate change predictions for the UK suggest that as the environment changes, biodiversity will be significantly affected. It is still not exactly clear how biodiversity in Scotland will be affected or how species will adapt to climate change, but it is suggested that there will be the potential for changes in:

- abundance and distribution of species;
- phenology (timing of flowering, breeding, migration, length of growing season);
- species behaviour (migration routes, response to drought/ flood);
- ecosystems (loss of species unable to move/ adapt);
- CO_2 (contribution to CO_2 storage, release and sequestration);
- temperature (could be less favourable for native species, while new species may appear. New species may compete with native species for food and habitat);
- habitats (damaged through flooding and increased erosion);
- food chains (potential catastrophic loss of species e.g. island breeding sea bird populations).

In addition, climate change mitigation measures may also have biodiversity impacts. Renewable energy developments could, for example, have effects on aquatic species and habitats (for hydro and run of river schemes) or on bird populations (for large scale wind). An increase in use of land for growing biomass crops may also lead to biodiversity impacts.

Soil/ Land

The Scottish soil resource contains a number of internationally important soil types including montane soils and peat. Podzols are the most common soil type occupying 18,480 km^2 or 24% of the land area. Peats occupy 16,940 km^2 or 22%; gleys occupy 10,780 km^2 or 14%; brown earths 9,240 km^2 or 12%; montane soils 3,850 km^2 or 5%; and lithosols, regosols, alluvial soils, rankers, rendzinas, calcareous soils and magnesian soils make up the remaining 4% of the land area.

Soil is a non-renewable resource and essential for supporting agriculture, forestry and all terrestrial ecosystems, as well as elements of the historic environment (archaeological resources). The soils of Scotland contain the bulk of the UK soil carbon pool. It is estimated that 13.6% (>1 m ha) of Scotland's land surface is overlain by deep peat soils. This represents about 5000 tonnes of carbon stored per hectare or about 10 times the equivalent stored in the mineral soils which are more common in England.

Taken together, the carbon stored in the deep peats and the shallower peaty soils of Scotland is about 170 times more than stored in all the vegetation of Scotland. Soil carbon can be lost either through climate change or as a consequence of inappropriate land management (e.g. drainage of deep peats). Either would have major effects in relation to added GHG emissions.

SEPA have identified three main pressures affecting soils: industry; agriculture and forestry, with agriculture and forestry accounting for 80% and 13% respectively of the land area in Scotland. Impacts from agriculture include soil erosion, and the use of inorganic fertiliser and pesticide applications. In addition, agriculture provides large quantities of greenhouse gases (from land use change, fertiliser use and ammonia from intensive livestock rearing) which can be reintroduced to the soil via atmospheric deposition.

Loss of organic matter in soils is a concern in Scotland along with soil erosion, while an increase in building developments and road improvements has meant losses associated with soil sealing by impermeable surfaces. Soil organic matter is also a significant carbon store and its loss increases carbon dioxide emissions and levels of organic carbon in water. Scotland's soils contain an estimated 2,196 million tonnes of soil carbon (to a depth of 100 cm) compared with a total of 4,566 million tonnes for the whole of the UK. Small changes in terrestrial carbon stocks will result in large GHG emissions.

Other threats to land include:

- Alteration of soil chemistry through the addition of substances, including acidification.
- Inappropriate waste disposal leading to land contamination, for example oils or chemicals.
- Poor forestry or agricultural practice increasing the risk of soil erosion, loss of organic matter/ nutrients, landslips, loss of vegetation, species shift and habitat change.
- Decreased biodiversity due to land use change.

Potential Climate Change Impacts

As the climate changes, the land and soil will also likely be subject to change, in terms of its physical properties or quality, and the way in which we use land for growing crops or for other commercial activities. The physical structure of soil may be changed through drought combined with higher intensity storm events causing landslides. In particular, peaty soils may suffer from accelerated decomposition (through drying) which may result in an increase in emissions of greenhouse gases normally locked up in these soils, which in turn may fuel further climate change. Land may also be lost through erosion caused by water (eg. through flooding, particularly coastal flooding) or by wind (particularly when associated with drying of soils).

Damage to soils (for example by landslide) can lead to significant disruption of human activities, particularly where transport infrastructure is affected. Changes to the climate may also lead to significant changes in the way that land is used. This is most likely to occur in respect of the types of crops able to be grown in Scotland, where crops previously unsuited to the climate may be able to be commercially viable and other crops may be less suited to new conditions.

Another feature which may affect land and soil are measures to adapt to climate change. For example, biomass crops to offset fossil fuel use may become increasingly popular, replacing traditional crops. This may in turn have impacts for landscape and biodiversity. Further, the need to protect land from flooding may also result in changes to land use, with some areas left as sacrificial land (e.g. flood meadows) with other areas requiring new or upgraded defences.

Population/ Human Health

Scotland covers an area of 30,414 square miles (78,772 km^2) and has a population of just over 5 million people, with almost 1 million living in rural areas. The population of Scotland in 2006 was estimated to be 5.12 million people. This has remained reasonably steady since 1951 with the population only expected to rise to 5.37 million by 2031. The number of new households has seen a steady rise since 1991, and in 2006 there were 2.3 million households in Scotland. This largely due to more couples or singles living alone rather than an increase in population.[3] The overall trend is one of increasing urbanisation with 1,403 hectares of agricultural land given over to roads, housing or industry in 2002 – 2003 (140% increase since 1989 – 1990).

According to the latest figures (2006 data) from the UK Government Actuary's Department life expectancy in Scotland is lower than in England, Wales and Northern Ireland. For the period 1998-2000 Scottish life expectancy was 72.83 years for males and 78.21 years for females. The corresponding figures for the United Kingdom as a whole are 75.13 for males and 79.98 for females: 2.3 years higher for males and 1.8 years higher for females[4]. Scotland has particularly high incidence of serious conditions such as heart disease, stroke and cancer.

Potential Climate Change Impacts

It is likely that climate change will have effects upon communities and individuals not just in terms of their day to day activities, but potentially their health. Disruption caused by severe weather and flooding can lead to significant impacts upon stress levels, access to services and therefore upon health. Other restrictions e.g. in water supply during drought and flood periods can also lead to increased disruption and stress. While the prediction of warmer winters may lower winter mortality and fuel poverty, the predicted warmer summers could lead to increase in incidences of heat stress.

Very hot summers such as those experienced in 2003, which contributed to the death of about 35,000 people across Europe, are predicted to become more common. Very extreme temperatures are considered less likely to affect Scotland, although heat related respiratory illnesses, for example, may increase. The main risk groups for climate change effects are predicted to be the elderly, the very young, and those with existing health issues.

The economic cost of climate change will also affect communities and individuals and this may also contribute to stress related health problems. The Stern Report estimated that the cost of extreme weather alone is expected to be 0.5 – 1% of the world's GDP by about 2050[5].

[3] http://www.gro-scotland.gov.uk/files1/stats/mid-2006-population-estimates-scotland/mid-2006-population-estimates-scotland.pdf

[4] http://www.healthscotland.com/uploads/documents/UnderstandingHealthofScotlandP1.pdf

[5] http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm

Air

Air quality can vary considerably across Scotland, and is dependent on many factors including local and national weather conditions and the emissions of substances to air both within and outwith Scotland. The main sources of air pollution include transport, energy generation, industry, waste and agriculture. With reductions in large-scale industrial emissions, transport is rapidly becoming an increasingly significant source. The continual increase in energy demand may also give rise to increased emissions.

In relation to specific pollutants, emissions of nitrogen oxides and sulphur dioxide from large industrial sources have fallen. The decrease in domestic coal use has also led to significant reductions in emissions of sulphur dioxide. Emissions of particulates and volatile organic compounds are showing a general downward trend. These improvements contrast with a general increase in ground-level ozone concentrations, with potential to harm humans, crops and ecosystems. In addition, a decline in stratospheric ozone over Scotland has the potential to increase exposure to harmful ultraviolet radiation.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland is designed to protect human health and the environment from air pollution. It sets policy objectives and measures to tackle air quality issues from a variety of transport (not aviation), industry and domestic sources. UK health and habitat based standards and objectives are set under the strategy for the main air pollutants: 1,3-butadiene, benzene, carbon monoxide, lead, nitrogen dioxide, ozone, particles measuring 10 micrometres or less (PM_{10}), ozone and sulphur dioxide. Performance against objectives is monitored in places where people and sensitive habitats may be exposed to air pollution. This is done by the Government through its automatic monitoring network and by local authorities under the Local Air Quality Management regime.

Scotland currently has 14 Air Quality Management Areas[6], mainly relating to breaches of the annual mean objectives for PM_{10} and NO_2 in urban areas (the exception is the area surrounding the petrochemical refinery in Grangemouth; which was established following instances in 2004 when SO_2 concentrations exceeded the annual mean objective. The objective has been met in 2005 and 2006)[7].

Potential Climate Change Impacts

Direct effects of climate change on air quality are likely to be less significant than for other SEA topics such as water or biodiversity. However some effects that may include an increase in summertime photochemical smog linked to increasing temperatures and small reductions in cloud cover. It is likely that the frequency of wintertime air quality pollution events will reduce.

Changes in air quality are governed by changes in pollutant emissions and the weather. It seems likely that climate change will result in an impact on general weather patterns, in particular, wind climatology, temperature, sunshine hours and rainfall patterns. This in turn may result in a change in the processes that govern chemical transformations in the atmosphere[8].

Indirect measures to mitigate climate change (such as improving the efficiency of buildings, reducing vehicle emissions, increasing energy derived from renewables, etc.) may result in improved air quality generally, within specific areas. However, other measures to reduce emissions could have a negative localised impact on air quality (e.g. emissions from CHP and incinerator projects).

---

[6] http://www.scottishairquality.co.uk/laqm.php?a=l&la_id=i

[7] Based on information published in the Key Scottish Environment Statistics 2007 http://www.scottishexecutive.gov.uk/Publications/2007/08/20165714/17

[8] http://www.defra.gov.uk/environment/airquality/panels/aqeg/publications/pdf/aqclimate-requirements.pdf

Landscape

For its size, Scotland, with a land area of around 78,500 km^2, has the most varied geology and landscape of any country in the world (SNH, 2002)[9]. There are vast topographical and regional differences in Scotland's landscape. Key land features include a large indented coastline, mountains, glens, moorland, forests and a distinctive patchwork of farmland. A large proportion of these landscapes are of high environmental quality, valued for their natural heritage as well recreation and tourism. Over 20% of the land area is protected through various natural heritage designations.

Scottish landscapes have been influenced by thousands of years of farming, and many physical traces survive of past land use, particularly since medieval times. Individual features of the past combine to form historic landscapes and these can be significant both visually and archaeologically. SNH and Historic Scotland have systems for Landscape Character Assessment and Historic Land Use Assessments which can advise and monitor changes to the landscape character and pattern.

Increasing urbanisation led to 1,403 hectares of agricultural land being given over to roads, housing or industry in 2002 – 2003 (140% increase since 1989 – 1990). The amount of derelict and urban vacant land fell from 13,571 hectares in 1995 to 10,570 hectares in 2005. This fall is partly due to land being brought back into productive use. Residential development was the most common new use (43%) for urban vacant and derelict land since the 2004 survey.

Forestry is an important land use in Scotland using both native and non-native tree species. There are 1.33 million hectares (13,300 km^2) of woodland in Scotland, having risen from 4.5% of land area in 1905 to 11.8% in 1980 and 17.1% in 2006.

Mining and opencast coal sites are still important activities in Scotland and have considerable local significance. In 2003, there were 364 mineral workings producing 40.2 million tonnes of minerals.

Scottish landscapes can be considered a key resource for biodiversity as well as for archaeological and built heritage, tourism and the rural economy. It is also likely that future landscape-scale management measures are the most effective means of adapting to significant climate change effects, through for example, flood management at the catchment scale, habitat modifications to improve wetlands or maintain peat bogs and co-operative action across and between boundaries by land managers to address these types of measures effectively.

Potential Climate Change Impacts

Landscape will likely be affected by climate change predominantly due to the changes in land use that may result from both mitigation and adaptation measures. With respect to mitigation, landscape changes may result from measures such as increased growing of biomass crops and from on shore renewable energy developments, particularly windfarms and hydro/run of river schemes. With respect to adaptation, landscape impacts may result from measures such as flood prevention schemes and coastal defences. Managed realignment of coastal areas to adapt to flood risk may offer opportunities for landscape enhancement. It is possible that some landscape features, particularly those in coastal locations and therefore vulnerable to erosion, may be threatened by the effects of higher sea levels and higher wave heights.

[9] MLURI Report at http://www.macaulay.ac.uk/LINK/link_part2_historic_landscapes.html

Cultural Heritage (inc. Historic Environment)

Scotland's distinctive character has been shaped by some 10,000 years of human activity, where past generations have left their mark in the form of monuments, buildings and sites, in towns and cities and in the countryside, even in the patterns of streets and fields. The historic environment provides a sense of place, well-being and cultural identity and enhances regional and local distinctiveness.

Scotland has more than 44,000 listed buildings and almost 600 conservation areas.

275 sites are identified in the Inventory of Historic Gardens and Designed Landscapes.

NPPG5 notes that the actual extent of archaeological remains in Scotland is unknown[10], with the 5600 Scheduled Ancient Monuments representing only a small proportion of the 70,000 sites and monuments for which there are records, and the many more unrecorded sites throughout the country.

The historic environment can be threatened by inappropriate development, and economic decline, loss of viable use, population change and neglect are issues of relevance to both designated and non-designated sites. Land use change, including forestry activity, biomass projects and agriculture can also have significant repercussions for the historic environment.

Potential Climate Change Impacts

Direct effects of climate change on historic environment are likely to be less significant than for other SEA topics, but there is, as for landscape, the potential for impacts derived from measures to mitigate and to adapt to climate change and from its actual effects.

With respect to mitigation, historic environment impacts may result from measures such as on or off shore renewable energy developments, particularly windfarms and hydro/run of river schemes.

With respect to adaptation, cultural heritage impacts may result from measures such as flood prevention schemes and coastal defences, which have the potential to impact upon specific features which are afforded protection.

It is possible that some cultural heritage features, particularly those in coastal locations or adjacent to rivers and therefore vulnerable to erosion, may be threatened by the effects of higher sea levels, increased wave heights and increased occurrence and severity of riverine flooding.

Material Assets

For the purposes of this baseline, Material Assets are considered to comprise transport and energy infrastructure, waste resources and derelict/ vacant urban land.

Scotland's total road network is 54,776km in length[11], with a trunk road network of 3,500 km (6% of the total). It is valued at around £12.5 billion and as it is considered to be of strategic importance, is under the authority of the Scottish Ministers. Other (non-trunk) A roads represent 14% of the total. Minor roads (B and C roads and unclassified roads) account for the remaining 80% of roads.

[10] http://www.scotland.gov.uk/Publications/1998/10/nppg5

[11] http://www.scotland.gov.uk/Publications/2006/12/15135954/61

The total route length of the railway network in Scotland is 2,736 kilometres[12], of which 639 kilometres is electrified. These figures do not represent the total length of railway track: a kilometre of single-track and a kilometre of double-track both count as one kilometre of route length. The number of passenger stations has increased from 331 in 1995-96 to 344 in 2005-06, an increase on the previous year (340).

Electricity generated from coal in Scotland declined between 2000 and 2004 (33% to 26%), but there has been a slight increase in gas and oil output (22% to 26%) over the same period. 11.5% of electricity generated in Scotland in 2004 was from renewable sources, particularly hydropower at 8.9%. The Government's target of generating 18% of electricity from renewable sources by 2010 has already been met. Further work will be required to meet the recently increased target of generating 50% of electricity from renewable sources by 2020.

SEPA monitors waste management, including the level of waste which is sent to landfill. They also record the proportion of Biodegradable Municipal Waste (BMW), which contributes to air, soil and water pollution if sent to landfill, and is therefore a priority for reduction/ recycling targets. The amount of BMW in Scotland has declined in recent years (estimated at 1.6 million tonnes in 2005), but further work will be required if targets set under the EU Landfill Directive are to be met (1.32 million tonnes by 2010, 0.88 million tonnes by 2013, and 0.62 million tonnes by 2020).

Furthermore, the National Waste Plan aimed to ensure that 25% of municipal waste was recycled or composted by 2006. Available figures show that this stood at 22.8% in 2005 and had risen to 29.8% by June 2007[13]. In January 2008 the Scottish Government announced its aim to increase to 60% the amount of municipal waste being recycled or composted by 2020 and set a new target of 70% by 2025.

The Scottish Vacant and Derelict Land Survey indicated that there were a total of 10,386 hectares of derelict and urban vacant land in Scotland in 2006. This reflects a substantial decline over the preceding decade, from more that 15,000 hectares in 1993, largely as a result of redevelopment, but also partly due to naturalisation of some areas. Much of the country's derelict and vacant land is concentrated in North Lanarkshire, Glasgow, Renfrewshire and Highland (with these areas together accounting for 44% of the total). Around a fifth of the land has been derelict or urban vacant for more than 25 years.

Potential Climate Change Impacts

Extreme weather events, flooding and subsidence are predicted to lead to increased damage to buildings and infrastructure, which may in turn increase disruption and costs. High cost material assets could be at particular risk from climate change effects (flooding, erosion etc.) depending on their location. Existing flood and coastal defences may require upgrading to account for increasing levels of risk through climate change. It is likely that new defences will be required to protect vulnerable communities and key infrastructure such as emergency services, sites providing power and water, and the transport network.

[12] http://www.scotland.gov.uk/Publications/2006/12/15135954/92

[13] Latest figures were published in November 2007 and are available at http://www.scotland.gov.uk/News/Releases/2007/11/12101844 or http://www.sepa.org.uk/nws/data/returns.htm

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix D

Modified Sectoral E-Tests

Advisory Note on E-Tests

The following tables, based on a modified “E-test” methodology, assess the sectoral implications of an 80% emissions reduction target; proposing possible measures for meeting the target and the anticipated effects on SEA topics.

Much of what is described in the E-test tables speculates on possible measures that might be implemented in order to meet the 80% emissions reduction target, rather than on the specific content of the Scottish Climate Change Bill consultation proposals, however this is considered an appropriate means of assessing the wider implications of the Bill.

Halcrow

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Energy Supply				
Business as usual	Electricity: Continued use of fossil fuels for a significant share of electricity supply. Need to replace existing fossil power stations to: a) Replace old assets b) Meet rising demand Gas: Continued use of gas as the main heating fuel. Oil: Continued use, blending with biofuels. Energy consumption will continue to rise although technological advances may mitigate this to a certain extent. Increased consumption will drive supply and increase emissions. Existing fossil fuel fired power stations will need to be replaced with time. Energy consumption increases until price rises prompt efficiency measures. Car use increases until fuel price rises limit mobility. Potential shortage of supply if energy generating stations and infrastructure not upgraded / replaced. Cheapest options (including coal firing) rather than best environmental solutions will prevail. Impacts on reliability of systems of adaptation is not considered.	Electricity: Coal is mainly imported, with Scottish production mainly open cast – not in short supply at global level. Gas: North Sea gas supplies are high relative to Scottish demand, but are modest relative to UK demand. Oil: N Sea oil supplies are high relative to Scottish demand, but are modest relative to UK demand. Fossil fuel consumption will continue to increase. Shortage of fuel supplies. Fossil fuels will become more scarce and expensive. We will continue to be dependent on volatile nations for our fuel needs. Increase in prices Goods will become more expensive as fossil fuels become more costly to extract. Prices passed onto customer / Increased inflation.	Electricity: CO2 emissions continue from power generation and gas use. SO2 and NOx will reduce under Business As Usual to meet the Large Combustion Plant Directive targets. Gas: Emissions from extraction and use for heating continue. Oil: Emissions from extraction and use for transport continue. If existing technologies are retained, unit emissions could improve though these may be offset by increased production. Emissions from petrochemical refineries will continue to compromise local air quality. “Conventional” energy supply sources retained, emissions and waste only reduce slowly if at all Wastes will continue to be produced in large volumes (e.g. ash). Emissions from fossil fuel burning will continue.	Electricity: Minimal changes: – Land for new/replacement fossil power stations. – Continued/increased open cast coal. Gas: No identified impact. Oil: Continued exploration, move to Atlantic Ocean sites. Similar use of space. Climate change will eventually impact on physical space and drive land use change. Habitats could be lost and material assets could be compromised. Land use changes occur due to wider effects of climate change. Most are detrimental due to the accelerated rate of change associated with changes to temperature, precipitation etc.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Energy Supply				
Emission Reduction Measures **Policy/ Behavioural**	Electricity: Need planning and investment systems in place, Renewables Obligation, credits for Carbon Capture & Storage etc. Gas and oil: Need to find alternative fuels/ markets. (e.g. switch to biofuels, electric vehicles) New business plan for sector. Feed-in systems and tariffs required for renewable sources where surplus energy produced at domestic or community levels can feed into the national grid system. Renewable producer subsidies to encourage development in the sector. Statutory agreement of sectoral contributions to overall targets is required to focus action. The cost of carbon should be realistically integrated into energy costs and thereby incentivise use of renewables. Strengthening the Renewables Obligation would further drive the sector. Funding of research and development for new energy streams would speed up implementation. Strengthening Pollution Prevention and Control (PPC) regulations to place stricter requirements on energy efficiency. Energy consumption reduces greatly by reducing demand and more efficient energy use. Required behavioural changes have implications for the organisation and operation of society, business. Community solutions to energy, emissions and other consequent issues	Electricity: Statutory sectoral contributions to emissions reductions imply a general reduction in raw material use. Materials should be sourced using procurement systems that place high value on carbon emission reductions and carbon accounting. There may be a need for development of new procurement systems, with robust means of assessment in terms of comparative carbon impacts. Legislation could be introduced to place an imperative on energy producers to assess the GHG impact of their procurement systems and suppliers. New procurement systems could be subject to Life Cycle Assessment (LCA)/ Strategic Environmental Assessment (SEA). Microgeneration systems should be subject to LCA, with focus on carbon payback period Greater awareness leads to more efficient use of raw materials meaning fewer emissions through reduced waste, transport etc. More sustainable resources investigated with substitution of less sustainable options Increase recycled materials use in development of new infrastructure and fitting of energy efficiency products. Need to improve understanding of long term impacts of consumption.	Electricity: The existing PPC regime can be utilised to prevent avoidable pollution, and protect the air, water and soil environments. Waste management legislation should seek to avoid generation of unnecessary waste streams or to divert the stream appropriately. This could be particularly important for biomass energy generation which has the potential to generate large quantities of biodegradable waste. Carbon reduction implies waste reduction, and reduction of embodied energy within waste streams. Improved emissions performance through reduced per capita consumption. Waste from replacement of old goods/cars etc.	Electricity: Increased land use for wind farms, increased land use for biomass. Use of geological storage for CO2, pipelines for CO2 Gas, Oil: Some redundant rigs, hazardous waste disposal. The planning system should steer the development of renewable capacity. There is potential for the planning regime to fast-track large scale renewables projects. Locational guidance is already available for renewable developments though more detailed guidance is needed for biomass, particularly in light of the potential air quality issue. Natural/historical heritage legislation should prevent deterioration from development. The need to minimise emissions from transport leads to new models for urban and rural development of all kinds. Similar use of space.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Energy Supply				
	are prevalent. Energy efficiency measures will become more common place. Improved use of most efficient vehicles and transport methods.			
Emissions Reduction Measures **Technical/ Financial**	Electricity: Increase all forms of renewable energy for power generation. Use of CCS if fossil fuel to continue. Legacy nuclear power, CCS or renewable sources such as tidal energy for base load generation. Gas: Re use of redundant gas routes – e.g. for heat mains Encourage gas collection from chemical plant over flaring where possible. Improve supply and distribution efficiency to minimise waste Use of renewable heat and power (solar, wind, hydro, geothermal, bioenergy) Combined heat and power Upgrades to grid system to facilitate input from large scale renewables Waste streams should be utilised where possible for power generation Energy cost per unit increases. Energy demand decreases greatly Greatly increased use of renewable energy sources and technologies Energy demand "designed out" of society Improved energy generation systems and technologies for transport including diversification from coal and gas firing.	Electricity: Reduction in Scottish coal extraction. Gas: Interconnection of gas networks may mean that N Sea production continues to supply other markets. Oil: Fuel switching from coal to gas Materials should be sourced using procurement systems which place high value in carbon emission reductions. There may be a need for development of new procurement systems, with novel means of assessing them in terms of their comparative carbon impacts. Life cycle assessment of alternatives should be carried out to establish the efficacy of new technologies for delivering carbon emission savings. Significant financial investments required for the development of a low carbon economy. Low carbon homes and buildings require changes to building practice, greater use of pre-fabricated components New industries develop associated with resource / carbon efficiency. Some specific semi-conductor materials for photovoltaic technology may increase in price if material supply limited. Increased use of biofuels and pressures on production methods and ecosystems may be significant.	Electricity: Major reduction in all emissions from reduction in fossil fuel burn. Gas: Reduction in emissions from production & transport (pipeline compressors) Oil: Early adoption of carbon capture and storage The existing PPC regime (or a stricter version of it) should be utilised to prevent avoidable pollution, and protect the air, water and soil environments. Carbon capture plants could require an amendment to the regime depending on their environmental impact. Waste management legislation should seek to avoid generation of unnecessary waste streams or to divert the stream appropriately. There is potential for generation of significant waste which must be dealt with appropriately. Pollution associated with conventional energy generation decreases greatly. Local emissions issues from use of biomass require careful attention. Waste from de-commissioning, impacts on water management for new power fuels and systems.	Electricity The planning system should steer the development of renewable capacity. There is potential for the planning regime to fast-track large scale projects. Locational guidance is already available for renewable developments. Natural/historical heritage legislation is probably sufficiently robust to prevent deterioration from development. Energy generation largely from low energy density sources, therefore land take and land use potentially increased (e.g. wind farms, growth of indigenous biomass for energy supply) and/or decreased (more decentralised power production, therefore grid infrastructure less significant) Challenges for land area for energy crops.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Energy Supply				
		Improved efficiency in energy production and increased use of wind and hydro power. Consumption of materials required for new infrastructure will add burden.		
Anticipated Environmental Effects (of emission reduction measures) on SEA Topics	Biodiversity, flora and fauna: There may be an indirect impact on biodiversity depending on the source of renewable energy (e.g. wind farms, biomass). Impacts are generally localised, permanent and negative, though limited in severity. Air: Biomass burning for energy can produce negative local air quality impacts, which can adversely affect human health. Other renewables technologies should have neutral impact on air quality. Low carbon transport reduces local air quality problems greatly. Possibility of increased transport air emissions. Waste streams could be diverted to energy production, reducing material use, although these can have direct impacts on air quality resulting from biomass transport. There should be improved air quality through energy efficiency or mode switching to more efficient energy production methods. Water: In general, waste streams and other emissions should be reduced, including those to water. Soil: Potential for contamination of soil to be reduced. Potential for some loss of soil/ soil erosion/ structural damage as a result of wind farm developments. Main impacts on soils through renewables physical infrastructure development. Human health/Population: Potential for human health impacts from local generation projects that involve combustion. Material assets/Landscape/Historic environment: Potential impacts as renewables development usually involve creating physical infrastructure with associated direct impacts on biodiversity, soils, and landscape and material assets. This applies equally to development of energy crops (monocultures, etc.). Landscape potentially affected by new energy generation developments and changes to existing energy generation and transmission developments. Reduction in fossil fuel consumption, though material intensive infrastructure development will be necessary for adequate renewables development.			
SEA Comment	Identify opportunities to maximise demand reduction across all sectors. Enabling provisions should allow for setting mandatory GHG reduction targets at sector level. National planning policy guidance should steer renewables development towards non-sensitive land and sea. Project EIA should be carried out for all developments, SEA could be carried out for sector wide initiatives. Any technology which involves burning of biomass has the potential for local air quality impacts; these should be assessed on a case by case basis. Life cycle assessments should be carried out for new technologies i.e. does the carbon saving justify the investment in the technology. Significant infrastructure change will be needed with consequent short term increase in consumption of materials, generation of waste and consumption of energy.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Transport				
Business as usual	Fossil fuel use continues to increase Private vehicle transport (cars) remain preferred mode of travel Price prevents greater market penetration of more efficient/ less polluting vehicles Mobility may be compromised as roads become more congested presenting public safety issues – also increases relative emission loads Continued extraction, refinement and transportation of fossil fuels exacerbates energy demand Cost of fossil fuels may eventually limit growth to some extent Modal shift not realised until people are priced out of their cars Impacts on reliability of systems of adaptation is not considered Aviation growth in UK/Scotland unrestricted as seen as major driver of business growth Maritime (shipping) fuel use also continues to grow in line with business growth	Fossil fuels continue to be main source of energy consumed and will eventually be exhausted Presents high priority security of energy and fuel supply issues Infrastructure development to accommodate increase in traffic numbers, results in continued demand for material resources Exacerbates existing problems Increasing turnover of road vehicles/ fleets and continued use of non-recyclable components Continued heavy demand for imports, with associated embedded carbon costs Aviation and shipping fuel demand may lead to conflict/ prioritisation with terrestrial vehicle fuel supplies – further cost implications Domestic biofuel production will not meet domestic demand Reliance on imported biofuels leads to concern over sustainable production and transfer of environmentally damaging processes	Continued extraction, refinement and transportation of fuels exacerbate emissions and polluting incidents Improvements in vehicle efficiencies and cleaner engine technologies may offer slight improvements, although this will likely be offset by increased vehicle numbers. Increased pressures on waste streams – esp. GHG and particulate atmospheric emissions, surface runoff to soil and water environments Limited use of bio-diesel from wastes	Increased use of physical space and land use change likely to keep up with increasing transport demands Infrastructure development will require extensive land resources, affecting local soil, water and biodiversity resources Inappropriate transfer of agricultural land to intensive biomass/ biofuel production can exacerbate known issues associated with intensive agricultural systems Increased potential for flooding and landslides (due to climate effects on drought and rainfall intensity) to damage built infrastructure
Emissions Reduction Measures **Policy/ Behavioural**	Legislation on sectoral contribution to meet targets could help to focus action Road transport and aviation emissions trading could be utilised to provide a flexible approach to attain targets Promotion of modal shift must identify 'carrots and sticks' for people to drive less and use other more sustainable modes of transport – no longer enough to say that organisations/ government will simply promote modal shift	Sectoral contributions to emissions reductions imply a general reduction in raw material use. A move towards utilisation of energy crops is implied. If sourced outside the UK/Scotland, develop procurement systems that provide robust assessments of comparative carbon impacts. New procurement systems should be subject to LCA/ SEA. Policies could work to drive manufacturers to improve the lifetime of vehicles and reduce	Fuel manufacturing/ refining installations may come under the remit of Integrated Pollution Prevention and Control (IPPC) regulations which should be robust enough to protect soils, waters and air Policy measures can be introduced to stimulate growth in bio-diesel from wastes as there is huge potential for use in public transport and road haulage	Strengthen guidance/ legislation on land use and transport planning to regulate growth of out of town retail development/ technology parks etc. Limit car parking spaces in town centres The planning system should support and steer the development of biofuel capacity – both in terms of energy crop location, and refining facilities Natural heritage and historic environment legislation is probably sufficiently robust to prevent deterioration from development of

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Transport				
		scrapping rates.		biofuels. Increase support for non-motorised options (safe walking and cycling routes)
Emissions Reduction Measures **Technical/ Financial**	Price caps/ financial incentive/ subsidy of public transport/ suburban rail to encourage modal shifts from private transport Consideration could be given to introducing road pricing/ congestion charging/ dedicated public transport routes Invest in attractive public transport facilities Develop market to reduce costs of hybrid/ efficient vehicles Support growth of bio-diesel from waste for use in public transport and road haulage	Improved extraction, refining, manufacturing and transportation efficiencies required with associated material consumption to drive energy and resource efficiency Biofuel source materials will be consumed, though there is potential for part of this to be sourced from waste streams Increase in scrapping rates and the turnover of vehicles as new energy efficiency models sold Increased development of energy system infrastructures for fuel for vehicles. Increase uptake of biofuels through the use of biofuel blending Hydrogen as a fuel for transportation should be explored further through a programme of well funded research and development	Hydrogen fuel cells can provide reductions in air emissions provided the source energy is sustainably generated Gains in fuel and energy efficiency should result in net decrease in air emissions Measures could be introduced to stimulate growth in bio-diesel from wastes as there is huge potential for use in public transport and road haulage.	Land take is inevitable if biofuels are to be developed in the domestic setting, both in terms of source crops, and also the location of manufacturing/ processing facilities. Integrated planning should consider wider costs/benefits of local processing facilities over transportation needs
Anticipated Environmental Effects (of emissions reduction measures) on SEA Topics	<u>Biodiversity, Soil, Water and Landscape:</u> A move towards use of biofuels could have direct, negative, long term impacts due to requirements for intensive energy crop production. There may be an indirect long term impact on the water environment depending on energy crop production methods. Increased land use change for biomass fuel development could have detrimental impacts on associated habitats and species, as more land is devoted to monoculture. <u>Air</u>: Air quality will still be negatively impacted by transport biofuel emissions still contain Air Quality Strategy priority substances. Modal shift may also negatively impact air quality at certain locations. Could be emissions from new manufacturing/ refinement processes – though it is likely these will be regulated by PPC. <u>Human Health and Population</u>: Improvements to public transport systems is implied, which can have a positive impact on mobility Impacts on human health will depend on the suite of measures adopted, although there may be little difference if biofuels are widely used.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Transport				
	Material Assets: Reduced use of fossil fuels and associated materials/ Increase in use of materials associated with manufacture of new technologies. Improved energy security though decreased reliance on fossil fuels, increasing diversity of energy/ fuel mix and improved efficiencies. Reduced use of raw materials from improved lifetime and recycling standards. Reduced waste streams if these can be utilised for biofuel production/ New waste streams could be produced from biofuel production.			
SEA Comment	The use of biofuels in the transport sector, supported by the Reserved RTFO, has the potential to cause environmental damage from growing energy crops. An assessment should be carried out to establish Scotland's capacity for sustainable energy crop/ bio-fuel production. Individual technologies should be subject to Life Cycle Assessment to assess whether they provide real GHG savings. Bio-diesel from waste, properly supported, has the potential to offer significant GHG savings. Encouragement of modal shift requires appropriate financial mechanisms to either price people out of cars or make other modes more attractive.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Agriculture & Land Use				
Business as usual	Energy consumption is responsible for only a small proportion of GHG emissions from Agriculture. Transportation does contribute to the GHG impact of the sector. Land use will continue to use energy resources in an unsustainable manner.	Difficult to assess this question for agriculture since raw materials are mainly drawn from within the farm volume. The great majority of raw materials for agriculture come from the air and soil via photosynthesis. Raw materials such as phosphate fertiliser are a very small part of the total. Raw material use will continue at close to current rates.	Agriculture is not significantly expanding or intensifying and measures are being introduced, such as the Water Framework Directive and IPPC, to reduce agricultural emissions to air and water. Thus with business as usual, these emissions should decrease.	Given that agriculture is not significantly expanding or intensifying, the land take should not change much in the near future under business as usual. Land use is managed through existing plans.
Emissions Reduction Measures **Policy/ Behavioural**	More widespread use of forestry stewardship techniques In conjunction with research into alternative crops and biomass, potential focus should be on distributed supply networks, micro-generation and support for farm scale solutions. Schemes encouraging the use of biodiesel for farm vehicles, machinery and associated heavy transport would help reduce costs and act to meet climate change targets	Significant reductions in GHG emissions from agriculture are only likely to arise via reductions in production, which will lead to reduced consumption of raw materials. More responsible application of soil enhancers leads to less direct N_2O and CO_2 emissions with associated raw material reductions further up the supply chain. Common Agricultural Policy reform could lead to reduced cattle numbers. Reduction in slurry wastes/ slurry as a resource. Improved cattle feeds could reduce methane emissions. Farms in NVZ required to keep fertiliser and manure records – could be extended across whole agricultural sector. Land Management Contracts, which include measures that contribute to climate change mitigation and adaptation are available to all land managers and rural businesses.	CAP reform could lead to reduced cattle numbers with resultant reduction in methane emissions. Expansion of arable land could lead to emissions of CO_2 from oxidation of soil organic matter. This may be an acceptable trade-off given the much greater global warming potential (GWP) of the emissions being reduced (CH_4, x21; N_2O x310). Increased pressure on forestry sector to mitigate emissions from other sectors. Better forestry management by adopting longer rotation periods, altering felling unit sizes, altering edge limits, creating a multi-aged mosaic of stands, using mixed species planting including native species can lead to reduced emissions.	Any considerations advocating land use change should be properly assessed to determine benefits against anticipated climate mitigation and adaptation. Priority should be given to protecting carbon stores including peat and wetlands. Carbon sequestration requires long term commitment, forward planning and appropriate support mechanisms. Wetland creation will encourage biodiversity improvements. Alternative cropping regimes should be investigated for potential benefits. Livestock and manure management to reduce CH_4 emissions. Measures to reduce GHG emissions could substantially increase the land area needed for farming, in particular arable farming. In order to minimise this potential problem any arable expansion should be on soils with relatively little organic matter, such as short-term leys and permanent grass on light sandy soils.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Agriculture & Land Use				
Emissions Reduction Measures **Technical/ Financial**	Funding sources for conversion to renewable energy systems should be identified. Dedicated energy crops to replace fossil fuel use. Improved energy efficiency. Improved crop yields. Effective measures to reduce GHG emissions from Agriculture are not likely to have a large impact on energy consumption. Increased use of biomass as a renewable energy source. Timber miles minimised through use of locally sourced biomass. Use of alternative fuels in operational vehicles.	Greenhouse gas mitigation should focus on reducing fertiliser use Improved fertiliser application techniques to reduce N_2O emissions Efficient use of fertilisers and irrigation. In addition, while large reductions in GHG emissions from Agriculture may be impossible to achieve; those emissions may be balanced by increased carbon sequestration. This may be achieved by planting woodlands. This may, in the short term at least, lead to greater use of water resources. However, vast amounts of carbon (c. 80% of all the carbon stored in all UK soils) are stored in Scotland's peat soils. It is essential that the hydrology of these peats is not disturbed as, should they begin to dry out, oxidation of the peat will take place potentially releasing large amounts of methane and CO_2. Forestry sector should supply more locally sourced wood for building materials. Tree species improvement to increase biomass productivity and carbon sequestration. Harvested wood product management.	Greenhouse gas mitigation should focus on reducing methane production (or capturing as much as possible as useful bio-gas). Significant reductions in GHG emissions from agriculture will be most readily achieved by reducing Nitrogen inputs to land and reducing livestock production, in particular ruminants. These measures will greatly reduce pollution of air and water both directly and indirectly through reduced manure production. Better understanding of importance of land (both soils and foliage) in sequestration of carbon Responsible use of soil enhancers reduces nitrification/eutrophication of inland waters. Planting of woodlands to sequester carbon should have neutral or even beneficial impacts on water quality. Preservation of soil carbon through better land use practices such as conservation tillage, cover crops, incorporation of crop residue and organic fertiliser enhances carbon storage.	Financial support (e.g. ROCs) should promote use of land for energy crops and short rotation coppice as fuel sources Financial incentives to increase forest area, and to maintain and manage forests Potential to use agriculture systems that increase carbon sequestration include agro-forestry options, woodland pasture and energy cropping Restoration of cultivated peaty soils and degraded lands. Maintain soil carbon content. In addition, since the potential to reduce CH_4 emissions from enteric fermentation is quite limited (c. 20%), a more effective means of reducing GHG emissions from livestock production would be to replace beef and lamb with pork and poultry in the diet, as those animals do not have a rumen. However, growing cereals for those livestock at the expense of grass would lead to emissions of CO_2 from ploughed-out grassland and hence this option would need to be carefully evaluated with respect to the overall GHG balance. Increased afforestation with native species improves natural biodiversity. Improved remote sensing techniques for analysis of vegetation soil carbon sequestration potential and mapping land use change.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Agriculture & Land Use				
Anticipated Environmental Effects (of reduction measures) on SEA Topics	Biodiversity, flora and fauna: Generally positive impacts through measures such as better fertiliser application techniques, responsible afforestation, wetland creation. Air: Potentially positive impact on air quality from reduced emissions from livestock, soils, and farming vehicles representing a positive permanent impact. Water: Responsible use of fertiliser should reduce diffuse pollution to controlled waters representing a positive permanent impact. Soil: Soil management measures are a central focus of the contribution agriculture can make to mitigating climate change. These measures generally involve some form of soil improvement (or development of a better understanding of soil processes) and can therefore be ascribed a permanent positive impact on this topic. Human health/Population: Better control of agricultural pollution should have an indirect positive permanent impact on human health and population. Material assets/ Landscape/ Historic environment; No significant effects have been identified for material assets or the historic environment. Potential mixed impacts on landscape depending on land take in, for example, forestry.			
SEA Comment	There are general environmental benefits to agriculture contributing to the mitigation of climate change in Scotland. The sector has an important role to play both in adapting its practices in order to directly/indirectly reduce GHG emissions, but also in providing a framework for mitigating the effects of other sectors. It is important that the climate change imperative is not seen as an overarching environmental objective that is tackled at the expense of other aspects of the environment. This is particularly pertinent the agriculture sector, as mitigation of other sectors' contributions to climate change invariably involve some form of land use, with potential consequential environmental damage.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Business				
Business as usual	Consumption will continue to drive upstream GHG emissions. Energy will become more expensive as the effects of dwindling fossil fuel resources takes effect. Business will continue to waste money through poor energy efficiency. Escalating energy prices as fuels become increasingly difficult to source. Impacts on reliability of systems of adaptation is not considered.	Raw material use will continue at close to current rates Raw material stocks face increased pressure as demand outstrips supply. Water resource demand grows and associated energy costs increase. Continued change from agricultural land to sealed surfaces exacerbates soil carbon losses and emissions. Use of aggregates in construction exacerbates raw material depletion unless recycled. Construction may move to more sustainable sources and materials, eg. timber sourcing, less concrete, eco-friendly insulation.	Indirect GHG emissions will continue unabated. Other emission streams will be the same at best.	Land will continue to be developed for industrial use with little consideration of the effects on climate change.
Emission Reduction Measures **Policy/ Behavioural**	Performance standards for business premises. Possibility of incentives for business investing in/utilising renewable energy technologies. Tax-credits or other fiscal measures to promote carbon reduction behaviour. Participation of businesses in climate change agreements. More stringent energy efficiency standards for buildings. Encourage investor participation in climate change issues. Educate staff on their contribution to helping the business reduce its footprint e.g. through sustainable business travel planning. Encourage staff to reduce their own carbon footprints. Greater awareness results in reduced energy consumption and improved energy efficiency.	Statutory sectoral contributions to emissions reductions imply a general reduction in raw material use. Legislation could be implemented to place an imperative on large business to assess the GHG impact of their procurement systems – possibly through assessment of individual raw material suppliers/ supply chains Implement carbon efficient procurement schemes/ systems. New procurement systems could be subject to LCA/sustainability appraisal. Greater awareness leads to more efficient use of raw materials meaning fewer emissions through reduced waste, transport etc. More sustainable resources investigated with substitution of less sustainable options. Issues for disposal rates of appliances (may increase).	Waste streams can be reduced by educating staff providing an indirect GHG benefit from the business sector. Legislation should require business to recycle a percentage of generated waste. Initiatives in other areas such as waste reduction can also provide indirect emission reductions on the supply side. Improved business reporting of GHG emissions. Knock on benefits to waste streams, soil, surface water etc. Continued living outside our long term environmental limits lead to exacerbation of current problems. Existing legislation and control measures heavily dependent on voluntary responsible behaviour.	Indirect effect on the energy supply side depending on energy mix (e.g. land take for biomass). Planning regime relaxation for business implementing renewables projects. Need for land for new premises. Need for new landfill sites. Limits on biodiversity enhancement and pressure on existing greenbelts for new development. Newer developments may improve design of biodiversity links and open spaces.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Business				
Emission Reduction Measures **Technical/ Financial**	More efficient end-use electrical goods would offer cost and climate benefits. Improved energy efficiency measures in new buildings, and possibly existing ones. Energy efficiency loans for SMEs. Developments in small scale renewable technologies. Employ energy managers with targeted responsibility. Opportunities for businesses in development of new technologies or financial systems. Investment needed in small scale renewables.	Building standards and funding schemes should drive adoption of energy efficiency measures (e.g. insulation); these will need to be manufactured with obvious raw material use. Microgeneration systems will be manufactured with concomitant use of materials. Systems should be subject to LCA to assess their climate change benefits. Investment in more small scale renewables. Resource efficiency awareness leads to less associated emissions. More efficient utility use means reduced emissions. Introduction of emissions trading for SMEs	Waste streams can be reduced by educating staff providing an indirect GHG benefit from the manufacturing/energy supply sector. Legislation should require business to recycle a percentage of generated waste. Develop carbon footprinting for business Manufacture of renewables systems can lead to emissions though these should be regulated through existing regimes. Audit and cut emissions from vehicle fleets. Increased waste as new appliances replace old.	Development of small scale renewables implies an impact on visual amenity though careful design should mitigate this. Planning policy should be flexible enough to facilitate development of renewables, while protecting environmental interests. New manufacturing facilities may be required for systems with associated land take issues. The planning regime is sufficiently robust in guiding development in this area.
Anticipated Environmental Effects (of reduction measures) on SEA Topics	Benefits will be mainly realised as a result of adopting energy efficiency measures, development of sustainable transport programmes, reduction in waste, adoption of renewable energy technologies, and more efficient use of resources. These will lead to generally positive (mostly indirect) impacts on the SEA topics, more specifically: Biodiversity, flora and fauna: Improved energy efficiency reduces demand with positive and permanent indirect benefits on biodiversity through reduction in emissions, and other factors such as land use change, extraction of raw materials. Air: Indirect positive impact on emissions to air through a reduction in energy consumption. Direct positive impacts on air from reducing waste, using more sustainable transport. Water: Direct permanent benefit on consumption of water resources, and indirect positive effects on water pollution through reduced emissions and waste generation. Soils: Potential for significant indirect permanent impacts if new practices lead to a reduction in raw material extraction. Less waste generation implies a reduced need for development of further landfill capacity. Human health/Population: Indirect permanent positive benefits to population through new employment opportunities. Material assets/ Landscape/ Historic environment: Generally positive permanent impacts on the above.. The measures described above imply a more resource efficient sector, thereby reducing the need for raw material extraction and generation of waste streams, all of which have positive implications for these topics.			
SEA Comment	The business sector is very important in mitigating climate change as the financial and social influence the sector wields is immense.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Business				
	The sector is well placed to influence the behaviour of employees, suppliers and other stakeholders. Climate change mitigation actions are likely to have indirect environmental benefits relating to reduction in energy use and reduction in waste stream volumes. Whilst crucial in ensuring benefits are realised, the use of appropriate, context specific economic, regulatory, voluntary and other policy instruments need to be carefully monitored for their effectiveness and overall environmental impacts.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Residential				
Business as usual	Energy consumption continues to grow in line with new housing development and demand for home electricals. New homes become more energy efficient as building standards improve. Some older homes become more efficient as technologies are renewed and updated and retrofitting of insulation etc. takes place. Some older homes/ flats not updated due to financial barriers/ cost implications. Increased demand for new homes as residential dynamic continues to slant towards single occupancy. Out of town retail, supermarkets and suburban developments maintain levels of domestic car use. Increased rise in conventional fuel prices. Discount holiday travel continues.	Raw material stocks face increased pressure as demand outstrips supply. Continued 'throw-away' society increases pressure on land fill sites. Water resource demand grows and associated energy costs increase. Continued change from agricultural land to sealed surfaces exacerbates soil carbon losses and emissions. Use of aggregates in construction exacerbates raw material depletion unless recycled. Construction may move to more sustainable sources and materials, eg. timber sourcing, less concrete, eco-friendly insulation. Scotland's consumer society results in continued embedded carbon costs/ emissions in imported products.	Continued living outside our long term environmental limits lead to exacerbation of current problems. Existing legislation and control measures heavily dependent on voluntary responsible behaviour. Many Scottish city dwellers live in flats, with associated limitations on waste separation and uplift. Municipal waste generation increases in line with housing growth. Domestic vehicle use continues until fuel costs limit non-essential use. Growth in transport emissions in line with housing growth and affluence. New town developments may present better integration of transport and land use planning leading to lower rates of domestic car use and associated emissions for these areas.	Need for land for new homes. Need for new landfill sites. Limits on biodiversity enhancement and pressure on existing greenbelts for new development. Continued biodiversity pressure due to urban expansion – some species may continue to thrive in urban environment. Newer developments may improve design of biodiversity links and open spaces.
Emission Reduction Measures **Policy/ Behavioural**	Ensure energy efficiency criteria applies to flatted developments (including communal areas/ facilities) Building energy codes and certification Feed-in tariffs could improve uptake of micro-generation technologies if residential customers could sell energy back to the grid. Secondary benefit in reducing demand from the grid. Building and planning regulations may need reviewed to help facilitate. Public transport could be subsidised or price capped to encourage use. Shift from flying (particularly short haul) to rail travel, particularly if rail services	Demand-side energy reduction is most important factor as reduced demand at point of delivery implies reduced demand throughout energy supply system – estimated to be in the region of 13 units saved overall for every 1 unit of demand reduced. Education to increase awareness leads to higher recycling rates. Increased recycling helps ease raw material consumption and ease stock depletion. Possibility of energy certificates for all homes sold. Water resources in Scotland seen as plentiful, links must be made between water uses and associated wider energy costs of treatment and supply.	Recycling rates must increase. Similarly, awareness over energy implications of water use must improve. Increased environmental awareness leads to more sustainable living. Reduced consumption leads to waste minimisation – must be supported by reductions in packaging. Some waste associated with retrofitting/ replacing old/ less efficient products. Waste streams diverted from landfill (eg composting) which reduces emissions of CO2 and methane. Reduced impact of emissions at altitude, along with the contrail and other emissions	Potential for phase out of landfill sites Potential to review statutory protection for prime quality agricultural land to limit soil sealing and maintain resource. Strengthen green belt protection. Planning system may need amended to strengthen protection of land resource. Strengthen policies to restrict development within identified flood plains – potential for increased risk and downstream costs. Provide incentive for appropriate energy efficient brownfield/ urban redevelopment. New development proposals should include carbon input-output or environmental footprint analysis along with appropriate habitat restoration or

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Residential				
	and costs improve and flying becomes more expensive. Voluntary agreements – demand side management programmes Consumer engagement – energy supply businesses could develop their energy services to move from payment for supply only.	In the long term, construction processes must be verified as low/ zero carbon before planning permission or development consent provided.	associated with flying. Plans to promote modal shift in transport must be supported with cost incentives and convenience to encourage effective uptake at anywhere near levels required to significantly reduce domestic vehicle emissions. Recycle and reward schemes eg. money back on bottles (preferably funded by manufacturers) would go some way to reducing waste and hidden costs.	enhancement/ mitigation strategies. Emissions abatement and carbon costs must become second nature in construction or development planning – as much as health and safety or access and recreation.
Emission Reduction Measures **Technical/ Financial**	One-stop centre for domestic energy advice should be created. Improved efficiency lighting could be subsidised to encourage uptake. The use and installation of eco-friendly home insulation materials should be actively promoted. Tackling fuel poverty – potential for welfare system to address installation of efficiency products. Incentives could be provided for the installation of integrated solar voltaic systems for water heating.	Increasing demand for renewables leads to increased raw material demand (high quality steel in short supply). Improving energy efficiency of appliances may actually lead to greater consumption as people buy more. Alternative (low GWP) refrigeration fluids should be developed. Better billing and intelligent metering with feedback and control. More efficient homes using more sustainable methods of construction.	Recovery and recycling of fluorinated gases. Construction firms should be required to produce input/ output analyses to verify wastes and emissions. Encourage sustainable supply chain management and identification of revenue streams for wastes. Financial incentive for householders could be related to tax rebates on waste minimisation or recycling. Biodiesel from waste should be supported to encourage market penetration.	Increased demand for renewable energy leads to increased land use change. Potential to support micro-generation and community programmes. Development of feed-in tariffs for domestic generation would improve uptake, reduce demand on national energy supplies and reduce emissions. Incentives for energy service companies to support small scale renewable technologies. Cost of 'green energy' comes down as these technologies become more established.
Anticipated Environmental Effects (of emission reduction measures) on SEA Topics	Climatic Factors: Personal responsibility for energy efficiency and awareness of the need to minimise demand must be fostered to realise any long term beneficial effects. Continued unsustainable global residential/business consumption and transport use will lead to highly critical negative impacts and potentially dangerous climate change. Air, Water and Soil: With appropriate consideration of wider environmental impacts of construction resource efficiency, there could be long term positive effects, however soil, water and air will all remain under pressure from domestic housing and business growth, therefore mixed impacts are likely. Biodiversity: Direct impacts realised during construction/ land use change phases. These pressures will continue in line with domestic housing and business growth. Long-term negative impacts associated with development, minor positives possible with appropriate planning for biodiversity/ habitat links and green routes. Human Health and Population: Only concerted and coordinated effort across the Scottish population has the potential to make a difference to emissions reductions.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Residential				
	Energy demand reduction is the only feasible option within the short term, with integration of renewables making some headway in the medium-long term. Lack of early action will lead to long term, significant negative effects on health and population due to dangerous climate change effects. Material Assets: New building efficiency standards positive but will need to go further to achieve the level of emissions reductions required. Incentives required to encourage people with older housing stock to take action also, otherwise potential benefits of new building efficiencies will be lost. Landscape/ Historic Environment: Potential for short term thinking to have long term impacts on landscape however change may become accepted with time. Any loss of historic features to development is usually permanent, but may not be significant.			
SEA Comment	Behavioural adaptation could be particularly important in the residential sector where regulation has limited reach. The general environmental benefits seen in this sector are indirect but far reaching, mainly deriving from reduced requirement for energy generation and reduced waste streams. Policy will clearly play a critical role and will need careful monitoring and assessment to ensure effectiveness and avoidance of unintended environmental consequences.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Public Sector				
Business as usual (Some details taken from: 'Scotland's Climate Change Declaration, A Programme of Support for Scottish Local Government, Appendices', 2007) **http://www.scotland.gov.uk/Resource/Doc/921/0054135.pdf**	The public sector currently accounts for 23% of employment in Scotland: Local Government including police and fire and related services (55.2%), NHS (26.3%), Civil Service (8.7%), Public Corporations (4.4%), Non Departmental Public Bodies (2.5%) Armed Forces (2.3%). (ONS, Q1, 2007) Scotland's Climate Change Declaration was developed to support delivery of the objectives in Scotland's Climate Change Programme and was signed up to by all Scottish Local Authorities. The Declaration marked the culmination of a collaborative effort between several interests including UKCIP, SNIFFER and the SSN and is a significant achievement particularly considering this was not a statutory duty. The public sector will however, continue to be energy intensive and a major indirect contributor to GHG emissions. Transporting 23% of Scotland's workforce presents huge emissions issues alone. Green energy contracts for energy supplies are only part of the solution.	There are no targets or other statutory obligations placed on local government. Public and environmental services raw materials use will continue at current rates unless there are extensive efficiency drives across all areas to reduce wasteful practice Public services must improve on energy and raw material use Progress will be limited without clear overall responsibility for progressing climate change in Scotland – no single agency has been delegated with the responsibility of delivering on this task Few authorities have integrated climate change into procurement or Best Value policies, although some link this issue, in some ways, to energy use. Change processes include moves to encourage shared services and more efficient government.	Indirect GHG emissions will continue unabated, other waste and emission streams continue in similar fashion Climate change is not integrated across local authorities or Scottish Government, especially in the important areas of waste, travel and energy A SNIFFER survey in 2005 found that for Sustainable Urban Drainage Schemes (SUDS), transport and roads infrastructure, waste management, subsidence, storm damage and emergency planning, no actions are identified or policies specified linked to climate change. Emphasis is very much on voluntary participation, rather than any specific requirements to act. While duties of Best Value and Community Planning are potentially tools to take forward commitments set out in the climate change declaration, clearer direction is needed.	New developments in the public sector will continue to take land Nine planning authorities include climate change – both mitigation and adaptation – as challenges facing the planning process in planning documents SNIFFER research suggests that climate change is regarded by some Community Planning partners as a lower priority There is scope to use the Community Planning process to achieve wider delivery of the Declaration through Community Planning While there are some very good examples of sustainable buildings and developments, these will remain the exception rather than the rule
Emissions Reduction Measures **Policy/ Behavioural**	Statutory agreement on sectoral contributions to overall GHG reduction targets would provide focus for public sector action. Requires driven by a dedicated, independent co-ordinating body to change direction of action from piece-meal and voluntary to focused and high priority. Government estate/ NHS/ public	Legislation could be introduced that places an imperative on local government/ public bodies to assess the GHG impact of their procurement systems and suppliers Public sector leadership programmes; including procurement, can drive private sector (suppliers/ consultants/ contractors) improvement. Opportunity for public sector to consider input-output analyses or carbon footprinting as	Public sector drive on efficiencies can have wide spread benefits through staff education and translation of learning into personal behaviours (potentially 23% of the working population and their families) More effort on reducing private car transport to work required. Encourage staff to reduce their own carbon emissions – e.g. car clubs, public transport subsidy	Planning relaxation for public sector implementing renewables projects (esp. micro scale). Strengthen protection for green belts, green corridors, agricultural land and soil resources. Development of any land should be considered against the intrinsic value of maintaining the current condition over potential for increased emissions and loss

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Public Sector				
	buildings targets would enable focused targeting and contributions towards overall reductions to be delineated. Strengthen energy efficiency standards/ requirements for all public buildings Strengthen Best Value considerations and responsibility for all public sector business travel. Improve targeted reporting of energy and resource use and associated GHG impacts. Link senior public sector remuneration to emission/ energy reduction targets.	measures of performance and means of driving overall efficiencies. National standards for analyses are required. People see action on climate change is for 'someone else' – and can be disempowered by messages relating to the immensity and complexity of the issue and the 'uncertainties' around climate change science – these issues must be addressed. There is a need to learn and share good practice, coupled with effective dissemination of the impacts of demand and the benefits of demand reduction.	Educate staff on their contribution to helping the sector reduce its footprint Local authority declaration should be enhanced to include targets for energy demand reductions and resultant emissions reductions. Stronger role for local government in targeting energy/ emissions reductions at a local level.	of sequestration functions, effectively considering the cumulative climate impacts of disparate decisions. Local Authorities are required to evaluate greenfield sites earmarked for development against climate, soil and flooding criteria, however, the relative emphasis on these issues should be strengthened and clearer guidance produced. Strengthened national building standards and town and country planning guidance may be required.
Emissions Reduction Measures **Technical/ Financial**	Secure Climate Change Mitigation and Adaptation funding within public sector budgets required. Funding schemes to invest in and promote energy and transport efficiency best practice across the sector. Increase awareness of energy efficiency loans to finance investment. All renewed public sector office equipment, lighting and heating should be highly energy efficient e.g. computer screens that shut off with PC. New public sector buildings should exceed energy efficiency requirements of regulations. Link senior public sector remuneration to emission/ energy reduction targets.	Building standards and funding schemes will drive adoption of energy efficiency measures Investment in microgeneration and other renewable systems will be manufactured with concomitant use of materials Public sector procurement decisions should be subject to Life Cycle Analysis to assess their climate change benefits/ impacts National standards for public sector procurement and accounting for embodied carbon are required Public sector duty to report on progress/ action/ results also required Areas of the public sector will increasingly respond to the climate change agenda, to assist this process, and complement delivery of the Declaration, funding programmes such as those for housing associations, and further and higher education funding, could be required to assist in the delivery of climate change objectives.	Waste streams can be minimised through educating public sector employees, thereby providing indirect GHG reductions from the manufacturing/ energy supply sectors. Legislation could require public sector to recycle and minimise generated waste Identification of revenue streams from waste (including collected municipal waste) should be encouraged to cover costs involved. Formal partnerships, together with common aims and operating rules, means that constituent public sector bodies may work to best advantage, rather than to deliver their own separate priorities.	Development of small scale renewables implies an impact on visual amenity though careful siting and design should minimise impacts. Planning policy should be flexible enough to facilitate development of renewables, while protecting environmental interests.

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Public Sector				
Anticipated Environmental Effects (of reduction measures) on SEA Topics	Reduction in energy demand/ consumption through concerted investment in energy efficiency and education (with savings re-invested), and a significant shift towards renewable sources of supply, coupled with a direct reduction in the use of raw materials (including water) and in waste stream volumes could lead to: Climatic Factors: direct, long term, positive impacts; Human Health & Population: indirect, local, positive impacts; Water: conservation of resources/ reduction in emissions, long term, positive impacts; Air: positive effects of indirect reductions in emissions; Soil: indirect, long term, positive impacts (if impact of renewables and soil sealing/ Sustainable Urban Drainage Systems issues properly considered); Biodiversity: indirect, long term, mixed impacts; Landscape: potential negative impacts of renewables on visual amenity (will decrease with time); Historic Environment: indirect benefits through conservation of resources.			
SEA Comment	The Local Government in Scotland Act 2003 (Best Value and Sustainable Development Duty) provides a driver for work on climate change. SEA processes supplement this with the need to consider climatic factors. However, realising the cross-cutting and priority nature of long-term considerations of climate change impacts and means to mitigate emissions at present, could be viewed as relatively weak. Stronger legislative drivers are required for the public sector if the target of the Scottish Climate Change Bill is to be realised. Reliance on voluntary measures represents a weak (light green) sustainability approach.			

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Waste Management				
Business as usual	Energy consumption including vehicle and plant fuel use subject to increasing unit costs. Efficiencies guided by market prices. Municipal waste collection and private vehicle transport to recycling centres necessary but fuel intensive Waste collection, management and disposal all energy intensive Energy from waste generally encompasses a range of technologies that directly generate energy from waste It does not cover waste management techniques that save energy, such as recycling or waste prevention	Raw material prices influenced by market forces in UK and abroad (eg. steel). Current waste management regulations and increasing disposal restrictions and costs have/ will increase(d) focus on efficiency and minimisation of wastes in some sectors May extend the availability of some raw material stocks through more efficient (less wasteful) use.	Emissions from licensed activities largely controlled by existing legislation. Potential for increase in fly-tipping events with associated potential for pollution Waste production and recycling will likely continue to grow in line with domestic housing and business growth. Waste minimisation more difficult without restrictions on packaging. Incineration may be promoted as energy from waste but is still heavily polluting for local air quality and GHG emissions, eg. electricity only incinerators can emit up to 33% more CO2, for the electricity they provide, than gas fired power stations. Biological wastes can be processed to provide soil improvers and generate methane which can be used to generate power and heat.	Landfill use continues with end-of-pipe collection of ground gases Contaminated land and soils may continue to be removed and dumped as controlled waste Urban wildlife continues to feed off domestic refuse. If wastes are separated at source, eg. kitchen waste, after suitable processing these should be usable as compost.
Emission Reduction Measures **Policy/ Behavioural**	Behavioural change required in waste management operations by businesses and local government. Increased segregation/ separation of wastes may be required. Renewable energy incentives or obligations. Reduce biodegradable waste reaching landfill. Increase awareness of CO2 and CH4 emissions from waste treatment processes. Support development of anaerobic digestion/ CHP waste systems over incineration.	Introduce policy measures to drive raw material and resource efficiency across sectors. Strengthen policy measures to address polluting activities (eg. improved powers to prosecute, higher environmental fines).	Residual waste is the waste left over after reuse, recycling and composting – the amount of residual waste depends on how effective non-residual treatments are, combined with how difficult certain waste types are to reuse, recycle or compost. From an environmental point of view, the best course of action is to phase out residual waste. Prevention, reuse and recycling are all more environmentally beneficial than residual waste treatment.	Strengthen policies to reduce biodegradable wastes to landfill (notably Commercial &Industrial wastes). Possible moratorium on landfill site development. Planning for residual waste should assume that its volume will reduce over time. Policies should be put in place to increase the amount of residual waste that is recyclable or compostable.
Emission Reduction	Waste incineration with energy recovery Recycling and waste minimisation	Promote the identification and use of waste as a raw material:	Move towards technologies that reduce CH4 emission in particular.	Potential land take required for construction of treatment facilities and infrastructure – promote brownfield over

What are the possible consequences of the Scottish Climate Change Bill on…?				
	Energy Consumption & Mobility	**Consumption & Stocks Of Raw Materials**	**Waste Streams – Atmospheric, Soil & Water Emissions**	**Use Of Physical Space, Land Use Change, Biodiversity Effects**
Waste Management				
Measures **Technical/ Financial**	Financial incentives for improved waste and wastewater management. Strengthen waste management regulations. Focus on technologies/ plant that have lower energy/ fuel use. Investment in treatment technologies that can deliver energy benefits such as AD and CHP. Methane from Anaerobic Digestion (AD) plant can be used as fuel in CHP plant, generating renewable-only heating. Combined AD/CHP plants are well suited for use in distributed generation schemes, where power and heat are generated more locally than in the current electricity supply system.	Composting source separated organic waste; Landfill and anaerobic digestion methane. (CH4) recovery to produce energy. Controlled waste water treatment and potential use of sludge on land.	Reduction of waste to landfill in favour of more controlled methods of disposal & treatment. Bio-covers and bio-filters to optimise CH4 oxidation Collection and anaerobic digestion of residual mixed waste (what is left after recycling and composting household waste) should be promoted. Gasification and/or pyrolysis of source separated organic waste should be promoted. Anaerobic digestion of source-separated organic waste (domestic, commercial, industrial) should be promoted in conjunction with Incineration of source separated organic waste in dedicated biomass plant.	greenfield sites. Landfill still required for final disposal but required capacity lower. Potential to strengthen policies and guidance on remediation of contaminated land to address on site rather than remove.
Anticipated Environmental Effects (of reduction measures) on SEA Topics	Organic waste management by anaerobic digestion (AD) and use of resultant methane in CHP most beneficial in terms of reducing GHG emissions from waste Also most beneficial option for water, soil, air, human health, landscape, population and biodiversity factors. Incineration of unprocessed waste to produce electricity is actually one of the more environmentally damaging methods of handling organic wastes. Incineration increases CO2 emissions (as compared to AD/ CHP) and degrades local air quality. Use of organic waste in dedicated biomass CHP also has implications for local air quality and emissions. Waste prevention and minimisation is the best long term option, but requires coordination across all sectors.			
SEA Comment	Government should consider prioritising or solely supporting those waste handling measures that minimise CO2 production. Anaerobic Digestion and Combined Heat & Power should be supported to drive long-term integration and resultant CO2 gains over incineration. Government should target local authorities on collection and separation of organic waste for composting, AD/CHP and biomass. Government should consider measures to ensure all products for sale in Scotland have recyclable/ biodegradable packaging. Packaging should be minimised across all sectors. Monitoring of impacts will be important, given extent of reliance on policy and emerging technology.			

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix E

High Level (Preliminary) Options Assessments

Halcrow

Appendix E - Scottish Climate Change Bill Consultation Proposals – Preliminary SEA Assessment

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Ways of setting the target – what is the target?					
80% reduction target	Emission reductions target based on percentage of 1990 and 1995 Kyoto baselines. Based on current understanding of climate change i.e. "the credible science of the day".	By meeting this target we are likely to meet any international targets that may be set in future. Takes a baseline and demands a percentage reduction without excuses. Independent of company growth. Forces government to seek to ensure that businesses implement ever more stringent measures in order to meet targets, driving innovation. Enforces the spirit of the Bill. Easy to understand and compare reductions across sectors. Simple and easy to communicate	May reach plateau prior to meeting 80% targets. Could cause businesses significant costs. Will likely require stringent fiscal measures to enforce. Scotland will need to invest significantly to realise appropriate levels of emissions reductions, in conjunction with realistic financial incentives and penalties for organisations to encourage sufficient action. Tyndall Centre suggest that focussing on final percentage reductions could have little relevance in avoiding dangerous climate change.	Air quality, human health in the short term. Soil, water quality and material assets in the medium term. Landscape, historic environment and population in the long term. Indirect effects on biodiversity. Long term benefits for climatic factors, material assets. Long term impacts upon landscape and historic environment. Indirect mixed effects on human health, population and biodiversity.	Independent body to ensure goals are met despite possible changing political environment. Full enforcement powers required. Changes to legislation would require Government level intervention. Reduction should be ultimate goal. Mitigation measures should be considered as a secondary role. Scotland has an advantage over the rest of the UK with the potential for massive use of renewable energy. Should include international aviation and shipping as soon as international method to do so is devised.
Use cumulative carbon budgets	Sets a stringent fixed total emissions allowance to 2050 which reductions must meet. Provides an absolute target required to stabilise global temperatures at no more than 2°C above those found in pre-industrial global temperatures. Aims to consider share of global emissions to stabilise CO2 at levels to minimise temperature increases (eg. $+2^{o}C$).	Ensures that enough is being done. Encourages early action to be taken. Allows more certainty in planning. Focuses on limiting total emissions rather than reducing them below a baseline level.	Issues on the division of total budget between sectors. Fairness of the division between countries. Global participation – has to be mandatory. How will it be enforced? Stringent reduction measures required very early to have any chance of success under this regime. Financial implications may not be acceptable.	Air quality, human health in the short term. Soil and water quality and climactic factors in the medium term. Landscape, historic environment and population in the long term. Short-medium term impacts upon population, material assets. Long term impacts on landscape. Long term benefits for human health, biodiversity and all other SEA Topics.	Trading mechanisms should be provided. Needs to be a global regulatory body. Reward for early meeting of budget? Should be a legal obligation to stay within the budget. Tyndall Centre identifies demand reduction as key to driving cumulative savings. Changes to targets should only be accepted in light of new scientific discoveries; it should not be a 'get-out-clause'.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Ways of setting the target – what is the target?					
Use interim carbon budgets	Scottish Government is minded to have multi-year budgets of at least three years. Multiples of two years fit with the financial budget cycle (the comprehensive spending review is every two years). Choices for the length of the budget period are: • Four years - fits with the Scottish Parliamentary cycle; • Five years - fits with the UK Climate Change Bill periods, current EUETS phase and Kyoto period; • Six years - multiple of financial budget cycle but allows more time to adjust policies; or • Eight years - fits with possible future EUETS phases (2012 onwards).	Flexibility – long and short term strategies can be implemented. Sets targets in people's lifetimes meaning they are more likely to act. If a target is 50yrs away people are less likely to worry about it.	More reactive. There is a risk that budgets may be increased if they're not being met. Could discourage some early action as companies may decide to 'save' actions for later budgets if earlier budgets are met.	Few short term gains as slow and steady approach. Most significant effects will be medium to long term.	Need to ensure that overall these budgets allow the total 2050 target to be met. Range of mechanisms required. Over-achievement could be traded however it should be discouraged. Limited borrowing between periods could be allowed but only in exceptional circumstances. Process needs to be totally transparent. Should include international aviation and shipping as soon as international method to do so is devised.
Use consumption based footprint measure	Establishing a current footprint (carbon/ ecological) and reducing it to meet the actual organisational size.	Holistic look at total business resources.	Would slow the process down as organisations gathered information and calculated their footprint. No national standard. Not an absolute target so risks overall 80% not being met.	All SEA topics will be influenced however there are unlikely to be many in the short term. Medium and long term goals are more likely with this route.	Would require every business to invest time and money in establishing a baseline. Will take a long time before any baseline is set. Needs a formal and agreed assessment process to ensure this is done correctly.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Ways of setting the target – what is the target?					
Use Kyoto baselines to set target	Baseline set to1990 (and 1995 for F-gases) levels with reduction gains measured from that point.	Recognised baseline. All countries are familiar with it. Acknowledges efforts that have already been made since 1999. Kyoto baseline already agreed so will save time.	Some countries will already be below the baseline (Russia closing much of heavy industry)	Baseline doesn't really influence SEA topics, except in the extreme long term. It is the reduction measures that matter.	
Should the targets be changeable?	Changes to targets should only be accepted in light of new scientific discoveries or recognised changes in the way climate change manifests itself. There should be no 'get-out-clause'.	Will encourage further research. Reductions in all GHG emissions are valid due to higher GWP values.	May be seen as a get out clause for businesses. Could detract from the imperative for early action.	Changing targets/ periods could encourage slow response and ultimately affect all SEA topics.	Possibly in light of new scientific discovery or to change from percentage reductions target to cumulative carbon target. Needs to be closely monitored. 2^{o}C threshold must take account of all emissions sources.
Focus on (1) CO_2 emissions only (2) CO_2, CH4 & NO_x emissions (3) basket of six GHGs	All 6 GHG contribute to climate change. Although CO_2 is emitted in the greatest volumes, other gasses are more harmful. Methane has a GWP 23 times that of CO_2 while SF6 has a GWP of 23,900	By considering all GHG we are tackling the problem on 6 fronts. Most beneficial reductions can be targeted first. Potential gains from reducing lower levels of high GWP emissions can add to extra 20% Scotland is seeking to achieve.	May encourage use of equally harmful gases not listed or identified. Fewer people have control of, for example SF_6, while everyone can reduce CO_2. Potential to reduce non-CO_2 GHGs further is less than for CO_2. It is possible that Scotland could end up having to 'overcompensate' and reduce CO2 beyond 80% in order to meet a target based on the basket of GHGs.	More short and medium term benefits than if only CO_2 or 3 gases where considered.	If considering the basket of gases, big cuts could be realised in agriculture, but not if CO_2 only is considered. Different sectors could have different budgets for different gases.
Use net domestic emissions measured through the GHG inventory	GHG Inventory provides accurate information, based on current knowledge, from which reduction targets could be set and compared.	Background data already available so immediate savings can be made and measured Data already being collected and easily accessible. Complies with UNFCCC requirements.	Not all business emissions are measured.	Purely measurement and data recording mechanism. In itself has little influence on SEA topics. Reporting in itself will have little impact.	

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Ways of setting the target – what is the target?					
Use an end user inventory or have individual targets for energy efficiency and renewable electricity.	Considers energy demand and use, as opposed to supply side emissions provided in GHG Inventory.	Allows flexibility and encourages innovation and initiative. Targets reductions on a more personal/ business/ corporate responsibility level.	Potentially more onerous to record data, collate and allocate emissions – could lead to further delays and maybe difficult to enforce. Supply side linkages already well developed. Some companies are reactive rather than pro-active and need targets to be set.		Worth considering after initial periods to augment GHG Inventory approach. Reduction actions should not be held up until such a system is in place. An end user inventory could be developed eventually. Existing emissions inventories are limited. Personal carbon allowances could be developed.
Most significant target before 2020 or after?	Largest savings made early this century are more beneficial due to the time lag and persistence of GHG in the atmosphere.	Set a precedent. Encourages action on identifying and committing to largest, early savings. Encourages action on implementing proven technologies – quick wins.	Businesses could incur large costs in a relatively short period. May need incentives to drive early action/ change.		
Include international aviation/ shipping emissions	They are a growing source of emissions. Aviation emissions recognised as more harmful than terrestrial emissions. Not including them places increased pressure on other sectors/ businesses.	Important route to reduce emissions and encourage efficiency. Public perception improves – at the moment may be negative with respect to skewed logic of promoting personal responsibility against major GHG emitting sectors. Costs passed to consumer (long term benefit in reducing consumption). Places onus on travel companies not just on passengers.	Will cause rise in prices of both travel and related products. Costs passed to consumer. May restrict access to travel – personal freedoms. Difficulties in obtaining international agreement on mechanisms – must be agreed. Some companies may fold under extra costs – competition efficiencies.	Continued lack of clarity and action on issue will impact all SEA topics. Positive action will likewise benefit all SEA topics in the medium to long term.	Requires agreement by companies to absorb some of the cost. Scottish Government may be unable to influence international agreement.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Monitoring the target – Measures					
Source of independent advice? (1) Using UK Committee or (2) Dedicated Scottish body (3) Existing Scottish Organisation	Government initially proposes to use the services of the UK Independent Committee on Climate Change, for 3 years, and then appraise whether advice is appropriate for Scotland. Sufficient expertise may not be available in Scotland at this time. A dedicated department within an existing organisation is a possible compromise.	Requires long-term remit outwith influence of election timescales. Allows evolution through phases of climate change budgets and targets without political constraint. In time, a dedicated Scottish body with responsibility for climate change could help drive co-ordinated action across government departments and private sectors. Could concentrate solely on climate mitigation and adaptation.	Setting up a new dedicated Scottish body is likely to (negligibly) increase resource use in the short term, but could help reduce overall resource use in the longer term. Do we have the necessary expertise? What could a Scottish Committee offer that the UK version could not?	Will influence all SEA Topics to some degree and could provide periodically revised guidance on SEA and EIA to ensure wider environmental issues are not significantly subsumed by climate action.	Should consist of technical experts and a wider stakeholder group to continue to give a representative balance. Balance needs to be achieved between independence from government and accountability. SEA consideration would suggest that long-term, a dedicated body may be required to provide advice and coordinate action across sectors to meet both UK and Scottish targets.
Mandatory annual reporting	Reporting progress on an annual basis. Will not set targets.	Builds on existing mechanisms. Ensures all sectors report on progress, and encourages continual improvement. Allows real trend analysis after consecutive reporting periods. Will help adjust interim budgets.	May be very little being done in such short time periods. Time consuming. Maintains focus on short term results.	Reporting itself will have little or no influence. Indirect impacts associated with energy and paper use.	Annual reports can be used to highlight successes but must be completely transparent on real progress achieved. Best to provide on-line report mechanisms wherever possible – reduce paper reporting.
Introduce statutory guidance or enact provisions for public sector	Voluntary schemes are currently available. May not drive change as effectively as statutory requirements or enforcement.	Will drive improvements. All would need to take part, rather than just the more environmentally conscious. Supply chain management and sustainable procurement can drive private sector suppliers to improve, but must be properly implemented/ strictly enforced.	Voluntary measures based on businesses mechanisms (eg. CSR) and energy reviews are not sufficient in their own right. May put pressure on smaller enterprises.	Air quality, human health in the short term. Soil and water quality in the medium term. Landscape, historic environment and population in the long term.	Government support should be considered. There are organisations that provide advice and support, eg. CT, EST, Envirowise etc. These could be expanded and more widely used.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Use of Best Value duty to introduce mitigation measures.	Best Value should be amended/ strengthened to take account of mitigation and adaptation.	Provides a non-legislative vehicle for improvements that could directly impact emissions. Best Value incorporating proper evaluation of climate issues will help address embodied costs of carbon.	Best Value may still offer more credence to financial and social considerations (more short term). Could rely on business to implement change as not statutory.	Any influence will be in the medium and long term depending on success of measures.	
Introduce reporting mechanisms for certain parts of the public sector on action to reduce or adapt to climate change.	Can feed into national level reporting mechanisms. Some form of reporting mechanism is required to improve transparency on climate action.	Establishes the requirement for action. Ensures continued focus on action over time. Could consider some form of Climate Action Plan for public sector. Demonstrates leadership from national and local government.	Annual reporting may increase focus on short term change. Time consuming. May maintain focus on short term goals.	Reporting with have little influence, however the action taken could have significant localised effects.	Reported to appropriate body with enforcement powers. Setting appropriate reporting periods is important. Worth considering climate action plans and reporting on progress, with information on short-medium-long term actions/ benefits.
Should the Bill allow the means of measuring the target to be changed through secondary legislation?	Only in light of new scientific knowledge/ understanding.	Provides a contingency measure in the event of future discoveries/ technological breakthroughs.	Maybe result in potential for abuse.	Measurement in itself will have little effect.	
Should the Bill allow the level of 2050 target to be changed through secondary legislation?	Changes to targets should only be accepted in light of new scientific discoveries or changes in the way climate change has manifested itself, there should not be a 'get-out-clause'	Provides a contingency in case there are new discoveries in the future.	Could undermine the overall target. With this provision present it may provide a disincentive.	This will depend on how the target is changed. There will likely be a lag between the change and the influence.	Any change to the 2050 target needs to be based on credible scientific and independent advice. This could be in the form of a formal recommendation made by the Committee on Climate Change.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
Ways of meeting the target.					
Use of international credit scheme (Clean Development Mechanism - CDM)	Provide mechanisms for those who do not meet targets to buy credits/ allowances from those who do. Clean development potentially credits developed nation for technology transfer that limits emissions elsewhere. Additional least cost abatement solution.	Benefits conscientious companies/ countries. CDM helps limit potential growth of emissions in other countries. Helps drive global approach and presents markets for renewables and energy efficient technologies.	Provides a mechanism for buying emissions credit, but does not drive emissions reduction in home country. Credits potentially based on assumptions of savings made. Potentially dilutes the example set by Scotland, 'selling our savings' we could allow other countries to benefit without doing enough themselves.	CDM offers long-term transboundary climate benefits. Little or no short term influence with potential for detrimental medium and long term influence if reductions are not realised in home country. Offset and International Credit Schemes (eg. CDM) do not necessarily drive emissions reductions in source country/ sector.	Could be considered within the total allowed in a particular budget period. Domestic reductions and behavioural change more preferable. Should be discouraged as a priority measure to meet the Scottish target as could hinder domestic reductions achievement.
Use of EU & domestic credit and trading schemes	Provides a mechanism for those who can't meet targets to buy more allowance whilst those below targets can sell.	Cap and trade schemes offer less onerous regulatory and administrative mechanisms to drive emissions reductions/ abatement. Competitive schemes also drive innovation. Could help drive economy towards low carbon and renewable energy.	Could see a skewed result as industries/ processes that make effective early change sell credits and heavy polluters continue to emit. Many emissions not currently covered. We could be seen to be "buying our way out".	Emissions trading in itself not likely to directly impact SEA topics. If successful in driving reductions, then indirect benefits on all topics could be realised over the long-term. Should only adversely affect SEA topics if caps are inappropriate.	International aviation and shipping should be included when appropriate mechanisms are agreed. If properly designed and effective then offers potential significant contribution to credible target.
Use of carbon offset schemes	Offsetting carbon provides a two pronged approach. Reduce (sequester) and mitigate. Offset schemes can include carbon sequestration and 'green' energy developments.	Can be part of an integrated approach in conjunction with direct emission reductions. Allows emissions that can't be reduced (at least immediately) to be mitigated through sequestration. Allows larger gains to be made towards targets.	End of pipe mechanism. Potential excuse to emit. Will not reduce direct emissions. Offsetting can be very complicated and difficult to quantify.	Potential impacts on landscape, soil, water and biodiversity. Positives if afforestation managed correctly. Difficult to control impacts of offsetting elsewhere – these impacts could be significant across topics.	Needs to be properly monitored. National standards need to be established with agreed conversion factors. Positive impacts associated with limiting levels of offsetting and focusing efforts on actual emissions reductions. Carbon offsetting should be considered after emissions reduction measures. Offsetting has limits and there

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
					should be recommendations for a balanced approach and potential limits in its use, in order to drive focus on emissions reduction rather than offsets.
Increase renewables integration	Renewable energy has fewer GHG emissions than conventional energy production methods. Renewables materials are sustainably produced through life cycle assessments.	Reduced emissions of CO2. Some established technologies now cost effective to implement. Greater energy security. More control over energy prices. Potential for small scale renewable production to 'feed-in' to grid with suitable upgrades. Research and innovation continues to present opportunity. Once the majority of energy demand is met by renewables, and if conventional fossil fuel generation is phased out, emissions and energy demand reduction are not so significant.	Increased land use change. Potential for increasing GHG emissions related to development and land disturbance. Potential for climate change to increase GHG emissions from peaty soils and renewables installation to exacerbate. Renewable technologies do not address demand reduction. Could encourage consumption if energy becomes cheaper. Large scale renewables projects typically have implications for infrastructure. Benefit dependent on whether baseline energy demand continues to rise.	Short term impacts on material assets, soils, water and biodiversity, possibly detrimental. Medium-long term positive impacts on air, human health, population. Potential for long-term impacts on landscape, historic environment.	Encourage use of small-scale and micro-renewable technologies with government support. Planning process needs to be made easier and quicker to use. Grid infrastructure issues need resolved – German 'feed-in tariff' example worth considering. Short term, GHG gains from installing proven renewables must be considered in line with wider environmental costs/ benefits. Smaller scale, localised generation is more efficient and should be encouraged as it takes burden off infrastructure. Renewables materials should be sustainably produced and subject to an accredited/ verified life cycle analysis.
Increase energy efficiency measures	Making products/ processes/ buildings and people more energy efficient. Enabling powers within the Bill could be a "home" for other legislation – building standards (possibly including existing buildings) and waste management are possible targets.	Allows a continued standard of living while reducing impacts. Low-cost gains available. Businesses should realise cost savings through energy efficiencies. Long-term gains in lifetime energy use of buildings. Improved energy efficiency should reduce demand, demand	Depends on behavioural change and buy-in from the general public –requires education to change perceptions/ awareness of benefits. May encourage increased consumption and demand as efficient items seen to use less energy. Cost and waste implications of replacement, and improving	Neutral impacts are generally observed for energy efficiency measures. A combination of improved efficiency and reduced demand will have significant benefits on reducing raw material use and extraction, thereby providing secondary or indirect benefits for all SEA topics.	Wider government support should be considered. Consideration of extension of subsidies/ grants for domestic improvement measures – especially for the fuel poor and those on income support. Germany has a programme of retrofitting existing building stock to improve energy efficiency. Encourage use of energy

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
		reduction key to reducing cumulative emissions within current generating structures. Phase out of non-energy efficient light bulbs example could be and applied to other technologies.	thermal/ energy performance of older buildings.		efficient technologies. This will drive the development of energy efficient products. Companies could be encouraged to sell services not energy, e.g. the customer would buy a "warm home with lighting" rather than units of gas/ electricity. This would put energy efficiency in the realm of the supplier.
Change industrial processes	Updating processes to reduce energy/ resource demand and waste emissions. Encourage clean technology by design over end-of-pipe solutions. Carbon capture and storage technology is in its infancy.	Reduced resource use. Improved supply chains and raw materials from wastes. Reductions in polluting incidents. Reduced running costs. Could help drive innovation and competition.	Potentially high initial costs. Waste and consumption during changeover. Inertia/ resistance in industries. There are potentially other, less 'drastic' measures that can be implemented first. Difficult for government to realise/ drive change, relies on private sector to take the lead. May require incentives/ subsidies. The risks to the environment from CCS are not proven; the technology could have negative and positive effects. Possible impacts depending on leakage potentials.	Potential for negative short term impacts however more likely beneficial in the medium to long term. Varied impacts possible at a local level.	Replacement or new industrial process designs should be subject to life cycle assessment to ensure minimisation of energy and resources. Carbon capture and storage could help provide long-term option for industry. More sustainable solutions should consider means to prevent emissions rather than storage. Government should focus primarily on industries which are not covered by the EU ETS, as those emissions are being addressed.
Increase resource efficiency	Using resources in a more efficient way. Resources include water, raw materials and wastes. Resource use has knock-on impacts on the wider environment through energy consumption, processing and transport.	Companies/ businesses could realise cost savings if properly reviewed. Maintains stocks – lowers depletion rates, more resource security. Lowers water resource demand. Reduces associated activities – mining, manufacture, transport	Resource use driven by consumer demand, difficult to achieve without affecting productivity/ profits. Requires buy-in, support and change in individual companies.	Presents potential benefits for all SEA topics.	Life cycle assessments and other input-output or mass balance techniques can help improve resource efficiency.

SCCB Consultation Proposal/Option	Rationale / Assumption	Anticipated Positive Effects/ Strengths	Anticipated Negative Effects/ Weaknesses	Major areas of influence on SEA Topics/ Issues	Recommendations/ Additional Measures
		Encourages reuse, recycling and consideration of waste as raw material as an extension.			
Reduce consumption	Combination of efficient resource use, energy efficiency, and more efficient processes. Restricting demand and consumption will require combination of pricing effects and education.	Moving to a less consuming society will have wide ranging benefits for all environmental media. Scottish Government can control education and promotion e.g. energy efficiency measures.	Difficult for government strategies to control personal behaviour. Little control over this at a Scottish level. Lack of fiscal power. Efficiency could drive consumption of other goods.	Less consumerism – less resource use – less polluting processes – fewer emissions – healthier environment Potential benefits across all SEA topics.	Taxes and price increases not always best way to encourage behaviour change, subsidy and reward options must be identified.

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix F

Preliminary High Level Options Assessments

Detailed Assessment Matrices (DAMs)

1. **Use of international credit schemes and the CDM**
2. **Use of carbon offset schemes**
3. **Increase renewables integration**
4. **Increase energy efficiency measures**
5. **Change industrial processes**
6. **Improve resource efficiency**
7. **Reduce consumption**

Halcrow

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Use of International Credit Schemes and the Clean Development Mechanism

Assumption/ Rational: Credits bought from other countries or obtained through CDM could be accounted for in Scottish domestic reduction targets. Impacts will be largely dependent on the nature of the projects implemented. However the Precautionary Principle has been applied throughout this assessment.

SEA Topic	Issue Considered	Description of predicted impacts/ effects	Duration: Short term	Duration: Medium term	Duration: Long term	Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigations / Recommendations
Biodiversity, Flora & Fauna	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to ensure stringent controls on development sitting/ impacts on biodiversity in receiving country	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes such as tree planting only occur in appropriate habitats with appropriate species and great care is taken to understand local circumstances.
Air	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Impacts are likely to be positive as measures will be installed to improve emissions from industrial plants and also other schemes could provide low emissions public transport etc.	+	++	++	Ongoing	Permanent	Regional	High	Medium	Major	Positive	Y	Programmes to improve local air quality through reducing emissions from existing industrial plants and transport should be a high priority. Best practice Scottish and EU guidelines should be used to ensure any projects do not cause any additional negative air quality impacts.
Water	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Schemes could potentially have negative impacts if inappropriate forestry planting occurs wich could upset the delicate balance of the watershed. However reducing pollution and emissions could potentially improve water quality and restoring degraded forests may help improve water managment. The precautionary principal has been taken though.	-	-	-	Ongoing	Permanent	Regional	Low	Low	Minor	Negative	Y	CDM programmes must take full account of water quality and management and not exacerbate local problems in receiving countries by working to most stringent EU/UK regulations. Ideally water quality and managment should be improved as a result of programme for the benefit of the environment and the local population.
Soil	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Schemes could potentially have negative impacts if inappropriate forestry planting schemes or inappropriate biofuel schemes occur which negatively effect soil quality. However replanting schemes are likely to reduce soil degradation from wind and water erosion. However the precautionary principle has been applied as negatively effecting soil quality will have disastrous effects on other aspects of the environment and people's livelihoods in subsistence based economies that many schemes are likely to take place in.	-	-	-	Ongoing	Permanent	Regional	Low	Low	Minor	Negative	Y	Local soil conditions must be fully taken into account in any projects and not adversely effected. Measures should be taken to protect and enhance soil quantity and quality.
Human Health	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Reducing emissions from industry and transport and protecting forest areas will have direct and knock on benefits for human health through improved air and water quality etc.	+	+	++	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	Projects need to take into account the health needs of the local population and take great care not to adversely effect the conditions of the local population who are often already living in extreme poverty.
Population	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Improvements to the quality of the environment will benefit standards of living, and in subsistence farming communities protection of soil and water resources will bring significant benefits. Technology transfer, job creation and knowledge sharing can all have positive social and economic impacts. However schemes for forestry plantation or protection need to ensure that they do not result in people being 'removed' from or denied access or prevented from using forest resources such as wood fuel or non timber forest products, which could have disastrous effects if not well managed.	+	+	++	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	CDM must ensure transfer does not lead to local environmental degradation or have a negative impact on the local population and their livelihoods as many communities already live in extreme. Ideally, transfer is based around the principles of sustainable livelihoods and long term, this may lead to enhanced opportunity and new local industry.
Material Assets	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Dependant on project. There maybe an initial increase in demand for raw materials as schemes are developed and implemented but schemes should overall be aiming to reduce resource and energy use. However if schemes lead to an improvement in quality of lives this may result in a secondary impact of increased incomes which could lead to increased resource use.	+	++	-	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	Care needs to be taken in the planning and implementation of projects to minimise resource use and also schemes should also focus ways to reduce impacts of future increases in resource use on the assumption that standards of living may increase.
Landscape	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to ensure stringent controls on development. Inappropriate forestry or biofuel schemes or renewable energy schemes could adversely effect landscape /townscape character.	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes taken it to consideration visual and landscape impacts and the most stingent Uk / EU legislation and best practice is applied. Full understanding of local conditions and local wishes should also be gained.
Historic Environment	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to protect the historic environment and archaeological features.	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes taken it to consideration the historic environment and archaeology and that the most stringent UK/ EU legislation and best practice is applied. Full understanding of local conditions and local wishes should also be gained.
Overall Effect	There will be no effects on the Scottish environment apart from a missed opportunity to reduce emissions and also a complicit suggestion that no actoin needs to be taken on climate change within Scotland. However there could be very mixed impacts on the receiveing country dependent on the level of development of that country, the nature of the schemes and the care by which they are undertaken. It is likely that there will be air quality, health, population and material asset benefits but even with in these topics there could be negative impacts.													
Proposed Mitigation / Recommendation	Carbon credits and clean development mechanisms can help reduce overall global emissions, however to continue to drive Scottish domestic emissions reductions, these credits should not be counted towards meeting a domestic emissions target.													

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Use of carbon offset schemes

Assumption/ Rational: Forestry is considered in national calculations but there is a risk of double counting with the EU ETS. Therefore no significant effects identified, current trends continue. Credits bought from other countries or obtained through CDM could be accounted for in Scottish domestic reduction targets.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Could have significant beneficials impacts, but if inapropriate sites and species are chosen for tree planting this can have significant adverse effects on indigenous habitats, flora and fauna. The precautionary principle has been applied.	-	-	--	Ongoing	Permanent	Regional	**High**	Medium	**Major**	Negative	**Y**	Ensure careful consideration is given to the siting of planting schemes and species used, being careful not to disturb other important habitats such as grasslands. If well done these schemes have the potential to have significant positive impacts.
Air	Increased tree planting will have significant benefical impacts on local air quality due to the filtering function of trees.	+	++	++	Ongoing	Permanent	Local	**High**	Low	**Moderate**	Positive	**Y**	Carbon offsetting programmes must take full account of air quality in all stages of their planning and implementation and as a result of ancilliary activities and not exacerbate local problems in receiving countries by working to most stringent EU/UK regulations and best practice.
Water	Could have significant beneficials impacts, but if inapropriate sites and species are chosen for tree planting this can have significant adverse effects on Water resources and managment. The precautionary principle has been applied.	-	-	--	Ongoing	Permanent	Regional	**High**	Medium	**Major**	Negative	**Y**	Ensure careful consideration is given to the siting of planting schemes and species used, being careful not to disrupt the watershed. If well done these schemes have the potential to have significant positive impacts.
Soil	Could have significant beneficials impacts, but if inapropriate sites and species are chosen for tree planting this can have significant adverse effects on soil resources and managment. The precautionary principle has been applied.	-	-	--	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Negative	**Y**	Ensure careful consideration is given to the siting of planting schemes and species used, being careful not to adversely effect. If well done these schemes have the potential to have significant positive impacts, tree planting could be used in areas that are suffering from soil erosion to help combat it have twin beneficial effects.
Human Health	Planting trees is likley to have a beneficial impact of human health through better air quality.	+	+	+	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Positive	**N**	
Population	Can promote sustainable export of industry (forestry/ renewables). Job creation and knowledge transfer can lead to positive social and economic impacts.However inappropriate sites and species for tree planting could lead to local populations loosing access to land which may infromally being used for subsistence. The precautionary principal has been applied.	-	-	-	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**	Negative	**Y**	Full understanding of the local population and the relationship they have to the site on which the project is based must be gained in order to ensure no negative impacts are caused and that the opportunities for positive benefts are taken advantage of.
Material Assets	No significant effects anticipated.									**Neutral**			
Landscape	Could have significant beneficials impacts, but if inaapropriate sites and species are chosen for tree planting this can have significant adverse effects on landscape, such as blocking views. The precautionary principle has been applied.	-	-	--	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Negative	**Y**	Ensure careful consideration is given to the siting of planting schemes and species used, being careful not to adversely effect. If well done these schemes have the potential to have significant positive impacts, tree planting could be used in areas that are suffering from soil erosion to help combat it have twin beneficial effects.
Historic Environment	Planting of trees could cause damage to archaeological features.	-	-	-	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**	Negative	**Y**	Ensure due investigation and consideration of archaeological features is taken when locating possible sites for schemes.
Overall Effect	Carbon offset schemes have the potential to have wide ranging environmental and social benefits for receiving countries, however in line with the precautionary principle poorly planned and inappropriate shcemes have the potential to adversely effect most aspects of the environment. Offset schemes also do not tackle the causes of climate change and adverse impacts will still occur from those activities that you are offsetting from.												
Proposed Mitigation / Recommendation	Great care needs to be taken to ensure that local environmental and social conditions are fully understood in receiving countries and that schemes have a significant beneficial impact on the receiving country.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe	Superior	**Beneficial**
	Negative effect	-			Major	Major	
	Positive effect	+			Moderate	Moderate	
	Major positive effect	++			Minor	Minor	
	Neutral environmental effect				Negligible	Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Increase renewables integration

Assumption/ Rational: At this high level, renewables integration considers all forms and requirements for fully distributed generation and feed-in to national grid. Issues considered relate to most appropriate current technologies. Positive assessments are considered as relative to continued fossil fuel use.

SEA Topic	Description of predicted impacts/ effects	Duration: Short term	Duration: Medium term	Duration: Long term	Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
Biodiversity, Flora & Fauna	Wind turbine bird strikes are thought to be a potential negative side effect of wind farms. Wave and hydro generation may also disrupt ocean and river ecosystem both at the construction phase and through operation. Intensive biomass cropping (monocultures) can change water regimes and habitats leading to reductions in local biodiversity. Although some woody energy crops can increase farmland flora and fauna when compared to arable crops.	-	-	-	Ongoing	Permanent	Regional	**High**	Medium	**Major**	Negative	**Y**	Species and habitats should be protected from development, appropriate assessments should be carried out for development near protected sites. Appropriate scale, siting and design of renewables will be key in mitigatin impacts.Biodiversity breaks, inter-cropping and uncultivated boundary regimes should be a central focus when developing biomass resources.Ensure best practice is employed during the construction of renewable technologyy in order to minimise disturbance and negative impacts on biodiveristy.
Air	Energy from biomass, involving combustion, can have minor negative impacts on local air quality, although these can be addressed by exisitng legislation and technologies.Biofuels generally produce lower emissions of priority pollutants, although NOx emissions are similar. Biodiesel from waste also offers signifcant emissions reduction when compared with the lifetime emissions costs of fossil fuel diesel. Other renewables unlikely to have significant impacts on air quality apart from replacing other polluting sources of energy and fuel. Biowaste incineration organic waste separated at source and collected effectively mitigates land fill use and gas emissions. Biowaste use reduces reliance on fossil fuels, with associated reductions in priority air pollutants.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Air quality impacts of biomass/ waste combustion projects should be scrutinised appropriately through EIA and controlled through existing local air quality and pollution control regimes. CHP is the preferred biomass option but requires real heat use to maximise energy efficiencies.
Water	Offshore wind power, wavepower and hydro generatio may all disrupt water flows with knock on consequences for habitats and coastal and fluvial sedimentation processes with secondary effects on flooding etc. The construction phase of these technologies may also have implications on water quality.Intensive biomass production can exacerbate soil erosion, surface runoff can be nutrient rich, leading to potential eutrophication of receiving water bodies. Water resources could be diverted for irrigation, limiting availability elsewhere and in extreme cases changing hydrological regimes.	-	-	-	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Negative	**Y**	Short term mitigation to avoid pollution from construction e.g. mobilisation of particulates, fuel spills, dust suppression.Agricultural best practice mitigation is required throughout the life cycle of biomass production. Water environments should be protected by riparian zones and uncultivated field borders. Biomass production should not exacerbate intensive agriculture/ diffuse pollution/ fertiliser emissions.
Soil	Potentially significant localised impacts on soils, associated with soil capping for turbine bases and access roads. Can lead to increased GHG emissions from peats and increased risk of erosion/ peat slides. In extreme cases, soil emissions may outweigh benefits of installation. Intensive biomass production can exacerbate soil erosion and other issues associated with intensive agriculture. Land may be given over to energy crop production with possible impacts on soil chemistry/ physical characteristics/ GHG emissions due to land use change.	-	-	-	Ongoing	Permanent	Local	**Medium**	High	**Minor**	Negative	**Y**	SPP6 offers locational guidance on windfarms, existing planning regimes and EIA should offer protection to sensitive/ protected habitats, however sc issues and potential for increased GHG emissions should be expressly considered through EIA and in planning decisions. Appropriate land management and use of best available technologies/technique is required throughout the life cycle. Impacts on Scottish soils should be minimised by meeting GAEC and Cross-Compliance conditions for funding. Suitable EIA could be required for change to biomass.
Human Health	Increasing renewables will signal a shift away from more polluting non renewable energy which has a knock on benefit for human health, though better air quality and a reduction in respiratory disease.	+	++	++	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**Y**	Local air quality issues must be considered in conjunction with likely benefits to national improvement through fossil fuel emission reductions.
Population	No significant effects anticipated									**Neutral**		**N**	
Material Assets	The UK grid was not designed for distributed generation and use with renewables. Centralised production and supply is too energy and emissions intensive. Infrastructure needs updating to allow feed-i from distributed sources or current trends continue. This may cause an increase in resource use. Properly controlled and supported waste as fuel/ incineration/ anaerobic digestion and CHP offers a potential win-win on waste, energy and emissions.	+	+	+	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Positive	**Y**	Government should encourage grid infrastructure investment and upgrades to support both the supply/ demand and growth of renewable energy. Must be done with minimum of disruption and environmental impact. Small-scale renewables will reduce loading and strain on the grid. Pre-treatment (eg. anaerobic digestion) of biomass to release natural gas will improve fuel efficiencies. Reduced waste to landfill will extend operations whilst improving energy security. The principles of the waste hierarchy must maximise energy potential and minimise GHG emissions.
Landscape	Wind farms can dominate and change the landscape character. Also potential impacts from construction of access roads. Widespread NIMBY-ism persists. But can also be seen as attractive landscape features. Potential impacts due to land use change to biomass obscuring landscape features or impacting scenic quality. Woody biomass may have positive effects. Diversion of waste will extend the lifetime of landfill sites. This will limit overall visual impact at a national level through reducing new landfill.	--	-	-	Ongoing	Permanent	Local	**Medium**	High	**Moderate**	Negative	**Y**	Landscape is important for Scottish tourism and cultural heritage however, appropriate use of Scotland's wind resources must be seen as a valid imperative to mitigate wider environmental damage from GHG emissions, care needs to be taken in the scale and siting of wind farms. Careful consideration is also needed of the siting and species of plant grown for biomass production. Use of virgin or unimproved farmland should be avoided. Lowland arable sites present less visual impact. Shrubs and tree can be used to limit the effects of sudden changes. Wildlife corridors should be maintained.
Historic Environment	Changing landuse may disrupt fragile arcaheological features.	-			Infrequent	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Should be considered during the EIA process and Historic Scotland should advise. Archaeological watching briefs should be sufficient during construction/ excavation.
Overall Effect	Increasing renewables will have very mixed effects on the environment. Although there are the obvious benefits on GHG emissions, air quality and human health. There could be significant advers impacts on biodiversity, water and soil resources and landscape character if due care is not taken.												
Proposed Mitigation / Recommendation	Care needs to be taken in the type, siting and scale of renewables used in particular locations.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe	Superior	**Beneficial**
	Negative effect	-			Major	Major	
	Positive effect	+			Moderate	Moderate	
	Major positive effect	++			Minor	Minor	
	Neutral environmental effect				Negligible	Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: **Increase energy efficiency measures**

Assumption: Energy efficiency results in demand reduction with knock-on benefits for resource use, extraction, processing and transmission efficiency across the energy system. Also emissions benefits across the energy system.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Improved efficiency reduces demand with associated upstream energy benefits in reducing land use change and raw material extraction. Potential signficant indirect benefits for biodiversity at all levels.	+	+	++	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Postive	**Y**	Will still be a need for renewables and energy crops. See biomass considerations in 'Increase Renewables' matrix.
Air	Reduced energy consumption reduces demand which in turn reduces emissions. Every unit of end-user energy consumed requires approximately 13 units of energy to generate, therefore even minimal energy savings can produce large emissions reductions upstream. Modal shift and use of transport alternatives (eg. trains instead of planes), coupled with more efficient vehicles will reduce transport emissions leading to lower GHG emissions nationally and improved air quality locally.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**N**	
Water	Energy generation can be extremely water resource intensive, so downstream energy efficiency measures can reduce consumption. Energy efficiency measures should provide postive impacts on the water environment through reduced abstraction. Similarly reduced water use helps energy efficiency through pumping and treatment energy savings.	+	+	+	Ongoing	Permanent	Regional	**Low**	Medium	**Minor**	Positive	**N**	Potential additional benefits in helping meet with the requirements of the Water Framework Directive.
Soil	Potentially significant benefits to the soil environment through reduced demand for mineral extraction, peat disturbance, biomass development, and other pressures. Energy efficiency can have pronounced indirect effects on soil carbon storage through reduced need for disturbance.	+	++	++	Ongoing	Permanent	Local	**High**	Medium	**Moderate**	Positive	**N**	Energy efficiency can have pronounced indirect effects on soil carbon storage through reduced need for disturbance.
Human Health	Potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty which can otherwise lead to detrimental health effects.	+	++	+	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups.
Population	Potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty and leading to a better quality of life.	+	++	+	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups.
Material Assets	No significant effects									**Neutral**		**N**	
Landscape	Although most measures will be internal to buildings, Insulation measures such as double glazing and external cladding could have significant adverse effects as could inappropriate orientation and posistioning of new build projects that have energy efficency in mind.	-	-	-	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are in keeping with landscape character.
Historic Environment	Although most measures will be internal to buildings. Energy efficiency measures may be out of character with historic buildings, although designated buildings are afforded some protection against unsympathetic measures it is those buildings that are not designated but still of local significance that are most at risk.	-	-	-	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are sympathetic to the buildings character whether designated or not.
Overall Effect	Energy efficiency will have largely beneficial effects on the environment												
Proposed Mitigation / Recommendation	Care needs to be taken to ensure that landscape character and the historic environment are taken into account when promoting measures.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: **Change industrial processes**

Assumption/ Rational: Updating processes to cleaner alternatives/ methods of operation. Support clean technology by design over end-of-pipe solutions.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Moving towards cleaner processes should offer indirect benefits to biodiversity by avoiding emissions to air, water and soil.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**Y**	New processes should be subject to an assessment of the likely impact on biodiversity.
Air	Cleaner production techniques can offer climate change benefits as well as reducing emissions of priority pollutants at a local/ regional level.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Positive	**Y**	EIA should be utilised to ensure protection of local receptors, it is likely that existing regimes will be sufficient.
Water	Cleaner production techniques implies a reduction in release of pollution to the water environment thereby reducing the frequency and severity of pollution episodes.Adoption of clean technologies should involve improved raw material efficiency. Water use reductions can also help to reduce waste stream volumes and reduce energy demand.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Positive	**Y**	Existing regimes should protect the water environment from pollution, however environmental fines could be reviewed to increase the deterrent.
Soil	Emissions to soil and generation of new contaminated land sites should be limited by a move to clean technologies.	**+**	**++**	**++**	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**	Positive	**N**	
Human Health	Emissions reduction across environmental media are implied by the implementation and integration of clean technologies. This can have a knock-on effect on human health.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Positive	**N**	
Population	Populations could benefit through new employment opportunities.	**+**	**+**	**+**	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Positive	**N**	
Material Assets	Moving to cleaner technologies implies a reduction in the need to use/ develop existing material assets, affording them a degree of protection.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Positive	**N**	
Landscape	Any externally visible new technology could have a negative impact on landscape character.	**-**	**-**	**-**	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure visual impact is taken into consideration when implementing new processes.
Historic Environment	Reducing air emissions will benefit historic buildings which can suffer damage and degradation from air pollutants	**+**	**+**	**+**	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Positive	**N**	
Overall Effect	This policy will be highly beneficail across a wide range of environmental factors. Care will need to be taken that there is no negative visual impact from new processes though.												
Proposed Mitigation / Recommendation	Any physical development as a result of new processes should undergo EIA.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: **Improve resource efficiency**

Assumption/ Rational: Resource efficiency implies energy savings and waste minimisation

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Potential benefits by reducing demand (through efficiency) for intensively managed forests, or mining activities that encroach on undeveloped land. Indirectly reduces risk of habitat fragmentation.	+	+	+	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**N**	
Air	More efficient resource use would include energy consumption which directly influences atmospheric emissions (see energy efficiency matrix). This would bring significant benefits from energy efficient cars and the consequent reduction in air emissions.	+	+	+	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**	Positive	**Y**	Government could require improved efficiency standards and documented LCA information for all new vehicles.
Water	Water resource efficiency reduces the need for extraction, improving availability. Access to water resources is of potentially growing importance due to climate change effects. Resource efficiency also minimises the likelihood of pollution events.Conserving water relieves pressure on the supply and treatment infrastructure presenting energy savings and reduced chemical use associated with water supply and treatment.	+	+	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Water resource management technology and techniques should be actively encouraged.
Soil	Extraction of minerals, aggregates and timber can have negative impacts on soil quality. Improved resource efficiency reduces the need for extraction/ harvesting of raw materials. Similar soil and diffuse pollution benefits in reducing agricultural intensity. Improving resource efficiency implies the production of less waste, reducing the demands on landfill, presenting associated environmental benefits.	+	+	++	Ongoing	Permanent	Local	**High**	High	**Moderate**	Positive	**N**	
Human Health	No significant effects anticipated.									**Neutral**		**N**	
Population	No significant effects anticipated.									**Neutral**		**N**	
Material Assets	This option directly protects material assets	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**N**	
Landscape	Reduction of the need for development, landfill etc is likely to have beneficial impacts on landscape character.	+	+	+	Ongoing	Permanent	National	**Low**	Low	**Moderate**	Positive	**N**	
Historic Environment	Resource efficiency suggests a reduction in greenfield development needs and hence potential to maintain historic environment features in situ and undistrubed	+	+	+	Ongoing	Permanent	National	**Low**	Low	**Moderate**	Positive	**N**	
Overall Effect	Increasing resource efficiency will have significant environmental benefits across all environmental topics.												
Proposed Mitigation / Recommendation	Government could require improved efficiency standards and documented LCA information for all new vehicles. Water resource management technology and techniques should be actively encouraged.												

Key

The 'Duration' column is noted as:	Major negative effect	--
	Negative effect	-
	Positive effect	+
	Major positive effect	++
	Neutral environmental effect	

Magnitude of significance is illustrated as:	**Adverse**	Severe	Superior	**Beneficial**
		Major	Major	
		Moderate	Moderate	
		Minor	Minor	
		Negligible	Negligible	

Appendix F - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: **Reduce consumption**

Assumption/ Rational: Reduced consumption of products translates to benefits in up-stream raw material demand, power and energy use, transportation effects and embodied carbon from imports.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Potential benefits by reducing demand for intensively managed forests, or mining activities that encroach on undeveloped land. Indirectly reduces risk of habitat fragmentation.	+	+	+	Ongoing	Permanent	Regional	**Medium**	Medium	Moderate	Positive	N	
Air	Reduced product consumption, results in reducing transportation effects throughout the supply chain, from raw material extraction through to purchase by the the consumer. As well as reduced production emissions. Potentially huge emissions savings.	+	+	+	On-going	Permanent	International	**High**	High	Superior	Positive	N	
Water	Water resource efficiency reduces the need for extraction, improving availability. Access to water resources is of potentially growing importance due to climate change effects. Resource efficiency also minimises the likelihood of pollution events. Conserving water relieves pressure on the supply and treatment infrastructure presenting energy savings and reduced chemical use associated with water supply and treatment. Reduction in intensive farming and implementation of environmental best practice techniques will reduce diffuse pollution and water consumption.	+	+	++	Ongoing	Permanent	Regional	**High**	High	Major	Positive	Y	Water resource management technology and techniques should be actively encouraged.
Soil	Extraction of minerals, aggregates and timber can have negative impacts on soil quality. Improved resource efficiency reduces the need for extraction/ harvesting of raw materials. Similar soil and diffuse pollution benefits in reducing agricultural intensity. Consuming less implies the production of less waste, reducing the demands on landfill, presenting associated environmental benefits. Reduction in imports may lead to increased domestic production which could increase pressure on soil quality. Pollution events could also increase.	+	+	++	Ongoing	Permanent	Local	**High**	High	Moderate	Positive	N	
Human Health	No significant effects anticipated.									Neutral		N	
Population	No significant effects anticipated.									Neutral		N	
Material Assets	This option directly protects material assets	+	++	++	Ongoing	Permanent	Regional	**High**	High	Major	Positive	N	
Landscape	Reduction of the need for development, landfill etc is likely to have beneficial impacts on landscape character.	+	+	+	Ongoing	Permanent	National	**Low**	Low	Moderate	Positive	N	
Historic Environment	Reducing consumption and therefore demand suggests a reduction in greenfield development needs and hence potential to maintain historic environment features in situ and undistrubed	+	+	+	Ongoing	Permanent	National	**Low**	Low	Moderate	Positive	N	
Overall Effect	Reducing consumption will have significant benefits across all environmental topics.												
Proposed Mitigation / Recommendation	Water resource management technology and techniques should be actively encouraged.												

Key

	Major negative effect	--		**Adverse**	Severe	Superior	**Beneficial**
The 'Duration' column is noted as:	Negative effect	-	**Magnitude of significance is illustrated as:**		Major	Major	
	Positive effect	+			Moderate	Moderate	
	Major positive effect	++			Minor	Minor	
	Neutral environmental effect				Negligible	Negligible	

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix G

SCCB Consultation Options Assessments

Detailed Assessment Matrices (DAMs)

1. **Energy Efficiency**
2. **Microgeneration**
3. **Combined Heat & Power and District Heating**
4. **Reducing Carbon Emissions From Existing Building Stock**
5. **Waste reduction and recycling**
6. **Carbon Capture and Storage (Assessment Revised Post-Consultation)**
7. **Trading Schemes**

Halcrow

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Increase energy efficiency measures

Assumption:

SEA Topic	Description of predicted impacts/ effects	Duration: Short term	Duration: Medium term	Duration: Long term	Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
Biodiversity, Flora & Fauna	Improved efficiency reduces demand with associated upstream energy benefits in reducing land use change and raw material extraction. Potential significant indirect benefits for biodiversity at all levels.	+	+	++	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**Y**	Will still be a need for renewables and energy crops. See biomass considerations in 'Increase Renewables' matrix.
Air	Reduced energy consumption reduces demand which in turn reduces emissions. Every unit of end-user energy consumed requires approximately 13 units of energy to generate, therefore even minimal energy savings can produce large emissions reductions upstream. Modal shift and use of transport alternatives (eg. trains instead of planes), coupled with more efficient vehicles will reduce transport emissions leading to lower GHG emissions nationally and improved air quality locally.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**N**	
Water	Energy generation can be extremely water resource intensive, so downstream energy efficiency measures can reduce consumption. Energy efficiency measures should provide positive impacts on the water environment through reduced abstraction. Similarly reduced water use helps energy efficiency through pumping and treatment energy savings.	+	+	+	Ongoing	Permanent	Regional	**Low**	Medium	**Minor**	Positive	**N**	Potential additional benefits in helping meet with the requirements of the Water Framework Directive.
Soil	Potentially significant benefits to the soil environment through reduced demand for mineral extraction, peat disturbance, biomass development, and other pressures. Energy efficiency can have pronounced indirect effects on soil carbon storage through reduced need for disturbance.	+	++	++	Ongoing	Permanent	Local	**High**	Medium	**Moderate**	Positive	**N**	
Human Health	Potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty which can otherwise lead to detrimental health effects.	+	++	+	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups.
Population	Potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty and leading to a better quality of life.	+	++	+	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups.
Material Assets	No significant effects									**Neutral**		**N**	
Landscape	Although most measures will be internal to buildings, insulation measures such as double glazing and external cladding could have significant adverse effects as could inappropriate orientation and positioning of new build projects that have energy efficiency in mind.	-	-	-	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are in keeping with landscape character.
Cultural Heritage (inc Historic Environment)	Although most measures will be internal to buildings. Energy efficiency measures may be out of character with historic buildings, although designated buildings are afforded some protection against unsympathetic measures it is those buildings that are not designated but still of local significance that are most at risk.	-	-	-	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are sympathetic to the buildings character whether designated or not.
Overall Effect	Energy efficiency will have largely beneficial effects on the environment												
Proposed Mitigation	Care needs to be taken to ensure that landscape character and the historic environment are taken into account when promoting measures.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe	Superior **Beneficial**
	Negative effect	-			Major	Major
	Positive effect	+			Moderate	Moderate
	Major positive effect	++			Minor	Minor
	Neutral environmental effect				Negligible	Negligible

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Increase Micro-generation

Assumption/ Rational:

SEA Topic	Description of predicted impacts/ effects	Duration: Short term	Duration: Medium term	Duration: Long term	Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
Biodiversity, Flora & Fauna	Wind turbine bird strikes are thought to be a potential negative side effect of wind turbines. Hydro generation may also disrupt river ecosystem both at the construction phase and through operation. Intensive biomass cropping (monocultures) for small scale bio energy production can change water regimes and habitats leading to reductions in local biodiversity. Although some woody energy crops can increase farmland flora and fauna when compared to arable crops.	-	--	--	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**	Negative	**Y**	Species and habitats should be protected from development, appropriate assessments should be carried out for development near protected sites. Appropriate scale, siting and design of renewables will be key in mitigation impacts. Biodiversity breaks, inter-cropping and uncultivated boundary regimes should be a central focus when developing biomass resources. Ensure best practice is employed during the construction of renewable and microgeneration technologies in order to minimise disturbance and negative impacts on biodiversity.
Air	Energy from biomass, involving combustion, can have minor negative impacts on local air quality, although these can be addressed by existing legislation and technologies. Biofuels generally produce lower emissions of priority pollutants, although NOx emissions are similar. Bio diesel from waste also offers significant emissions reduction when compared with the lifetime emissions costs of fossil fuel diesel. Other renewables unlikely to have significant impacts on air quality apart from replacing other polluting sources of energy and fuel. Bio waste incineration organic waste separated at source and collected effectively mitigates land fill use and gas emissions. Bio waste use reduces reliance on fossil fuels, with associated reductions in priority air pollutants.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Air quality impacts of biomass/ waste combustion projects should be scrutinised appropriately through EIA and controlled through existing local air quality and pollution control regimes. Combining anaerobic digestion or gasification with CHP is the preferred biomass option but requires real heat use to maximise energy efficiencies. Even at the microgeneration scale these issues and measures apply.
Water	In-river small scale hydro generation may disrupt water flows with knock on consequences for habitats and sedimentation processes with minor secondary effects on flooding etc. Construction phases may also have implications for water quality. Biomass production can exacerbate soil erosion, surface runoff can be nutrient rich, leading to potential eutrophication of receiving water bodies. At the microgeneration scale, biomass fuel use may be limited to wood chip or organic wastes, however these issues are still relevant.	-	-	-	Ongoing	Permanent	Regional	**Medium**	High	**Moderate**	Negative	**Y**	Short term mitigation to avoid pollution from construction e.g. mobilisation of particulates, fuel spills, dust suppression. Agricultural best practice mitigation is required throughout the life cycle of biomass production. Water environments should be protected by riparian zones and uncultivated field borders. Biomass production should not exacerbate intensive agriculture/ diffuse pollution/ fertiliser emissions.
Soil	Potentially significant localised impacts on soils, associated with soil sealing. Land may be given over to energy crop production with possible impacts on soil chemistry/ physical characteristics/ GHG emissions due to land use change. At the microgeneration scale, soil impacts are likely to be minimal but could present cumulative degradation if implemented in large numbers.	-	-	-	Ongoing	Permanent	Local	**Medium**	High	**Minor**	Negative	**Y**	Existing planning regime should offer protection to sensitive/ protected habitats, however soil issues and potential for increased GHG emissions should be expressly considered through EIA and in planning decisions for large installations or community sites. At the microgeneration scale, the planning regime could be reviewed to allow easier integration of measures not covered by permitted development. Cumulative soil impacts may be limited by provided appropriate guidance on positioning microgeneration technologies.
Human Health	Increasing all forms of renewables will signal a shift away from more polluting non renewable energy which has a knock on benefit for human health, through better air quality and a reduction in respiratory disease.	+	++	++	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**Y**	Local air quality issues must be considered in conjunction with likely benefits to national improvement through fossil fuel emission reductions.
Population	No significant effects anticipated									**Neutral**		**N**	
Material Assets	The UK grid was not designed for distributed generation and use with renewables. Infrastructure needs updating to allow feed-in from distributed sources or current emission trends continue. This may cause an increase in resource use. At the microgeneration scale, life cycle analysis in product development can limit resource use and embedded emissions.	-	-	-	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Negative	**Y**	Government should encourage grid infrastructure investment and upgrades to support both the supply/ demand and growth of all renewable energy forms. Must be done with minimum of disruption and environmental impact. Small-scale and micro-renewables will reduce loading and strain on the grid. Pre-treatment (eg. anaerobic digestion) of biomass to release natural gas will improve fuel efficiencies. Reduced waste to landfill will extend operations whilst improving energy security. The principles of the waste hierarchy must maximise energy potential and minimise GHG emissions.
Landscape	Wind turbines and solar panels can have significant visual impacts especially in areas of particular landscape/ townscape character and widespread NIMBY-ism persists. But can also be seen as attractive landscape features. Potential impacts due to land use change to biomass obscuring landscape features or impacting scenic quality. Woody biomass may have positive effects. Diversion of waste will extend the lifetime of landfill sites. This will limit overall visual impact at a national level through reducing new landfill.	--	-	-	Ongoing	Permanent	Local	**Medium**	High	**Moderate**	Negative	**Y**	Landscape is important for Scottish tourism and cultural heritage however, appropriate use of Scotland's wind resources must be seen as a valid imperative to mitigate wider environmental damage from GHG emissions, including microgeneration options. Care needs to be taken when siting microgeneration technology. Careful consideration is also needed of the siting and species of plant grown for biomass production. Use of virgin or unimproved farmland should be avoided. Lowland arable sites present less visual impact. Shrubs and trees can be used to limit the effects of sudden changes. Wildlife corridors should be maintained.
Cultural Heritage (inc Historic Environment)	Microgeneration technologies may adversely affect the wider historic character of conservation areas or older settlements, especially if introduced in great numbers. Cumulative impacts of increasing numbers of small changes may also have detrimental effects, on non-designated but locally important areas.	-			Infrequent	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Microgeneration may be allowed within permitted development, however planning authorities and Historic Scotland should agree an approach and advise. Cumulative impacts need to be considered within the Government's preferences/ priorities for emissions reductions measures against conservation of historic settings. Due to the fact that older buildings are more likely to be less energy efficient, microgeneration can go some way to reducing the energy burden of older building stock.
Overall Effect	Increasing renewables will have very mixed effects on the environment. Although there are the obvious benefits on GHG emissions, air quality and human health. There could be significant adverse impacts on biodiversity, water and soil resources and landscape character if due care is not taken.												
Proposed Mitigation	Care needs to be taken in the type, siting, scale and design of renewables used in particular locations.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe	Superior **Beneficial**
	Negative effect	-			Major	Major
	Positive effect	+			Moderate	Moderate
	Major positive effect	++			Minor	Minor
	Neutral environmental effect				Negligible	Negligible

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Combined Heat and Power and District Heating Schemes

Assumption/ Rational: CHP itself has been assessed not the source of energy e.g. biomass that would be supplying the CHP.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Secondary benefits of reduced emissions through increased efficiency.	+	+	+	Ongoing	Permanent	Regional	**Low**	Low	**Minor**	Positive	**N**	
Air	Significant benefits of reduced emissions through increased efficiency. Potential for localised air quality impacts from combustion processes.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**N**	Existing local air quality management and pollution control regulations should address any localised impacts.
Water	No Significant Effects									**Neutral**		**N**	
Soil	Secondary benefits of reduced emissions through increased efficiency.	+	+	+	Ongoing	Permanent	Regional	**Low**	Low	**Minor**	Positive	**N**	
Human Health	Significant benefits if social housing and deprived communities are targeted as reducing fuel poverty will have direct benefits on human health especially to those who are most vulnerable.	+	++	++	Ongoing	Permanent	Local	**High**	High	**Moderate**	Positive	**N**	
Population	Significant social benefits if implemented in social housing schemes and to low income communities to try and raise the standard of housing and reduce heating costs.	+	++	++	Ongoing	Permanent	Local	**High**	High	**Moderate**	Positive	**N**	
Material Assets	The UK grid was not designed for distributed generation and problems could arise if there was widespread adoption as electricity supply could become unmanageable at a national scale, with peaks and troughs in supply and demand. Infrastructure needs updating and new management methods introducing to cope with different supply methods.	-	-	-	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Negative	**Y**	Government should encourage grid infrastructure investment and upgrades to support both the supply/ demand and growth of local distribution. Must be done with minimum of disruption and environmental impact.
Landscape	Large scale CHP plants need to take account of visual impact and landscape character to avoid negative visual impacts.	-	-	-	Ongoing	Permanent	Local	**Medium**	Medium	**Minor**		**Y**	Ensure landscape and visual impact is taken fully into consideration when designing and siting CHP plants.
Cultural Heritage (inc Historic Environment)	No Significant Effects									**Neutral**		**Y**	Extreme care needs to be taken when installing new infrastructure that no damage occurs to archaeological features.
Overall Effect	Overall beneficial effects on the environment.												
Proposed Mitigation	More detailed consideration needs to be given about how present energy infrastructure will be able to deal with a significant shift towards CHP.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: **Reduce carbon emissions from existing building stock**

Assumption/ Rational: Includes retrofitting new forms of micro generation and energy efficiency measures. Therefore many of the effects will be similar to that for energy efficiency and micro generation.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Improved efficiency reduces demand with associated upstream energy benefits in reducing land use change and raw material extraction. Potential significant indirect benefits for biodiversity at all levels.	**+**	**+**	**++**	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**N**	
Air	Reduced energy consumption reduces demand which in turn reduces emissions. Every unit of end-user energy consumed requires up to 13 units of energy to generate, therefore even minimal energy savings can produce large emissions reductions upstream. Shift to renewable energy will reduce emissions to air.	**+**	**++**	**++**	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**N**	
Water	Energy generation from non renewable resources can be extremely water resource intensive, so downstream energy efficiency measures reducing consumption and a switch to renewables will be extremely beneficial. Energy efficiency measures should provide positive impacts on the water environment through reduced abstraction. Similarly reduced water use helps energy efficiency through pumping and treatment energy savings.	**+**	**+**	**+**	Ongoing	Permanent	Regional	**Low**	Medium	**Minor**	Positive	**Y**	Potential additional benefits in helping meet with the requirements of the Water Framework Directive.
Soil	Potentially significant benefits to the soil environment through reduced demand for mineral extraction and peat disturbance. Energy efficiency can have pronounced indirect effects on soil carbon storage through reduced need for disturbance.	**+**	**++**	**++**	Ongoing	Permanent	Local	**High**	Medium	**Moderate**	Positive	**N**	
Human Health	Potential to improve cold and damp inefficient housing which can lead to detrimental health effects.	**+**	**++**	**++**	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups.
Population	Potential to improve cold and damp inefficient housing which will improve the quality of many peoples lives, especially those on low incomes. Energy efficiency and micro generation may have potential financial benefits through reducing the need to buy as much energy and also the potential with micro generation to sell it back to the grid. Potential financial benefits, reducing financial stress on low income households, thereby helping address fuel poverty and leading to a better quality of life.	**+**	**++**	**++**	Ongoing	Permanent	National	**Medium**	Medium	**Major**	Positive	**Y**	Requires assistance to improve efficiency for fuel poor/ low income households. Energy efficiency incentives could limit the impact of fuel poverty on high risk groups. Ensure that micro generation and energy efficiency measures are targeted effectively at low income and vulnerable groups and any domestic trading schemes don't disadvantage those who are unable to afford or have access to these measures or have high energy use due to a particular reason such as the elderly or disabled.
Material Assets	Energy efficiency will reduce resource use but increasing micro generation may have minor effects. T he UK grid was not designed for distributed generation and use with renewables. Centralised production and supply is too energy and emissions intensive. Infrastructure needs updating to allow feed-in from distributed sources or current trends continue. This may cause an increase in resource use. Properly controlled and supported waste as fuel/ incineration/ anaerobic digestion and CHP offers a potential win-win on waste, energy and emissions.	**-**	**-**	**-**	Ongoing	Permanent	National	**Low**	Medium	**Moderate**	Negative	**Y**	Government should encourage grid infrastructure investment and upgrades to support both the supply/ demand and growth of renewable energy. Must be done with minimum of disruption and environmental impact. Small-scale renewables will reduce loading and strain on the grid. Pre-treatment (eg. anaerobic digestion) of biomass to release natural gas will improve fuel efficiencies. Reduced waste to landfill will extend operations whilst improving energy security. The principles of the waste hierarchy must maximise energy potential and minimise GHG emissions.
Landscape	Although most measures will be internal to buildings, insulation measures such as double glazing and external cladding, could have significant adverse effects as could inappropriate orientation and positioning of new build projects that have energy efficiency in mind.	**-**	**-**	**-**	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are in keeping with landscape character.
Cultural Heritage (inc Historic Environment)	Although most measures will be internal to buildings, energy efficiency measures and microgeneration may be out of character with historic buildings, although designated buildings are afforded some protection against unsympathetic measures it is those buildings that are not designated but still of local significance that are most at risk.	**-**	**-**	**-**	Ongoing	Permanent	Local	**Low**	Low	**Negligible**	Negative	**Y**	Ensure that all energy efficiency measures that are visible are sympathetic to the buildings character whether designated or not.
Overall Effect	Promoting the reuse and energy efficiency improvement of existing building stock, rather than demolition and new build, will have major beneficial impacts on future potential GHG emissions.												
Proposed Mitigation	See above												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Waste Reduction & Recycling

Assumption/ Rational:

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Reduced resource consumption which will have secondary beneficial impacts on biodiversity.	+	+	+	Ongoing	Permanent	Local	**Low**	Medium	**Negligible**	Positive	**Y**	Promote regional self sufficiency for Scotland in terms of waste management to ensure that Scotland's waste doesn't become somebody else's problem. Ensure all former landfill sites and waste management sites are developed in such a way as to enhance biodiversity.
Air	Reduced resource production will reduce emissions. Reduced use of forestry resources will also ensure that there are more trees are available to absorb air pollutants and carbon. Reduced landfill will reduce the landfill gas emissions to air. Reduced transport emissions from waste movements.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Promote regional self sufficiency for Scotland in terms of waste management to ensure that Scotland's waste doesn't become somebody else's problem. Increase recycling rates, energy recovery from waste and reduce landfill as Scotland's highest priorities in terms of waste management.
Water	Reducing all waste emissions to land from waste storage, treatment and / or disposal will reduce the potential for water contamination. Reducing the level of contaminates in process waste waters will have a significant benefit to overall water quality.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Promote regional self sufficiency for Scotland in terms of waste management to ensure that Scotland's waste doesn't become somebody else's problem. Encourage the closure of the most polluting waste management facilities by looking for alternative technologies. Encourage use of grey water reuse for all waste processing activities.
Soil	Will encourage the reuse of soils from construction activities, for flexible landscaping within development sites, reducing the use of virgin materials and preserving soil integrity. Reducing all waste emissions to land from waste storage, treatment and / or disposal will reduce the potential for soil contamination.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Promote the processing of waste soils and soil materials into secondary aggregates. Encourage the recovery of waste soils as opposed to disposal at all opportunities.
Human Health	Reduction in noise, vibration, dust and air pollutants from waste management activities will benefit human health.	+	++	++	Ongoing	Permanent	Local	**Medium**	High	**Minor**	Positive	**N**	
Population	Reduction in noise, vibration, dust and air pollutants from waste management activities will benefit quality of life. Reduction in waste movements which will potentially help to reduce road congestion. Increased recycling will increase jobs both for collection and processing. Care needs to be taken to ensure that regulatory measure and strategic drivers encourage recycling in multiple occupancy dwellings and amongst remote rural populations and measures are put in place to ensure the waste management needs of low income families are met.	+	+	++	Ongoing	Permanent	Local	**High**	High	**Moderate**	Positive	**Y**	Care needs to be taken to ensure that regulatory measure and strategic drivers encourage recycling in multiple occupancy dwellings and measures are put in place to ensure the waste management needs of low income families are met. Ensure innovative methods of waste management are introduced for remote rural locations such as community skips. Ensure all former and present inert waste management sites are developed with a view to enhancing the environment and for the benefit fof the local population.
Material Assets	Promoting waste reduction and recycling and increased producer responsibility led legislation will provide an incentive to reduce packaging in general and promote more sustainable and recyclable materials for packaging, which will benefit overall resource use. Will encourage the reuse of aggregates for construction reducing the need for extraction of virgin materials. Overall reduction in energy used for production of virgin materials and goods.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Encourage packaging take back schemes for the commercial and industrial sectors. The taking back of excess materials for reuse elsewhere (especially in the construction industry). Promote the use of secondary aggregates in new builds and other construction activities. Address possible waste production at the design stage by considering the lifecycle of new products. Use procurement as a driver and a controlling mechanism for reducing waste and promoting resource management.
Landscape	Reduction of the need for landfill and other waste management sites is likely to have beneficial impacts on landscape character.	+	++	++	Ongoing	Permanent	Regional	**High**	High	**Major**	Positive	**Y**	Better planning and communication of the need for waste management facilities. A national level capacity and infrastructure study would facilitate this. Any recycling facilities need to be of appropriate scale and take into consideration landscape impact. Ensure that during and post operation efforts to integrate the facilities within the landscape and have a beneficial impact.
Cultural Heritage (inc Historic Environment)	Reducing emissions to air will have secondary beneficial impacts on dissolved particulates within precipitation therefore reducing to corrosive damage to historic buildings and structures.	+	+	+	Ongoing	Permanent	Regional	**Medium**	Medium	**Moderate**	Positive	**N**	
Overall Effect	Increasing resource efficiency is likely to have significant benefits across all environmental topics.												
Proposed Mitigation	See above												

Key								
The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe		Superior	**Beneficial**
	Negative effect	-			Major		Major	
	Positive effect	+			Moderate		Moderate	
	Major positive effect	++			Minor		Minor	
	Neutral environmental effect				Negligible		Negligible	

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Carbon Storage

Assumption/ Rational: The environmental effects of carbon storage, especially ocean storage, are poorly understood and more studies are needed. Great care, along with long term monitoring must be taken when implementing carbon storage.

SEA Topic	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigation / Recommendations
		Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	The most practical carbon capture solution for large-scale point sources such as power stations would involve limiting the distance for transport and therefore the length of pipeline used. This could result in new power plants being built at locations nearer to storage sites than existing powers stations are. This would have a detrimental impact on biodiversity at those sites, but improvements are possible at decomissioned sites. Potential effects such as ocean acidification could have a severe negative impact on biodiversity, flora and fauna.	**-**	**--**	**--**	Ongoing	Permanent	International	**High**	Medium	**Severe**	Negative	**Y**	Associated infrastructure should take full account of biodiversity and use Best Practice measures to minimise disturbance and enhance biodiversity where possible.
Air	Will reduce overall emissions to air.	**+**	**++**	**++**	Ongoing	Permanent	International	**High**	High	**Superior**	Positive	**N**	
Water	Carbon capture is a technology in its infancy. Groundwater and ocean acidification as a result of CO_2 leakage from stores under the sea-floor could be a side effect with severe negative consequences.	**-**	**--**	**--**	Ongoing	Permanent	International	**High**	Medium	**Severe**	Negative	**Y**	Careful testing and research needs to be undertaken to understand the effects on water resources before carbon storage is implemented.
Soil	The most practical carbon capture solution for large-scale point sources such as power stations would involve limiting the distance for transport and therefore the length of pipeline used. This could result in new power plants being built at locations nearer to storage sites than existing powers stations are. This would have a detrimental impact on soil resources at those sites.	**-**	**--**	**--**	Ongoing	Permanent	Local	**High**	Medium	**Moderate**	Negative	**N**	Should new plant be required with CCS facilities, careful siting, preferably on brownfield land, will be required. Losses to soil resources must be minimised with high carbon soils protected as a priority.
Human Health	Unknown impacts									**Neutral**		**Y**	Effects unknown at present but further research is needed to identify potential impacts before carbon storage is implemented.
Population	Unknown impacts									**Neutral**		**Y**	Effects unknown at present but further research is needed to identify potential impacts before carbon storage is implemented.
Material Assets	Unknown impacts									**Neutral**		**Y**	Effects unknown at present but further research is needed to identify potential impacts before carbon storage is implemented.
Landscape	The most practical carbon capture solution for large-scale point sources such as power stations would involve limiting the distance of transport and therefore the length of pipeline used. This could result in new power plants being built at locations nearer to storage sites than existing powers stations are. This would have a detrimental impact on landscape at those sites.	**-**	**-**	**-**	Ongoing	Permanent	Local	**High**	Medium	**Moderate**	Negative	**Y**	Ensure visual impact is taken into consideration.
Cultural Heritage (inc Historic Environment)	Unknown impacts									**Neutral**		**Y**	Effects unknown at present but further research is needed to identify potential impacts before carbon storage is implemented.
Overall Effect	Although carbon storage has significant beneficial impacts for climate change and air quality, there is a risk that it could also result in significant adverse environmental impacts which are not currently fully understood. The introduction of CCS may not be seen as the most environmentally sustainable technology for domestic energy production, however, development of the technology could have significant benefits, when exported, to allow the use of fossil fuel generation in countries with more significant coal reserves. Therefore the medium-term transboundary benefits may be significantly positive in terms of limiting the release of CO2 elsewhere.												
Proposed Mitigation	Effective research into environmental controls for domestic development of CCS and similarly effective research into appropriate geological formations and suitable environmental controls when considered for use in exporting the technology to other countries.												

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe			Superior	**Beneficial**
	Negative effect	-			Major			Major	
	Positive effect	+			Moderate			Moderate	
	Major positive effect	++			Minor			Minor	
	Neutral environmental effect				Negligible			Negligible	

Appendix G - DETAILED ASSESSMENT MATRIX

Ways of meeting the target: Use of International Emissions Trading Schemes

Assumption/ Rational: Credits bought from other countries or obtained through CDM could be accounted for in Scottish domestic reduction targets. Impacts will be largely dependent on the nature of the projects implemented. However the Precautionary principle has been applied through out this assessment.

SEA Topic	Issue Considered	Description of predicted impacts/ effects	Duration			Frequency	Temporary or permanent	Geographic significance	Magnitude	Level of certainty	Severity of significance	Positive or negative	Mitigation required?	Mitigations / Recommendations
			Short term	Medium term	Long term									
Biodiversity, Flora & Fauna	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to ensure stringent controls on development sitting/ impacts on biodiversity in receiving country	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes such as tree planting only occur in appropriate habitats with appropriate species and great care is taken to understand local circumstances.
Air	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Impacts are likely to be positive as measures will be installed to improve emissions from industrial plants and also other schemes could provide low emissions public transport etc.	+	++	++	Ongoing	Permanent	Regional	High	Medium	Major	Positive	Y	Programmes to improve local air quality through reducing emissions from existing industrial plants and transport should be a high priority. Best practice Scottish and EU guidelines should be used to ensure any projects do not cause any additional negative air quality impacts.
Water	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Schemes could potentially have negative impacts if inappropriate forestry planting occurs which could upset the delicate balance of the watershed. However reducing pollution and emissions could potentially improve water quality and restoring degraded forests may help improve water management. The precautionary principal has been taken though.	-	-	-	Ongoing	Permanent	Regional	Low	Low	Minor	Negative	Y	CDM programmes must take full account of water quality and management and not exacerbate local problems in receiving countries by working to most stringent EU/UK regulations. Ideally water quality and management should be improved as a result of programme for the benefit of the environment and the local population.
Soil	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Schemes could potentially have negative impacts if inappropriate forestry planting schemes or inappropriate bio fuel schemes occur which negatively effect soil quality. However replanting schemes are likely to reduce soil degradation from wind and water erosion. However the precautionary principle has been applied as negatively effecting soil quality will have disastrous effects on other aspects of the environment and people's livelihoods in subsistence based economies that many schemes are likely to take place in.	-	-	-	Ongoing	Permanent	Regional	Low	Low	Minor	Negative	Y	Local soil conditions must be fully taken into account in any projects and not adversely effected. Measures should be taken to protect and enhance soil quantity and quality.
Human Health	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Reducing emissions from industry and transport and protecting forest areas will have direct and knock on benefits for human health through improved air and water quality etc.	+	+	++	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	Projects need to take into account the health needs of the local population and take great care not to adversely effect the conditions of the local population who are often already living in extreme poverty.
Population	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Improvements to the quality of the environment will benefit standards of living, and in subsistence farming communities protection of soil and water resources will bring significant benefits. Technology transfer, job creation and knowledge sharing can all have positive social and economic impacts. However schemes for forestry plantation or protection need to ensure that they do not result in people being 'removed' from or denied access or prevented from using forest resources such as wood fuel or non timber forest products, which could have disastrous effects if not well managed.	+	+	++	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	CDM must ensure transfer does not lead to local environmental degradation or have a negative impact on the local population and their livelihoods as many communities already live in extreme. Ideally, transfer is based around the principles of sustainable livelihoods and long term, this may lead to enhanced opportunity and new local industry.
Material Assets	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Dependant on project. There maybe an initial increase in demand for raw materials as schemes are developed and implemented but schemes should overall be aiming to reduce resource and energy use. However if schemes lead to an improvement in quality of lives this may result in a secondary impact of increased incomes which could lead to increased resource use.	+	++	-	Ongoing	Permanent	Regional	High	Low	Major	Positive	Y	Care needs to be taken in the planning and implementation of projects to minimise resource use and also schemes should also focus ways to reduce impacts of future increases in resource use on the assumption that standards of living may increase.
Landscape	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to ensure stringent controls on development. Inappropriate forestry or bio fuel schemes or renewable energy schemes could adversely effect landscape /townscape character.	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes taken it to consideration visual and landscape impacts and the most stringent Uk / EU legislation and best practice is applied. Full understanding of local conditions and local wishes should also be gained.
Cultural Heritage (inc Historic Environment)	Domestic impacts	No significant effects - International credit schemes do nothing for domestic emissions, therefore allowing current trends to continue.									Neutral		N	
	Recipient country	Unknown impacts, but presumed negative (precautionary principle) as often poor legislation or enforcement to protect the historic environment and archaeological features.	-	-	-	Ongoing	Permanent	Regional	Low	Medium	Minor	Negative	Y	Care needs to be taken to ensure that schemes taken it to consideration the historic environment and archaeology and that the most stringent UK/ EU legislation and best practice is applied. Full understanding of local conditions and local wishes should also be gained.
Overall Effect	There will be no effects on the Scottish environment apart from potential missed opportunity to reduce emissions and also a complicit suggestion that less action needs to be taken within Scotland. However there could be very mixed impacts on the receiving country dependent on the level of development of that country, the nature of the schemes and the care by which they are undertaken. It is likely that there will be air quality, health, population and material asset benefits but even within these topics there could be negative impacts.													
Proposed Mitigation	Carbon credits and clean development mechanisms can help reduce overall global emissions, however careful consideration is required to develop mechanisms that continue to drive Scottish domestic emissions reductions.													

Key

The 'Duration' column is noted as:	Major negative effect	--	**Magnitude of significance is illustrated as:**	**Adverse**	Severe	Superior	**Beneficial**
	Negative effect	-			Major	Major	
	Positive effect	+			Moderate	Moderate	
	Major positive effect	++			Minor	Minor	
	Neutral environmental effect				Negligible	Negligible	

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix H

Post-Consultation Re-Issue Additional Appendix

Environmental Report Consultation Comments and Responses

Halcrow

No.	Reference	Comment	SEA Response
Scottish Environment Protection Agency (SEPA) – received 23-04-08			
1	Covering Letter	Please note, this response is in regard only to the adequacy and accuracy of the Environmental Report and comments SEPA has on the SCCB consultation itself have been provided separately.	Noted.
2		SEPA welcomes the undertaking of a Strategic Environmental Assessment on the SCCB consultation and considers that it is a very comprehensive document that covers the issues in considerable detail and, importantly, identifies a comprehensive range of mitigation measures.	Noted.
3		Given the comprehensive nature of the work, SEPA would recommend that a simplified report is prepared to support the introduction of the SCCB to Parliament which clearly sets out the key findings and mitigation measures. This will help inform decision making on the Bill as it progresses through Parliament.	The SCCB Team are in favour of providing an effective summary through the SEA Statement.
4		As the SCCB consultation is finalised, the Scottish Government, as Responsible Authority, will be required to take account of the findings of the Environmental Report and of views expressed upon it during this consultation period. As soon as reasonably practical after the adoption of the plan, the Responsible Authority should publish a statement setting out how this has occurred. SEPA normally expects this to be in the form of an "SEA Statement" similar to that advocated in the Scottish Government SEA templates and toolkit. A copy of the SEA statement should be sent to the Consultation Authorities via the Scottish Government SEA Gateway on publication.	Noted.
5	Environmental Report General Comments	SEPA recognises the difficulties and practical constraints in undertaking SEA of a strategic consultation document and consider that in most areas you have been successful in using the assessment to identify issues for consideration as the Bill itself is prepared.	Noted.
6		At a general level, the one key concern is, in fact, that it may be a little *too* comprehensive to the point that it becomes very complex and as a result difficult to read through the various stages of assessment. That said; the findings of the assessment, as set out in chapter 6 and the non technical summary, are actually very clear in terms of the positive, negative and cumulative effects upon each of the SEA topics.	Accepted. Due to the complexity of the issue, the wide ranging implications of the SCCB, and constraints on developing an acceptable methodology and preparing the report in conjunction with consultation deadlines, the final presentation of analyses could have been improved.
7		As the SCCB consultation is progressed and the Bill itself prepared and indeed introduced to parliament, it would be helpful for a very simple overview of the assessment findings to be prepared (eg from the non technical summary or via the SEA statement) in order to help inform debate on the Bill and its implications.	Following discussions with the SCCB Team, the SEA Statement will fulfil this requirement.

No.	Reference	Comment	SEA Response
8	Re. Question 31	The SCCB consultation itself asked: "*should provisions within the Environmental Assessment (Scotland) Act 2005 be amended in order to provide clearer links with emissions reductions and if so how should this be done* ?". As noted in our response to the consultation, SEPA considers that using the SEA process to evaluate progress by public bodies in integrating greenhouse gas reduction targets into plan-making is supported. In addition to this, there is a big opportunity to influence the climate effects other plans and programmes through this Environmental Report. For example, the adoption and implementation of a mitigation measure that encourages Responsible Authorities to identify the contribution of their plans and programmes to climate change objectives or to the proposed 80% target would enable reporting of the contribution of each plan and programme through its SEA. As noted in our response to the Bill consultation, SEPA would be very pleased to work with the Scottish Government and the SEA consultation authorities to investigate ways in which SEA could be used proactively to integrate emissions reduction into plans and programmes.	Potential future guidance on climate issues within SEA is likely to play a key part in embedding the SCCB targets and emissions reduction throughout public policy. Similarly, the SEA monitoring framework is intended to integrate with proposals for SCCB reporting as far as possible. SCCB proposals for ministers to report on future policies and plans for emissions reduction and climate adaptation should be accompanied by appropriate SEA if expected to have significant environmental effects. The Scottish Government has considered the views which SEPA and SNH have expressed on the SEA process in their responses to the consultations on both the Scottish Climate Change Bill proposals and the related Environmental Report. The Environmental Assessment (Scotland) Act 2005 is a relatively new piece of legislation and users are still learning how best to work within the framework it sets out. The Scottish Government considers that the most appropriate measure in the first instance is to seek to amend the SEA guidance to embed consideration of emissions in the assessment process. The Scottish Government is now working with SEPA to consider how the SEA guidance might best be improved.
9	Environmental Report Detailed Comments 1. Introduction	We note the position that the SEA is of the consultation proposals and not of the Bill itself and also that there may be no assessment of the adopted version of the Bill following the Parliamentary handover and the legislative process. SEPA cannot comment on whether this is compliant with the SEA legislation. We are of the view, however, that given the comprehensive nature of the assessment that has been undertaken on the SCCB consultation and, on the assumption that the findings of the Environmental Report are fully taken into account as the Bill is drafted, that we are broadly content with this approach.	The SEA presented an assessment of the environmental implications of a wide range of possible emissions reduction activities, and of the various options for the drafted Bill contained within the consultation document. It is anticipated that as the Bill is drafted, the findings of the SEA will be taken into account and, should any significant additions/ changes be made, these will be assessed in their own right. The primary purpose of the Scottish Climate Change Bill is to set a target to reduce emissions by 80% by 2050; establish a framework to set a trajectory to achieve that target, to ensure decisions are taken on the basis of appropriate expert advice and to put reporting and scrutiny measures in place to ensure transparency. Targets in isolation do not have an environmental effect but the activities undertaken to meet them may. The SEA on the consultation proposals for a Scottish Climate Change Bill sought to reflect this. Separate policies will have to be brought forward following the parliamentary passage of the Bill in order to deliver the 80% emissions reduction by 2050. Each of these will be considered on their own merits and SEA will be undertaken where appropriate.
10		As noted above, it would be helpful to flag up as part of the parliamentary handover the SEA work that has been completed, its key findings and the way in which it has been taken into account in progress towards the Bill. This will help inform debate on the Bill. This can be done via the SEA Statement that will be published as the Bill is introduced and we assume that this will be made available to the Parliament alongside other supporting documents.	Discussions on the most appropriate means to provide a summary of key findings and the way in which they have been taken into account, in order to inform parliamentary debate, and to meet the Post Adoption requirements of the SEA legislation will be held. The full range of SEA documents will be available to Parliament.

No.	Reference	Comment	SEA Response
11		We note that any further assessment as the Bill progresses will be at the discretion of Scottish Ministers. We acknowledge that this is a practical arrangement that reflects the uncertainties regarding progress of the Bill and the possibility that its provisions may be amended. It is SEPA's view that there would be merit, if at all possible within the constraints of parliamentary procedure, in considering any significant environmental effects that may arise from proposed changes to the Bill.	After parliamentary handover, this particular SEA project will close; however, the SCCB Team may have to discuss the implications of such changes with the SEA Gateway and potentially legal advisors. Scottish Ministers do not plan to make any amendments to the Bill which will be outwith the scope of the existing Environmental Report. If non-governmental amendments are made which are considered to have an environmental effect outwith the areas considered in the Environmental Report it may be most appropriate to consider separate strategic environmental assessment of the proposed actions to implement such provisions.
12	2. SEA Methodology	This chapter is helpful in setting out the context for the assessment. SEPA welcomes the inclusion (as Annex A) of a summary of the scoping consultation and a summary of the way in which views expressed have been taken into account. We are content that our views made at scoping have been taken into account.	Noted.
13	3. Policy Drivers and Context for the SCCB	This summary provides a clear context for the SCCB and is very helpful. SEPA requested in its scoping report a brief summary of the context for climate change science, policy and action in order to aid consultation on the Environmental Report and this section does this comprehensively.	Noted.
14	4. Key Environmental Issues	In association with the policy context in Chapter 3, this summary provides a clear environmental context for the SCCB and is very helpful.	Noted.
15	5. Assessment of SCCB Proposals	The assessments in this section are extremely comprehensive for such a strategic level document and we welcome and support the effort that has gone into evaluating the potential effects of the provisions of the SCCB consultation. The assessments gradually focus from a strategic overview by sector (in phase 1) to a comprehensive evaluation of the key proposals and consultation questions in the SCCB. Such an approach is comprehensive, but does in places become rather complex and difficult to understand. It is also unclear how the different phases relate to each other. However, the summary provided in chapter 6 which brings all the findings together is much clearer and focuses on the key findings of the assessment. Some detailed points on the assessments are provided below.	The SEA did not develop 'new' approaches/ guidance to emissions reduction, but did provide a comprehensive review of potential environmental implications of such actions, with each phase of assessment informing the next. A summary of the intended relationships between phases of assessment will be provided in the SEA Statement.

No.	Reference	Comment	SEA Response
15a	*Energy Sector* (p 30)	Under “water”, reference should also be made to impacts on waterbody status from water based renewables – eg hydro, offshore wind, marine renewables such as wave and tidal devices. Some of these impacts on water will also affect water dependent biodiversity.	Accepted. This reviewed version of the ER incorporates these impacts.
15b	*Transport Sector* (p 31)	Under “land”, one would expect an increase in use of biomass for fuel to have impacts on Scotland’s land that should be recorded. This may also lead to effects on population (eg through diverting land away from food crops) which should also be recorded. The potential for increased use of biofuel in both energy and transport sectors driven by the 80% target is an issue that deserves some focus in this assessment as the implications of this are quite significant for many issues.	Accepted. This reviewed version of the ER incorporates these impacts.
15c	*Waste Management* (p 37)	The most effective means of reducing greenhouse gas emissions from waste is to adopt a waste management regime that deals with waste as far up the waste hierarchy (prevent, reuse, recycle (including composting), recover and dispose) as possible. You will be aware that the Government has, since publication of the SCCB, made an announcement regarding its vision for waste management in Scotland which calls for 70% recycling by 2025 and proposes a cap of 25% of all municipal waste being used to generate energy. The assessment notes that energy from waste facilities will have impacts on local communities. While SEPA does not contend this statement, it should be noted: (a) that *all* waste management facilities will have impacts on those living close to them (eg. from vehicle movements or from emissions from that waste management process) and (b) that these emissions will be strictly controlled through both the land use planning and environmental consenting processes to ensure that adverse effects are prevented or minimised.	Accepted. This reviewed version of the ER incorporates these impacts.
16	6. Anticipated Significant Effects	As noted above, this section is extremely important in bringing together all of the more complex assessments into a single summary of the key environmental effects. It is our view that this has been done comprehensively. We also welcome the summary of potential cumulative effects which are cited here. As a result, SEPA has no significant comments on this section, although under the water section you should note potential negative effects on waterbodies may also occur as a result of marine and water based renewables.	Noted. This reviewed version of the ER incorporates these impacts.

No.	Reference	Comment	SEA Response
17	7. Mitigation and Enhancement	SEPA considers that mitigation is a very important part of SEA in ensuring that the adverse effects of a plan are addressed. Accordingly SEPA supports the inclusion of this section which, like the assessments, is very comprehensive. In particular, we welcome the inclusion of suggestions regarding ways to maximise environmental gain in the SCCB. SEPA would recommend that as you move towards introducing the Bill and preparing the SEA Statement you consider including a section which identifies those mitigation measures that will be put into place along with an indication of when those actions will be implemented and by whom. This will help to ensure that the measures are actually put into place as the Bill is taken forward.	The Environmental Report made suggestions on a range of data sources and indicators for SEA monitoring that could help inform wider SCCB reporting. Discussions on the developing SEA statement will consider the most appropriate means to integrate SEA monitoring with SCCB reporting mechanisms. These will include identifying the most appropriate means to incorporate mitigation proposals and responsibilities. As noted in the response to no. 8 above, the Scottish Climate Change Bill is primarily intended to create the targets and framework to drive subsequent climate change policies. The Scottish Government published a SEA Scoping Report investigating the range of emissions reduction measures potentially open to Scottish Ministers (available from: http://www.scotland.gov.uk/Topics/Environment/Climate-Change/16327/Climate-Change-Bill/Scopingreport/Q/forceupdate/on). Work is ongoing to build on this study, and the work of the UK Committee on Climate Change, to develop a strategic overview of policies to deliver the 80% emissions reduction, and a recent report by AEA Technology is available online at http://www.scotland.gov.uk/Resource/Doc/244863/0068651.pdf The Scottish Government intends to make further announcements on these policies in due course.
17a		One matter that you may wish to consider is the extent to which the SCCB has the potential to deliver some of the mitigation measures put forward. While SEPA supports the measures put forward and recognise that these are extremely comprehensive, it is difficult to see how the Bill will implement some of them as they rely on other drivers which may well be outwith the Bill's remit. That said, the measures are a useful reminder to the Scottish Government and public bodies of the measures that they can put in place to contribute to the proposed 80% target through their own activities. An implementation framework such as that suggested above would assist with this.	See response to no. 17 above. The Scottish Climate Change Bill is primarily about setting a statutory framework and the SEA assessed the potential environmental impact of this by considering measures which *may* be brought forward in the future to deliver the 80% reduction in emissions. Therefore, the SEA makes reference to mitigation of potential impacts that are not directly associated with the Bill itself. Subsequent delivery policies will be considered individually and further SEAs carried out, if required. The Environmental Report stated that further discussions will be required between the Climate Bill Team and environmental consulting authorities to determine the most effective monitoring and mitigation framework. It is likely that this will develop further over the lifetime of the SCCB.
18	8. Monitoring Framework	The identified set of potential environmental indicators that may be used to monitor the significant environmental effects are extremely comprehensive and SEPA supports their identification. For the most part, the indicators are directly linked to activities the SCCB will closely influence and, accordingly, when monitored should provide an accurate reflection of the SCCB's effects.	Given that the Bill will set a 40+ year trajectory, the list of environmental indicators is likely to develop over time as the policies for achieving emissions reductions are implemented. As the Bill is based upon achieving reductions in emissions, the statutory reporting framework will be based around data which shows the progress being made in this respect. Ministers will be required by the Bill to report emissions figures on an annual basis. Longer-term reporting will also cover proposed and ongoing emissions reduction and climate change adaptation policies. The Bill will also require independent expert advice to inform future target setting.

No.	Reference	Comment	SEA Response
Scottish Natural Heritage (SNH) – received 23-04-08			
19	Covering Letter General Comments	Overall, the Environmental Report provides a well-balanced assessment of the potential environmental effects arising from the proposed Bill. The following comments on the Environmental Report are further to our comments on the consultation itself.	Noted.
20	Covering Letter General Comments	We have argued in our consultation response that the Scottish Climate Change Bill should more clearly relate the intended target to the goal of avoiding dangerous climate change. Only in this way can the target be justifiably and robustly adjusted should emissions projections or the understandings of climate change science, change.	Comment refers to Tyndall Centre Analyses. At the time of producing the ER, cumulative targets were not favoured by the SCCB team and only receive minimal attention in the preliminary assessments in the ER Appendices. Action on climate change requires a global response. Scottish greenhouse gas emissions account for just 0.15% of the global total. It would not therefore be credible for a Scottish target to use such global measures, so the target is specified in terms of Scottish emissions. The Bill will require Scottish Ministers to take account of independent expert advice before setting any of the emissions budgets which will set the trajectory towards achieving the 80% target. The Bill will allow the 80% target to be adjusted in secondary legislation should it be judged necessary to do so in light of developing understanding of climate change science.
20a		This is relevant to this SEA as there are frequent references, especially in the Detailed Assessment Matrices (Section 5.7) and Anticipated Significant Effects (Section 6) to the relative unimportance of Scottish emissions in the global context. This is an argument which nearly all countries could adopt and could potentially lead to inaction, which would run contrary to the case for action by Scotland set out in the consultation paper. It is therefore of importance that the proposed emissions from Scotland can be related to a 'Scottish fair share' of the global emissions total.	The ER simply recognises that Scottish reductions alone will not be sufficient to significantly impact global climate change. If Scottish emissions represent 0.15% of current global GHG emissions, and if the SCCB is successful in delivering an 80% reduction, then Scottish emissions could be as little as 0.03% (at current rates of global emissions). This is much more equitable in light of Scotland's population of around 0.1% of global population. If global emissions decrease through similar action in other countries, the Scottish share will once again increase, and IPCC accounting mechanisms should allow confirmation of the relative percentage. In bringing forward this Bill, Scotland is taking the first step in the action called for in the consultation paper. As noted in the response to point no. 17 above, work is underway to develop the right policies for Scotland to deliver the necessary emissions reductions over the long term. It is considered that in seeking to achieve an 80% reduction in emissions is a sufficiently ambitious target.

No.	Reference	Comment	SEA Response
21	Section 3 Policy Drivers and Context for the SCCB	We agree with the suggestion in paragraph 3.5.2 that SEA guidance and requirements on the consideration of greenhouse gas emissions and climatic factors within environmental assessment procedures should be strengthened. This will help maintain a focus on emissions reduction not only within government policies but also in private and public sector development proposals. We envisage a clear role for SEPA within environmental assessment processes – both SEA and EIA – to act as the consultation authority in respect of greenhouse gas emissions, by commenting on the assessments made on potential emissions. We also welcome development by the Scottish Government of a carbon assessment tool for evaluation of the next Spending Review.	See response to comment #8 above.
21a	Paragraphs 3.5.20 – 3.5.24	Discuss the National Planning Framework, which we agree is a key determinant of whether Scotland develops a low- or high-carbon infrastructure. Note that the National Planning Framework now has statutory status following the passage of the Planning (Scotland) Act 2006. We have responded separately to the consultation on the National Planning Framework 2 Discussion Document and its associated SEA. We might repeat here our concerns that the proposed emphasis on increased connectivity and airport enhancement could lead to the development of infrastructure associated with a high-carbon economy.	Noted – the ER states that the NPF is non-statutory and this is accepted as an error, which is addressed in this revised edition. As previously noted, the Scottish Climate Change Bill is primarily intended to set high-level emissions reduction targets and the framework for achieving them. The emissions reductions will be achieved by a variety of measures on the basis of what is most cost effective. The Bill as introduced will not contain any provisions relating to the National Planning Framework.
21b	Paragraphs 3.5.25 – 3.5.28	Discusses Scotland's Transport Strategy. They state that biofuels are widely recognised as a more environmentally sound option. This statement must be substantially qualified. International discussions are still underway with a view to ensuring that biofuels are based on sustainable production – for example using crops which do not replace valuable habitats and grown and harvested such that significant life cycle carbon savings are achieved. There are also global issues emerging about competition between land for biofuels and food. Biofuels are indeed likely to play an important role in carbon reduction for transport, but great care will be needed initially, with the real potential probably realised only when second generation biofuels (based on ligno-cellulose) become economic.	The statement on biofuels was taken directly from the Government's own SEA of the National Transport Strategy. The issues raised by SNH are accepted and the ER does discuss sustainable sourcing, local impacts and international trading restrictions under Material Assets and Transport Mitigation on p86. It is accepted that there are significant difficulties and issues associated with the sustainable development and growth of acceptable biofuel solutions, but the ER simply recognises that they are likely to be of increasing importance within the future transport fuel mix. These statements are qualified in this revised edition of the ER.

No.	Reference	Comment	SEA Response
22	Section 5 Assessment of SCCB Proposals	We welcome the emphasis on life cycle analysis in the recommendations and mitigation for the energy and transport sectors. This should extend to other sectors, for example: • to agriculture and land use, including assessments of greenhouse gas emissions from different farming systems and food supply from farm to plate; • to the business sector (where product mapping increasingly uses life-cycle analysis), and • in the public sector, where there remains a risk that financial constraints could lead to capital investment decisions which are lower cost but more carbon-intensive.	It is anticipated that such assessments will become more widespread across all sectors as the need to meet emissions reductions and the understanding of embedded energy and carbon considerations improves. Whilst it is agreed that such assessments would lead to environmental benefits, the Scottish Climate Change Bill itself is will not place a specific duty to incorporate LCA. This could potentially be achieved via one of the enabling powers in the Bill but is more likely to develop organically through improving best practice guidance.
23	Section 5.4 Stage 2 Assessment of Potential GHG Reductions	We agree with the range of potential environmental effects arising from the emission reduction measures noted here. In many cases the effects can be mitigated by adopting an appropriate strategic approach to the siting of development, and through detailed planning, design and implementation of specific measures.	See response to point no. 17 above. In accordance with SEPA's comments addressed under #17/17a above, it is accepted that the wide range of mitigation measures should be reviewed to target more strategic options suitable to the level of the Draft SCCB. Such a summary will be incorporated within the SEA Statement.
24	Section 5.7 Detailed Assessment Matrices	In the Table of the Preferred Options Assessments (p.47), the assessment for 'Q1 carbon dioxide based target' is positive for soils. However, a CO_2-only target could lead to perverse outcomes. For example, the emissions saved by some windfarm developments on peat-rich soils could be substantially overstated if the assessments fail to take account of potential emissions of greenhouse gases (including methane) resulting from land use change. The overall assessment for a CO_2-only target on soils should therefore be '+/-' (potentially positive or negative (mixed) effects).	This reviewed version of the ER incorporates these impacts. SEA guidance is being evaluated to determine how best to incorporate emissions reduction into these assessments. EIA would likely be required to assess the environmental impact of each individual project. Recent guidance has also been produced that updates SNH's own guidance on carbon balancing emissions related to wind farm development on peat soils.
24a		We agree the assessment on p.50 that reducing emissions of methane and nitrous oxide in the agriculture and land use sector and a shift to less intensive agriculture could bring benefits for biodiversity, landscape, field patterns, boundaries and features. We suggest that the assessment for Q1 Basket of greenhouse gases on p47 should be '+' while for Q1 Carbon dioxide-based target might be '0'.	Accepted. This reviewed version of the ER incorporates these impacts.

No.	Reference	Comment	SEA Response
24b		Q12 (interim targets) is discussed on p.59, including a proposal for an interim target of a 40% reduction by 2025. This is referenced to 2008 to give a slightly front-loaded emission reduction pathway (40% of the total target in the first 17 years and 25 years to meet the remaining 40%). This is confusing because the consultation paper proposes baselines consistent with international agreements (1990 for CO_2, N_2O and CH_4, and 1995 for F-gases to accord with the Kyoto Protocol and subsequent developments under the UN FCCC) – and we support this. Referenced to 1990, a 40% reduction by 2025 produces a pathway more consistent with the less desirable upper curve in Fig 6 of the consultation paper (i.e. delayed emission reductions and greater cumulative emissions). Interim targets of at least 40% by 2020 against a 1990 baseline are required to front-load emission reductions and move towards the lower, more desirable curve in Fig.6.	It is accepted that the discussion of interim targets within the ER did not correlate with the discussion within the consultation document, and this is accepted as an error. The ER discussion would have been improved by simply removing the last two bullet points in this section, which would have prevented any discrepancy and confusion. The Scottish Government accepts the principal of having a statutory interim emissions reduction target. The Bill will therefore set an interim target of reducing Scottish emissions by 50% by 2030, which is the mid-point between 2010 and 2050.
25	Section 6 Anticipated Significant Effects	Table 6.1 (last bullet on p71) discusses carbon capture and storage and highlights effects such as ocean acidification and adverse impacts on biodiversity, flora and fauna. We presume this refers to deep ocean storage of CO_2 and/or to the potential for leakage from storage within depleted oil and gas reservoirs or saline aquifers, as suggested on p72. We strongly agree with this assessment. Hence it is vitally important that carbon capture and storage is directed towards secure geological reservoirs and that the security of these is adequately monitored.	It is accepted that the ER did not fully discuss the implications of CCS using suitably porous geological reservoirs (eg. appropriate sandstones) and that this is potentially a more secure/ viable option than ocean storage. This is accepted as a limitation of the report, however SNH comments on the use and continued monitoring of the security of such sites are fully supported by the SEA. This reviewed version of the ER incorporates these comments.
25a		Parts of Table 6.1 stray away from environmental effects. For example, in the section dealing with population (p74) there are references to business costs, lower standards of living, expensive travel, foreign holidays, out-of-season food, food costs, fuel costs for transport and limits on expenditure on luxury items. We agree that these are potential outcomes, though they will depend in detail on the mix of policy measures pursued. However, we suggest that all of these lie outwith the scope of this SEA assessment. We note that the potential population benefits of mitigating climate change – for example by avoiding floods, famine, storm damage, drought, heat mortality across the planet – are not identified within this SEA. We accept that these not be identified, but to be consistent, neither should potential social disbenefits.	As climate adaptation is to be considered under a separate study, mitigating climate change impacts were specifically excluded from this assessment. The ER does state this as being a limitation to analysis; however, as this study was to focus on the environmental implications of emissions reductions, the statutory SEA requirement to discuss effects on population means that the particular range of impacts discussing quality/ standard of living on p74 can be justified in this case. An Equality Impact Assessment of the proposals for the SCCB will be published prior to the Bill's introduction to the Scottish Parliament.

No.	Reference	Comment	SEA Response
Historic Scotland – no direct response received to the SEA consultation			
Scottish Government Consultation on Proposals for a Scottish Climate Change Bill **21,046 consultation responses received and collated by Scottish Government** **Analysis of responses completed by Reid Howie Associates.** **The report of the analysis is available at: http://www.scotland.gov.uk/Publications/2008/08/15113442/0**			
Royal Society for the Protection of Birds (RSPB) – Response to SCCB Consultation and not the SEA			
	Q33. Is there any existing legislation within the competence of the Scottish Parliament (devolved) which needs to be amended so that appropriate action on climate change can be taken by sectors in society?	RSPB Scotland would like to see changes to the legislation covering muirburn under the Hill Farming Act 1946. Recent published studies show the growing season starting up to three weeks earlier in much of Scotland since 1961, with predicted changes of a similar magnitude over the next decade, as a result of climate change. The breeding season for moorland birds is similarly advancing in spring and therefore it is important that the legislation allow for changes to the muirburn dates. It would be helpful therefore, if the Climate Change Bill could facilitate such changes.	The ability to amend dates for Muirburn activities could be classed as an adaptation measure that allows flexibility in response to climatic and seasonal change in Scotland. This SEA was restricted to consideration of emissions reduction measures and therefore such issues were not originally addressed. At the specific request of the SCCB Team, provisions to allow amendment of muirburn dates have been assessed as part of the SEA Post Adoption stage, and the assessment is also included as Appendix I to this reviewed edition of the ER.

Strategic Environmental Assessment of the

Scottish Climate Change Bill Consultation Proposals

Appendix I

Post-Consultation Re-Issue Additional Appendix

Addition of Muirburn Proposals – Post Consultation Assessments

Halcrow

STRATEGIC ENVIRONMENTAL ASSESSMENT
OF THE
SCOTTISH CLIMATE CHANGE BILL CONSULTATION PROPOSALS

Post-Consultation
Addition of Muirburn Considerations

November 2008

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

Scottish Government
Climate Change and Water Industry Directorate

Strategic Environmental Assessment (SEA)

Environmental Report for the:

Scottish Climate Change Bill Consultation Proposals

Post Consultation Addition of Muirburn Considerations

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	0	Addition of Muirburn Considerations, 1st Draft	10/10/08	John Fox (JF)
1	1	2nd Draft for Comment	04/11/08	JF
1	3	Final Draft for Submission	07/11/08	JF John Debenham (JD)

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

Contents

List of Acronyms Used

DOC/P	Dissolved Organic Carbon/ Phosphorous
GAEC	Good Agricultural and Environmental Condition
GHG	Greenhouse Gas(es)
PEPFAA	Prevention of Environmental Pollution from Agricultural Activity
PPS	Policies, Plans and Strategies
SCCB	Scottish Climate Change Bill
SFP	Single Farm Payment
SMR	Statutory Management Requirement

Halcrow Group Limited
City Park, 368 Alexandra Parade, Glasgow, G31 3AU
Tel +44 (0)141 552 2000 Fax +44 (0)141 552 2525
www.halcrow.com

1 Introduction

1.1 Applicable dates for muirburn practice are currently fixed by the Hill Farming (Scotland) Act 1946. One of the responses to the Scottish Government consultation on Proposals for a Scottish Climate Change Bill referred to the need to have more flexibility in assigning dates for the purpose for conducting muirburn. This is an issue that the Scottish Government has been looking at as part of the strategic response to climate change adaptation in Scotland.

1.2 Fire has been part of the upland environment for many thousands of years. It occurs naturally as a result of lightning strikes and is probably one of the most useful, and oldest, land management tools. Controlled burning is a powerful tool which needs to be used with skill and understanding. In Scotland, the making of muirburn is an essential land management tool used by upland managers, to encourage regeneration of food sources for livestock and game. It is also necessary to prevent uncontrolled wildfires and to facilitate habitat management.

1.3 The environmental benefits of muirburn practice include positive effects on biodiversity through encouraging the growth of new shoots and managing vegetation at a mixture of ages and heights, providing a range of habitats, shelter and food for upland species. Similarly, the controlled burning of vegetation can help prevent the incidence of wildfires, which could lead to fires within peat reservoirs, with significant emissions impacts. Controlled burning can help minimise risks of accidental fires through lightning strike and/ or through human influence.

1.4 In the context of climate change, it is possible that changing weather patterns could lead to conditions, during the current muirburn season, in which burning may not be suitable, due to increased wind, precipitation and saturated or desiccated soil conditions. It is therefore proposed that there is a sensible case for setting a provision within the Scottish Climate Change Bill, to alter the dates of burning seasons, as a positive action to help adapt and respond to climate change.

1.5 When conditions are too wet, reduced burning activity is likely, which could lead to an increasing amount of vegetation drying out during other periods of the year, with an associated increased risk of wildfire. Similar risks are associated with extended dry periods of weather, during seasons when muirburn is currently prohibited. Uncontrollable burning could lead to higher risks of soil damage, erosion and carbon release from peat soils, as well as local biodiversity and human health risks.

1.6 Therefore, the Scottish Government have instructed that the SEA considers the likely effects of an additional provision within the SCCB, that will allow for the amendment of muirburn dates as both an effective adaptation and potential mitigation measure.

2 Environmental Baseline Issues – Muirburn Considerations

2.1 Part 2 of Schedule 3 (in relation to Section 14) of the Environmental Assessment (Scotland) Act 2005 establishes that environmental reports should record,

> "*The relevant aspects of the current state of the environment and the likely evolution thereof without the implementation of the plan or programme."*

2.2 As such, and with respect to upland management and muirburn practice, the following baseline discussion has been provided by the Scottish Government Landscapes and Habitats Division.

2.3 Sources of information have been identified as:

Caseldine, C. & Hatton, J. 1993. The development of high moorland on Dartmoor: fire and the influence of Mesolithic activity on vegetation change. *In* F.M. Chambers (ed.) *Climate Change and Human Impact on the Landscape*, 119-132. London: Chapman & Hall.

Edwards, K.J. 1990. Fire and the Scottish mesolithic: evidence from microscopic charcoal. *In* Vermeesch, P.M. & Van Peer, P. (eds) *Contributions to the Mesolithic in Europe*. Leuven: Leuven University Press, 71-79.

McCullagh RPJ &Tipping R 1998 *The Lairg project: the evolution of an archaeological landscape in northern Scotland, 1988 - 1996*. Edinburgh: STAR Monongarphs Series No 3.

Mellars, P. 1976. Fire ecology, animal populations and man: a study of some ecological relationships in prehistory. *Proceedings of the Prehistoric Society* 42, 15-45.

Simmons, I G 1975 'Towards an ecology of mesolithic man in the uplands of Great Britain', *J Arch Sci* 2, 1-15.

Simmons, I G 1993 'Vegetation change during the Mesolithic in the British Isles: some amplifications', *in* Chambers, F M (ed) *Climate Change and Human Impact on the Landscape*, London, 109-118.

Simmons, I.G. 1996. *The Environmental Impact of Later Mesolithic Cultures*. Edinburgh: University Press.

Simmons, I.G. & Innes, J.B. 1987. Mid-Holocene adaptations and later Mesolithic forest disturbance in northern England. *Journal of Archaeological Science* 14, 385-403.

Simmons, I.G. & Innes, J.B. 1996b. Prehistoric charcoal in peat profiles at North Gill, Yorkshire Moors, England. *Journal of Archaeological Science* 23, 193-197.

Simmons, I.G. & Innes, J.B. 1996c. An episode of prehistoric canopy manipulation at North Gill, North Yorkshire, England. *Journal of Archaeological Science* 23, 337-341.

Tipping, R. 1996. Microscopic charcoal records, inferred human activity and climate change in the mesolithic of northernmost Scotland. *In* Pollard, A. & Morrison, A. (eds) *The Early Prehistory of Scotland*. Edinburgh: Edinburgh University Press, 39-61.

Tipping, R. & Milburn, P. 2000. The mid-Holocene charcoal fall in southern Scotland: spatial and temporal variability. *Palaeogeography, Palaeoclimatology, Palaeoecology* 164, 193-209.

Tipping, R. 2004. Interpretative issues concerning the driving forces of vegetation change in the early Holocene of the British Isles. *In* Saville, A. (ed) *Mesolithic Scotland and its Neighbours: The Early Holocene Prehistory of Scotland, its British and Irish Context, and some Northern European Perspectives*. Edinburgh: Society of Antiquaries of Scotland, 45-54.

SNIFFER Handbook of Climate Trends Across Scotland, available online at http://www.sniffer.org.uk/Webcontrol/Secure/ClientSpecific/ResourceManagement/UploadedFiles/CC03_1_Handbook.pdf

UK Climate Impacts Programme (UKCIP) Report 2002, available online at http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=161&Itemid=291

Table 2.1 Baseline Discussion

Climatic Factors	1. Changing seasons and weather patterns, eg. drier summers with extended drought periods, could increase the risk of wildfire, especially when considered in the context of similarly expected stormier weather events which could increase risks from lightning strikes. 2. Although the general expected trend is for wetter springs and increased precipitation during winters with heavier rainfall periods, the uncertainties involved suggest that it is feasible that areas of Scotland could be subject to sequences of single or multiple dry winters. If such periods are combined with hotter, drier summers, the risk of uncontrolled wildfire would increase accordingly as soils and vegetation become progressively drier. 3. In the event of heavy rainfall conditions over the prescribed muirburn season, the practice of burning may not be feasible, thereby increasing future risk as vegetative growth is not adequately controlled during that particular year.
Related Emissions Impacts	Some greenhouse gas emissions are to be expected with the continuation of muirburn practice; however, due to the fact that the combustible material is vegetation, muirburn can reasonably be considered carbon neutral. However, in the event that wildfires become established, significant detrimental impacts can be expected through the associated risk of fire within upland peat habitats. Peat fires can burn relatively undetected for long periods of time, they can be extremely difficult to extinguish, and can lead to further combustion of surface vegetation at locations distinct from the original source. The implications for carbon emissions from peat fires are significant, although not possible to quantify in this SEA study. Therefore, although there are carbon and GHG emissions associated with the controlled burning of surface vegetation, these emissions could reasonably be considered as carbon neutral and an acceptable trade-off as a mitigation measure for the potentially more significant emissions associated with wildfire and peat fires.
Implications for Adaptation	The current legislation which governs Muirburn practice (the Hill Farming Act 1946) prescribes specific dates between which the practice is allowed, following best practice as laid out within the Muirburn Code. Since 1946 Scotland's climate and seasonal patterns have and will continue to shift, with lengthening growing seasons associated with earlier springs and later autumn periods. Therefore the current fixed dates within the Hill Farming Act are unlikely to provide sufficient flexibility to adapt such burning practices to respond to changing weather patters, local weather conditions and risks. An ability to amend muirburn dates, through provisions in the Scottish Climate Change Bill, could be considered a reasonable and pragmatic, effective and low cost climate adaptation measure.
Biodiversity, Flora & Fauna	• 8.7% of Scotland is covered by heather moorland; • 15.7% by heather moorland and peatland mosaics; and • 14.5% by rough grassland and moorland mosaics. Moorland is an important breeding/ feeding habitat for invertebrates, mammals and bird species. Scottish moorland supports high densities of Red Grouse, Golden Plover, Lapwing, Curlew and Hen Harriers. Controlled burning of heather and vegetation is important to maintain diversity of moorland vegetation. Young shoots provide a food source for livestock, deer, grouse and nesting habitats for birds and mature plants provide nesting habitats. Burning cyclically aims to improve botanical diversity and vegetation structures and to produce a mosaic of young, intermediate and mature heather and plants. . Areas of moorland which are unsuitable for burning are set out in the Muirburn Code, and these include areas such as blanket bog.

Air	Burning vegetation will lead to a level of fine particulate release. At this time it is not possible to quantify what these levels are, however air quality impacts of controlled muirburn are expected to be highly localised and temporary. If muirburn is not carefully controlled, or in the case of wildfire, air quality impacts would reasonably be expected to be more severe.
Water	The Muirburn Code advises against burning close to water, due to the risk that soil next to watercourses could be charred and friable, which would in turn present soil erosion risks, with associated water quality risk. The PEPFAA Code indicates that land managers should follow the Muirburn Code.
Soils	The majority of Scottish soils are organic and most of the UK's peat resource in Scotland. Over 50% of the UK's total soil carbon store is in Scotland and 80% of this is peat. The approximate total is 3 thousand million tonnes of carbon. 50% of Scottish soils are peat based, and it has been suggested that burning helps the formation of blanket peat through ash and other fine particulate material plugging pores in soils and increasing waterlogging. Managed muirburn, following best practice advice in the muirburn code and associated technical guidance, can protect these high carbon soils by reducing the fireload (vegetation/ combustible material) on the surface, thereby reducing wildfire risk. Managed muirburn can help prevent the erosion, or degradation, of exposed haggs and gully sides. However, inappropriate muirburn practice has the potential to increase the risk of soil erosion, although no impacts have been quantified. The Macaulay Institute are conducting research on muirburn effects on dissolved organic carbon and phosphorus (DOC/P) loss. The Scottish Soil Framework Consultation ends in September 2008 and there are a number of questions raised in the consultation which may have some bearing on peat, climate change and erosion policy issues in the future.
Material Assets	Upland managers require a full range land management tools, including muirburn. Over 50% of Scottish moorland supports grouse moor which influences sporting estate revenue. The exact contribution Scottish moorland makes is unknown; however, shooting and stalking of all types is currently worth around £240 million annually to the Scottish economy. Without the ability to carry out muirburn, the future economic viability of moorland sporting and other outdoor pursuits is likely to become less sustainable as the climate alters. In addition, upland farmers require the ability to undertake muirburn as an aid to hill grazing management. Many peatland sites have prevailing weather conditions that are suited to wind farm development, or are at altitudes suitable for communication masts; there are therefore potential impacts on these sites associated with the risk or wildfire. Managed burning can help minimise such risks.

Population & Human Health	Visit Scotland (2007 Visitor Experience Report) states that 52% of GB visitors and 59% of international visitors undertake longer walks and hikes in the Scottish countryside. The Scottish Mountaineering Council estimates that 6% (c. 300, 000) of the Scottish population are active hill walkers. A recent Mountaineering Council of Scotland survey indicated that 96% of its members go mountain walking. Mountaineers currently contribute some £150 million to the Scottish economy each year (http://www.mcofs.org.uk/assets/pdfs/mountain%20walking%20df.pdf) Not all of this can be attributed to moorland but it is reasonable to assume that a percentage of hill walkers and ramblers use and enjoy well-managed moorlands as part of their experience. Without the ability to carry out muirburn the future economic viability of moorland both for grouse shooting and outdoor pursuits is likely to become less sustainable as the climate alters. Members of rural populations are involved in muirburn practice as part of traditional land management, sporting estate or hill farm management, realising income and maintaining traditional practice and it is reasonable to expect that land management activities which support the local economy will assist in retaining jobs and members of the rural population, particularly in lower population density areas.
Landscape	Landscapes are an important tourism asset to Scotland demonstrated by the large number of visitors who come to enjoy the beauty of rural Scotland and take advantage of its opportunities for recreation (78% of GB visitors and 89% of international visitors explored Scottish scenery – Visit Scotland). In Scotland, muirburn has formed part of the *recorded* landscape for more than 300 years. There is current controversy among conservationists as to whether burning is good or bad; without it, however, some aspects of what is wanted to be preserved would likely be lost through vegetation succession to woodland. While it can be expected that some individuals would prefer to see a wilder and more unmanaged landscape, others expect to see symbols of a traditionally managed landscape, which can include muirburn. Managing heather through muirburn results in continued flowering of heather during August across the uplands. However it is difficult to measure the economic value of these aspects, as a tourist commodity.
Cultural Heritage (including the Historic Environment)	Scrub and land management by fire has been part of the cultural heritage of Scotland since the earliest days of agriculture, and has formed part of the *recorded* landscape for more than 300 years. Analysis of sediments retrieved during archaeological excavations at the site of Lairg in Sutherland suggests that heather burning was being undertaken here as part of pasture management in the late 1st millennium AD. It is widely accepted that upland *Calluna spp.* heaths have been created and persist through fire and management by burning and, without fire and grazing, most heaths would revert to woodland. Although this change may have been natural, many would regard our heaths as "*cultural*" landscapes. The continued use of (appropriately managed) muirburn helps keep traditional land management practices and skills alive for present and future generations. It is also likely that flexibility outwith the muirburn dates prescribed over sixty years ago will help minimise risks of wildfire and therefore help minimise risk of damage to heritage features.

3 Summary of Related Legislation/ Policies and Issues

3.1 Schedule 3 of the Environmental Assessment (Scotland) Act 2005 requires that the Environmental Report includes an outline of relationships with other relevant programmes, plans and strategies (PPS), and how their environmental protection objectives have been taken into account in the PPS review.

3.2 Table 3.1 below provides a discussion of relevant legislation and regulations, with respect to muirburn practice. The provisions of the Scottish Climate Change Bill are only expected to directly affect the dates set by the Hill Farming Act 1946.

3.3 All other related guidance, legislation and regulations may require consequential amendment, as required, as a result of any amendment to the Hill Farming Act 1946.

Table 3.1 Policy Review

Name of plan/ programme/ legislation/ guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
Summary of Proposed Muirburn Provisions within the Scottish Climate Change Bill: As global warming has an increasing impact on weather patterns, the Scottish Government is consulting on whether there is a need to vary the dates during which land managers can carry out muirburn, as a measure to allow added flexibility in responding to climate change. Muirburn, used to prevent uncontrolled wildfires and manage habitats is currently permitted from October 1st to April 15th; there are also relevant extension periods. **Rationale:** In the context of climate change there is an opportunity to allow added flexibility to respond to local seasonal change and weather conditions. It is also possible that conditions may arise during the muirburn season in which muirburn would not be advisable. There may be a case for provision to impose restrictions on the carrying out of muirburn in specific areas for specific periods of time during weather conditions where the likelihood of loss of control of fire, or the likelihood of significant damage to soils and vegetation through fire, is increased, eg. during or after extended or repeated periods of summer drought, combined with periods of low winter rainfall. Risks of uncontrolled fire may increase after dry winters, however suitable controlled burning outwith currently specified periods may help to minimise risks.		
Muirburn Related Legislation & Codes		
Hill Farming Act 1946 http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1946/cukpga_19460073_en_1	The Act provides the restrictions and procedure which must be followed when making muirburn. The making of muirburn is permitted in Scotland for land below 450m (1500ft) above sea level, between 1 October and 15 April inclusive. This may be extended to 30 April for the proprietor or on the authority of the proprietor. For land above 450m (1500ft), the muirburn season is the 1Oct to 30 April and this may be extended to 15 May for the proprietor or on the authority of the proprietor. s.24 - Applies to the rights of tenants to undertake muirburn not withstanding any provision in their lease relating to Muirburn Regulation. s.25 (a)→ (d) - These sections lay down the regulatory framework applying to Muirburn and the related offences. • Burning at night, between 1 hour after sunset and 1 hour before sunrise. • Leaving a fire unattended. • Being unable to control a fire or having not made provision for its proper. • Causing damage to *any* woodland. • Causing damage to neighbours' property. The following acts are offences which are detailed under the code: • Burning outwith the statutory burning season [Hill Farming Act 1946, s23]. • Burning at night, between 1 hour after sunset and 1 hour before sunrise [Hill Farming Act 1946, s25]. • Leaving a fire unattended [Hill Farming Act 1946, s25]. • Being unable to control a fire or having not made provision for its proper control [Hill Farming Act 1946, s25]. • Causing damage to any woodland [Hill Farming Act 1946, s25]. • Causing damage to neighbours' property [Hill Farming Act 1946, s25].	Principal legislation governing muirburn. Covers the burning of all vegetation on moorland, including plants such as gorse. It does not refer just to the burning of heather. In Scotland, below 450 m (1500 feet) above sea level, muirburn is permitted only between the 1st October and 15th April inclusive. This may be extended to 30th April on the authority of the proprietor or of the Scottish Government (through the Scottish Government Rural Payments & Inspections Directorate). Above 450 m (1500 feet), the muirburn season is 1st October to 30th April, extendable as above to 15th May. Generally, the Scottish Government does not encourage burning after the 15th April (or 30th April above 450 m). The proprietor does not require the permission of the Scottish Government for the extension periods. Unlike in England and Wales, there are currently no provisions for extensions before or after these dates by either the proprietor or the Scottish Government. Gradual changes to Scotland's climate are likely to require increased flexibility with respect to dates that muirburn can be authorised. Appropriate provisions within the Scottish Climate Change

Name of plan/ programme/ legislation/ guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	• Causing damage to a scheduled monument [Ancient Monuments and Archaeological Areas Act 1979, s2(2)a] . • Failing to take fire safety measures in respect of harm caused by fire. Fire (Scotland) Act 2005, Part 3, s53 & s54. • Carrying out burning on a Site of Special Scientific Interest, without consent from Scottish Natural Heritage, if burning has been notified as an 'Operation Requiring Consent' [Nature Conservation (Scotland) Act 2004, s19]. • Intentional or reckless harassment of birds listed in Schedule A1 of the Wildlife and Countryside Act 1981. • Intentional or reckless damage to the natural features of a Site of Special Scientific Interest [Nature Conservation (Scotland) Act 2004, s19]. • Intentionally or recklessly disturbing or destroying the nests, eggs or young of breeding birds [Wildlife & Countryside Act 1981 (as amended), s1, Schedule 1 and Schedule A1] . • Omitting to give the landlord and adjoining proprietors at least 24 hours written notice of the date, place and extent of intended muirburn [Hill Farming Act 1946, s24 and s25]. • Lighting a fire, or allowing a fire to spread, within 30 m of a road so as to damage the road or endanger traffic on it, without lawful authority or reasonable excuse [Roads (Scotland) Act 1984, s100(c)] . • Creating smoke that is a nuisance to inhabitants of the neighbourhood [Clean Air Act 1993, s17, refers to an offence under the Public Health (Scotland) Act 1897]. Endangering anyone's health or safety, including members of the public [Health and Safety at Work etc. Act 1974, s2 and s3, Management of Health and Safety At Work Regulations 1999 S.I. 3242]. s.26 - Sets conditions for notices required for Muirburn practice. s.27 - Offences as to Muirburn and the associated fine tariff levels which can be imposed.	Bill could provide this flexibility.
Muirburn Code http://www.scotland.gov.uk/Publications/2008/04/08154231/0	The cross compliance requirements of the Single Farm Payment (SFP) require moorland to be maintained in Good Agricultural and Environmental Condition (GAEC), and the Muirburn Code will be used as the standard expected of land managers. The Code applies to all areas, regardless of altitude or type of vegetation. It should not be seen as applying only to grouse moors, as the guidance applies equally to the management of all vegetation by fire. The Code applies to farmers and all moorland managers and forms part of the compliance requirements for Single Farm Payments. The code contains a number of situations where burning should not be carried out. The code explains how to carry out burning, detailing the methods of safe burning. The code provides details on how to prepare thoroughly before burning.	Changes in agricultural support are increasing the importance of this Code. Through the use of GAEC, financial penalties could be applied to farmers and crofters in receipt of Single Farm Payment, if the Muirburn Code is breached. Similarly, gradual changes to Scotland's climate are likely to require increased flexibility with respect to dates that muirburn can be authorised. Appropriate provisions within the Scottish Climate Change Bill could provide this flexibility.
Agricultural Policy Schemes (Cross-Compliance) (Scotland) Regulations 2004	Regulations outlining Cross Compliance measures including Statutory Management Requirements (SMR) and Good Agricultural and Environmental Conditions (GAEC) as pre-requisites for subsidies through the Single Farm Payment Scheme.	Gradual changes to Scotland's climate are likely to require increased flexibility with respect to dates that muirburn can be authorised.

Name of plan/ programme/ legislation/ guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
http://www.opsi.gov.uk/legislation/scotland/ssi2004/20040518.htm	In order to continue to receive subsidies farmers must comply with a range of existing EU animal and plant health, animal welfare and environmental law, known as Statutory Management Requirements (SMRs). Farmers must also keep their land in Good Agricultural and Environmental Condition (GAEC). These latter conditions are mainly designed to ensure a minimum use of farm land, but Scotland has gone further than the minimum requirements by developing various codes of good practice, including the Muirburn Code, which is referenced under GAEC 6. Full guidance details and relevant updates are available from the Scottish Government web pages on Cross Compliance, available at http://www.scotland.gov.uk/Topics/Agriculture/grants/Schemes/ccompliance	Appropriate provisions within the Scottish Climate Change Bill could provide this flexibility.
Wildlife and Countryside Act (as amended) 1981 http://www.jncc.gov.uk/page-1377	Principal legislative mechanism for the protection of wildlife in Great Britain. Requires any land that is identified as being of special interest by reason of any of its flora, fauna, geological or physiographical features to be classified as a Site of Special Scientific Interest (SSSI) and afforded certain protection against damaging measures s. 2 - This Section prohibits the intentional or reckless harassment of birds listed within the Act.	It is expected that the provisions of this legislation will not be affected by proposed provisions enabling flexibility with respect to the dates that muirburn can be authorised. Local advice will likely be required when setting muirburn dates that maintain current provisions with respect to wildlife considerations, eg. nesting and breeding seasons.
Fire (Scotland) Act 2005 http://www.opsi.gov.uk/legislation/scotland/acts2005/asp_20050005_en_1	This Act operates in the situation where there is a failure to take fire safety measures in respect of harm caused by fire. s53 - Duties of employers to employees (1) Each employer shall ensure, so far as is reasonably practicable, the safety of the employer's employees in respect of harm caused by fire in the workplace. (2) Each employer shall— (a) carry out an assessment of the workplace for the purpose of identifying any risks to the safety of the employer's employees in respect of harm caused by fire in the workplace; (b) take in relation to the workplace such of the fire safety measures as are necessary to enable the employer to comply with the duty imposed by subsection (1). (3) Where under subsection (2)(a) an employer carries out an assessment, the employer shall— (a) in accordance with regulations under section 57, review the assessment; and (b) take in relation to the workplace such of the fire safety measures as are necessary to enable the employer to comply with the duty imposed by subsection (1). (4) Schedule 2 makes provision as to the fire safety measures. s.54 - Duties in relation to relevant premises (1) Where a person has control to any extent of relevant premises the person shall, to that extent, comply with subsection (2). (2) The person shall— (a) carry out an assessment of the relevant premises for the purpose of identifying any risks to the safety of relevant persons in respect of harm caused by fire in the relevant premises; and (b) take in relation to the relevant premises such of the fire safety measures as in all the circumstances it is reasonable for a person in his position to take to ensure the safety of relevant persons in respect of harm caused by fire in the relevant premises.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.

Name of plan/ programme/ legislation/ guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	(3) If a person falls within subsection (1) other than by virtue of— (a) having control to any extent of relevant premises in connection with the carrying on by the person (whether for profit or not) of an undertaking; or (b) owning relevant premises	
Clean Air Act 1993 http://www.opsi.gov.uk/ACTS/acts1993/ukpga_19930011_en_1	s.17 - This Act prohibits the Creation of smoke causing nuisance to inhabitants of the neighbourhood. (1) Smoke other than— (a) smoke emitted from a chimney of a private dwelling in a smoke control area; (b) dark smoke emitted from a chimney of a building or from a chimney serving the furnace of any fixed boiler or industrial plant; or (c) dark smoke emitted otherwise than as mentioned in paragraph (b) from industrial or trade premises within the meaning of section 2, shall, if it is a nuisance to the inhabitants of the neighborhood, be deemed for the purposes of the [1897 c. 38.] Public Health (Scotland) Act 1897 to be a nuisance liable to be dealt with summarily in manner provided by that Act. (2) In any proceedings brought by virtue of this section in the case of smoke emitted from a chimney, it shall be a defence for the person against whom proceedings are taken for contravention of any interdict or decree granted under section 22 or 23 of the [1897 c. 38.] Public Health (Scotland) Act 1897 for the prevention, removal, remedy or discontinuance of a nuisance to prove that the best practicable means are being or have been employed to prevent the nuisance. (3) This section extends to Scotland only.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.
Roads (Scotland) Act 1984 http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1984/cukpga_19840054_en_1	s.100 - This section deals with damage caused to roads: A person who without lawful authority or reasonable excuse— (a) deposits anything whatsoever on a road so as to damage the road; (b) paints or otherwise inscribes or affixes upon the surface of a road or upon a tree, traffic sign, milestone, structure or works on or in a road, a picture, letter, sign or other mark; or (c) by lighting a fire within, or by permitting a fire for which he is responsible to spread to within, 30 meters of a road, damages the road or endangers traffic on it, commits an offence.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.
Health and Safety at Work Act 1974 http://www.hse.gov.uk/legislation/hswa.pdf	Prohibits the endangering anyone's health or safety, including members of the public. The main section applicable is s.2: s.2 - (1) It shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.
Nature Conservation (Scotland) Act 2004 http://www.opsi.gov.uk/legislation/scotland/acts2004/20040006.htm	The Act sets out provisions relating to biodiversity duties, including Notification of SSSIs, Nature Conservation Orders to prohibit an operation, Land Management Orders for SSSIs to ensure conservation, restoration or enhancement. The overall aim is wildlife protection. s.16 - An owner or occupier of land within a site of special scientific interest must not carry out, or cause or permit to be carried out, an operation requiring consent on the land.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.

Name of plan/ programme/ legislation/ guidance	Main requirements of plan / programme / legislation/ guidance	How it affects or is affected by the Scottish Climate Change Bill, in terms of SEA Issues at Schedule 3 of the Environmental Assessment (Scotland) Act 2005
	s.19 - This section is applicable to cases of Intentional or reckless damage to the natural features of a Site of Special Scientific Interest: (1) Any person who intentionally or recklessly damages any natural feature specified in an SSSI notification is, subject to subsection (2), guilty of an offence. (2) Any person who does anything which would, but for this subsection, amount to an offence under subsection (1) is not guilty of the offence if it is shown that— (a) the act was the incidental result of a lawful operation, (b) the person who carried out the lawful operation— (i) took reasonable precautions for the purpose of avoiding carrying out the act, or (ii) did not foresee, and could not reasonably have foreseen, that the act would be an incidental result of the carrying out of the lawful operation, and (c) that person took such steps as were reasonably practicable in all the circumstances to minimise the damage caused.	
The Conservation (Natural Habitats, &c.) Regulations 1994 http://www.opsi.gov.uk/si/si1994/uksi_19942716_en_1.htm	The Regulations require that "competent authorities" consider the implications of any plan or project on European sites. 48.—(1) A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which– (a) is likely to have a significant effect on a European site in Great Britain or a European offshore marine site (either alone or in combination with other plans or projects), and (b) is not directly connected with or necessary to the management of the site, shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.
The Conservation (Natural Habitats & c.) Amendment (Scotland) Regulations 2004 http://www.opsi.gov.uk/legislation/scotland/ssi2004/20040475.htm	These Regulations amend the Conservation (Natural Habitats, &c.) Regulations 1994. The provisions in these Regulations relating to site protection bring European sites into line with the protection regime set out in Part 2 of the Nature Conservation (Scotland) Act 2004. Further protection is given to European protected species through amendments to Part III of the 1994 Regulations which reflect the provisions relating to species protection contained in Part I of the Wildlife and Countryside Act 1981.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.
Ancient Monuments and Archaeological Areas Act 1979 s2 (2) a http://www.historic-scotland.gov.uk/ancient_monuments_and_archaeological_areas_act_1979.pdf	Law relating to ancient monuments, making provision for the investigation, preservation and recording of matters of archaeological or historical interest and for the regulation of operations or activities affecting such sites or matters. s.2 - The section operates as to make it an offence to cause damage to a scheduled monument.	The Muirburn Code refers to the requirements of this Act. Proposed provisions within the Scottish Climate Change Bill will pertain to flexibility of dates and not muirburn practice itself, which should always be carried out in line with the Code.

4 Assessment of Environmental Effects and Consideration of Alternatives

4.1 Section 14(2) of the Environmental Assessment (Scotland) Act 2005 requires that the Environmental Report shall identify, describe and evaluate the likely significant effects on the environment of implementing a plan and any reasonable alternatives, taking into account the objectives and the geographical scope of the plan or programme.

4.2 With respect to the consideration of alternatives, 3 options have been identified and considered:

1. **Status Quo**– consideration of this option assumes that muirburn dates remain fixed, and that muirburn practice is restricted accordingly.

2. **Stop Muirburn** – consideration of this option assumes that the practice of muirburn is stopped altogether, as a means of removing associated emissions, as a direct translation of the need to remove/ prevent carbon and greenhouse gas emissions as widely as possible.

3. **Added Flexibility** – consideration of this option assumes that muirburn practice is allowed to continue as a traditional land management and proactive upland wildfire preventative measure, with added flexibility over when muirburn can be carried out, in response to changing weather and climate conditions.

4.3 Each option has been reviewed against the SEA topics and the discussion is informed by the baseline details provided earlier. A basic scoring system was applied to help demonstrate which option(s) are likely to be the most environmentally sustainable, over the range of SEA topics considered, as follows:

+2	Option is likely to significantly minimise risk of GHG emissions/ wildfires/ adverse environmental impacts
+1	Option minimises risks of GHG emissions/ wildfires/ adverse environmental impacts
0	No clear impact identified/ No significant change from business as usual
-1	Option increases risk of GHG emissions/ adverse environmental impacts
-2	Option is likely to significantly increase risk of GHG emissions/ wildfires

This scoring provides a maximum possible of +16 and minimum possible score of -16.

4.4 The assessments in Table 4.1 below suggest that the most sustainable option is Option 3 – Added Flexibility, with Option 1 – Status Quo ranked 2nd and Option 2 – Stop Muirburn demonstrating the least sustainable scores.

4.5 Table 4.2 outlines a summary assessment of potential environmental effects and, in the absence of quantified data, these predictive assessments have been informed by expert judgement.

Table 4.1 Consideration of Alternatives

SEA Topic	Option 1 Status Quo	Option 2 Stop Muirburn	Option 3 Added Flexibility
Climatic Factors	Emissions associated with muirburn practice persist. Could present risk that as climate change leads to extended summers and significant dry spells that existing restrictions on muirburn dates actually lead to increased risk of uncontrolled wildfire and potentially combustion of peat reservoirs.	Minor benefits associated with removal of emissions associated with muirburn practice. However, increased risk of greater emissions associated with significant increasing potential for wildfire and peat combustion due to drier vegetation during summer months.	Allows flexibility in response to seasonal change, local knowledge and expert advice. Emissions associated with muirburn practice persist. Likely to help minimise risk of uncontrolled burning.
Score/ Summary	**-1** **Could increase risk of GHG emissions**	**-2** **Significantly increased risk of greater GHG emissions**	**+1** **Minimises risk with respect to increased GHG emissions**
Air	Existing localised air quality impacts associated with muirburn practice persist. Risks associated with climate outlined above could be seen as increasing risk of further local impacts associated with wildfire and peat combustion.	Would present local air quality benefits by removing emissions associated with managed combustion. However, could lead to increased risk of uncontrolled burning and actually increase air quality impacts.	Existing localised air quality impacts associated with muirburn practice persist. Risk of impacts associated with uncontrolled burning minimised.
Score/ Summary	**-1** **Could increase risk to local air quality associated with uncontrolled burning**	**-1** **Increased risk of uncontrolled burning would have impact on air quality**	**+1** **Minimises risk with respect to local air quality impacts**
Water	Existing impacts on local water quality persist. Potentially increased requirement for localised water abstraction/ use in extreme event of uncontrolled burning. Although controlled burning using supporting equipment such as argos (all-terrain vehicles) with mounted water tanks could have a neutral impact on water abstraction.	Minor benefit associated with reduction in impacts associated with muirburn. Potential disbenefits associated with increased risk of wildfire and requirement for increased water use to extinguish fires.	Existing impacts on local water quality persist. Minimises risk of uncontrolled events and therefore minimises additional risks to water environment.
Score/ Summary	**0** **No significant change**	**-1** **Increased risk of wildfire could impact local water resources**	**+1** **Minimises additional risks to water environment**
Soil	Controlled muirburn can provide some recycled nutrient input to local soil sites. Seasonal change may increase risk of uncontrolled burning, which may be detrimental. In extreme cases, combustion within peat reservoirs would be significantly detrimental to local soils and soil organisms. General benefits and risks to soils associated with muirburn persist.	Preventing muirburn entirely would conserve vegetation and local soils may continue to accumulate organic matter under peat forming conditions. Unburned surface vegetation likely to increase risk of wildfire and therefore peat fires. Increasing risk of wildfire associated with seasonal and climatic change will increase risk of serious damage to local soils and soil organisms.	Current soil issues associated with muirburn persist as practice still allowed. Added flexibility over dates should allow local soil conditions to be taken into consideration in conjunction with other relevant climatic and seasonal factors. Minimising risk of wildfire through active habitat management also minimises risk of combustion within peat reservoirs.

SEA Topic	Option 1 Status Quo	Option 2 Stop Muirburn	Option 3 Added Flexibility
	Minor risk of soil degradation could increase if fixed dates lead to burning outwith optimum local conditions for minimisation of risk.		
Score/ Summary	-1 Minor increase in risks to local soils associated with seasonal change	-1 Increasing risk of wildfire increases risk of damage to soils	+1 Helps minimise risks to high carbon soils
Biodiversity, Flora & Fauna	Effective muirburn can be beneficial for local biodiversity by encouraging new growth and providing fresh shoots for grazing. Also helps provide moorland habitat exhibiting a range of maturity to provide different scales of shelter/ protection. Minor loss of flora being burned, however new growth is encouraged. Potential minimal losses of fauna within burn zones. Long-term, local biodiversity will exhibit change in line with phenological response to seasonal variation, fixed muirburn dates are not similarly responsive.	Preventing muirburn practice is likely to result in more natural succession and growth. Increasing moorland scrub/ gorse/ heather cover may inhibit access to food/ availability for some species. May provide increasing cover for others. Could increase wildness aspects for local species by reducing frequency of human contact. However, preventing muirburn entirely may increase risk of wildfire which would ultimately be more destructive.	Would provide similar benefits as Option 1. Benefits enhanced by additional flexibility in applicable dates, as long as flexibility applied following best practice and expert advice. Long term, phenological change can be addressed through added flexibility.
Score/ Summary	-1 Fixed dates not likely to be as beneficial over the longer term	-1 Some benefits, but increasing risk of uncontrolled burning more significant	+1 Helps response to climatic, seasonal and phenological change
Material Assets	Effective Muirburn practice can affect the financial viability of various sporting enterprises, which bring revenue to rural areas. Sporting game could be considered material assets in this case. In the extreme, fixed dates may hinder viability over the longer term as breeding seasons may change, and risks associated with uncontrolled burning may be significant.	Stopping muirburn practice is likely to impact upon the availability of habitat suitable for sporting game over the long term. Greater risks are associated with the increasing risk of uncontrolled wildfire which muirburn helps to control. Uncontrolled burning may affect other rural assets, including forestry.	Provides additional flexibility to help protect rural material assets by adapting to climate change impacts (eg. changing seasonality) and mitigating potentially increased emissions from uncontrolled burning and combustion of peat resources.
Score/ Summary	-1 Fixed dates likely to prove minor hindrance over longer term	-1 No direct impact, but risk of wildfire damage increases over time	+1 Benefits associated with minimising risks of more serious impacts
Population & Human Health	Muirburn helps protect game resources and habitat. Effective Muirburn practice can affect the financial viability of various rural enterprises, which bring revenue and employment to rural areas and assist in sustaining populations in remote areas.	Stopping muirburn is likely to reduce direct health and safety risk associated with muirburn practice. Stopping muirburn may increase risk of wildfire. Could impact local populations through lost revenues, damage to assets and reduced employment opportunity.	Flexibility would help minimise risks of excessive damage, thereby helping maintain rural populations and revenues. Increased flexibility should help minimise risk of uncontrolled burning, thereby limiting health risks to similar levels as at present.

SEA Topic	Option 1 Status Quo	Option 2 Stop Muirburn	Option 3 Added Flexibility
	Health and safety risks are directly associated with muirburn and the dates over which muirburn is allowed will not affect these kinds of risk. Main risk is with respect to the increased incidence of conditions suitable for wildfire as uncontrolled burning could present risks to human health as people are brought in on an emergency basis to fight fires.	However, increasing risk of incidence of wildfire would increase risks to human health for those trying to subdue fires.	
Score/ Summary	-1 Fixed dates may have some detrimental impact over the longer term.	-1 No direct impact, but stopping muirburn likely to increase other risks	0 No significant change from current conditions
Cultural Heritage (including Historic Environment) & Landscapes	Archaeological sediment analyses suggest that the establishment of blanket peat can occur through waterlogging of soils by clogging of soil pores by charcoal particles introduced from burning of heather in adjacent areas, therefore muirburn managed moorland can be considered a 'cultural' landscape. Best practice muirburn should minimise risks to cultural features and landscapes, however some people would prefer to see more unmanaged or wild landscapes.	Stopping muirburn altogether would lead to long term vegetative succession and ultimately loss of moorland to woodland as scrub and gorse prevent grazing pressure. Some cultural features may be damaged/ lost by such succession and the increased risk of uncontrolled burning could be detrimental.	Added flexibility would allow land managers to conduct muirburn under the most favourable conditions, thereby being likely to minimise risks to the historic environment and landscapes. When compared to the status quo however; no significant differences to be expected, current impacts/ risks persist but over potentially different timescales.
Score/ Summary	0 No significant change from current conditions	-1 No direct impact, but stopping muirburn likely to increase other risks	0 No significant change from current conditions
Total Score (from +/- 16)	- 6	- 9	+ 6

This assessment suggests that the most sustainable options should be ranked (based on the total scores applied in Table 4.1) as:

1. Option 3 – Added Flexibility (+6)
2. Option 1 – Status Quo (-6)
3. Option 2 – Stop Muirburn (-9)

Table 4.2 Summary Assessment of Environmental Effects

Key to Assessment:

++	Significant Positive/ Beneficial Impacts Likely	- -	Significant Negative/ Detrimental Impacts Likely
+	Minor Positive/ Beneficial Impacts Likely	-	Minor Negative/ Detrimental Impacts Likely
0	No Effect identified/ Neutral Effect Likely	+/-	Mixed Impacts Possible

SCCB Feature/ Inclusion	An enabling power is required to allow the Scottish Government, in the future, the ability to vary muirburn dates to help adapt to and mitigate the effects of climate change. This enabling power should be included in the Scottish Climate Change Bill.	
SEA Assumptions	The power will allow current and future administrations flexibility in assessing/ setting the dates to allow muirburn practices in response to local weather/ climate conditions and to sustainably manage risks to the local environment.	
SEA Topics	**SEA Impact Assessment**	**Additional Comments** (eg. permanent/ temporary/ reversible, secondary/ indirect, short/ medium/ long-term effects)
Climatic Factors	++	Some emissions will be associated with burning vegetation, however it is not expected that the total area being burned will increase, therefore related emissions may vary on an annual basis but not significantly. Allowing for mitigation of potentially large scale emissions by limiting risks of incidence of wildfire and uncontrolled combustion of peat reservoirs, is likely to represent the major benefit. Also allows flexibility to adapt in accordance with seasonal and weather changes brought about through global warming. Indeed with extended warming through climate change, some upland areas may become more suited to differing vegetation that may not require control by muirburn.
Air	0	No significant change when compared to the status quo, as the practice of muirburn itself will continue to have localised impacts. If muirburn is not allowed to continue there is an increased risk of CO2 and GHG emissions released from peat soils subject to wildfire.
Water	0	No significant change when compared to the status quo, as the practice of muirburn itself will continue to have localised impacts.
Soil	+	Slight benefits to be expected due to the fact that added flexibility in muirburn dates should allow rural land managers to conduct burning at times most beneficial to local soil, vegetation and weather conditions. When considered within the requirements for Good Agricultural and Environmental Conditions, this added flexibility should help maintain soil quality.
Biodiversity, Flora & Fauna	+	Slight benefit to be expected when compared to the status quo as, by burning in response to local soil, vegetation and weather conditions and reducing the risks of wildfire, significant detrimental impacts can be avoided/ minimised. Existing benefits with respect to encouraging new vegetative growth and providing a range of habitats of different age/ height/ cover will continue to be realised. If muirburn is not allowed to continue there will be an increased risk of reduction in species sustainability, given the range of habitats and food sources provided by burning the vegetation periodically and the loss of muirburn practice would potentially decrease vegetation (heather) viability.

Material Assets	**++**	Flexibility in setting muirburn dates is likely to be beneficial for rural land managers and associated employees and businesses, by helping maintain land for livestock, game and managed uplands which provide safe walking and recreational assets. All of which in turn should help sustain local tourism. There is an increased risk of negative financial impact on land supporting windfarms and communication masts if muirburn is not continued due to the increased risk of damage to these assets from wildlife.
Population	**+**	Flexibility in setting muirburn dates is likely to be beneficial in retaining rural land managers, associated employees and communities.
Human Health	**0**	No significant change when compared to the status quo, as the practice of muirburn itself will continue to have localised impacts, especially on fire beaters and local populations. However, continuation of this land management tool will assist in retaining viable businesses which support recreational activities and tourism.
Cultural Heritage (incl. Historic Environment)	**0**	No significant change when compared to the status quo, as the practice of muirburn itself will continue to have localised impacts. Any risks should be controlled through appropriate consideration of relevant guidance and legislation. Continuation of muirburn could actually be seen as a minor positive by encouraging the continued employment of traditional land management practices.
Landscape	**+**	Slight benefit to be expected when considered in the context of large scale damage that could result from uncontrolled wildfire. Limiting the risk of such events and continuing to manage the uplands in a traditional manner will help maintain landscape quality. Some detrimental impact may be assigned immediately during and after burning, however these should be considered temporary. Continuation of muirburn as a landscape management tool to provide heather and other traditional landscape features can be seen as a positive asset.
Inter-relationships	**++**	Immediate detrimental impacts on landscape and air quality should be considered within the context of traditional land management, potential biodiversity and habitat improvement benefits, minimisation of risks of wildfire and uncontrolled combustion within peat reservoirs and the material benefits associated with maintaining upland habitats for game. Added flexibility in assigning or amending muirburn dates will help form part of a coordinated response to climate adaptation and help minimise/ mitigate potential emission risks from uncontrolled burning.
Mitigation/ Enhancement Recommendations	In general, the SEA assessments suggest that added flexibility on muirburn will have positive environmental effects and, therefore, no mitigation measures are identified. As the development of further research on phenological, soil and peatland responses to climate change progresses, it would be useful to identify, and where possible quantify, the impacts of a range of management measures over at least 3 distinct sites, under varying management regimes which include muirburn under existing restrictions, muirburn under flexible dates to respond to local conditions and a standard site where no muirburn is undertaken. Long-term data on emissions impacts (GHG, water, air), vegetative succession, peat formation and species adaptation will go some way to filling data gaps. Similarly, experiential data on carbon load/ emissions will help quantify the emissions from muirburn activity at the local, regional and national scale.	

5 SEA Recommendations

Enhancement Recommendations

5.1 In general, the SEA assessments suggest that added flexibility on muirburn will have positive environmental effects and, therefore, no mitigation measures are identified.

5.2 As the development of further research on phenological, soil and peatland responses to climate change progresses, it would be useful to identify, and where possible quantify, the impacts of a range of muirburn management regimes over at least 3 distinct sites, which include muirburn under existing date restrictions, muirburn under flexible dates to respond to local conditions and a standard/ control site where no muirburn is undertaken.

5.3 Although such research takes time to develop, in terms of identifying suitable sites, setting the parameters, objectives and clearly stating the intended use of the results; long-term data on emissions impacts (eg. GHG, water, air) and the effect on the carbon balance between muirburn and soils, vegetative succession, peat formation and species adaptation will go some way to filling baseline data gaps.

5.4 The latest information from the Scottish Government is that they are already exploring such research and modelling options.

Environmental Baseline Data Recommendations

5.5 It is anticipated that any future research into the effects of muirburn management regimes could help provide long-term experiential data, on a range of issues, and that this would then help define future monitoring regimes and determine progress towards carbon sustainability by providing estimates on carbon balance in relation to muirburn activity.

5.6 Baseline data improvements could include:

- Area likely to be affected (eg. total area under muirburn management/ practice),
- Quantification/ estimate of associated GHG emissions (if available),
- Quantification of the carbon content of the soils under muirburn management,
- Overview of the impacts of muirburn on local ecology/ water/ soils/ landscape,
- Overview of the benefits of muirburn for same,
- GIS mapping of muirburn area/ soils at risk of damage from muirburn,
- Overview of the impacts of changing climate on muirburn practice,
- Estimate of the likely change under changing climate conditions, (ie. will more or less land be likely to come under muirburn management, and therefore lead to more, less or similar emissions).

Future Monitoring Recommendations

5.7 Scottish Government, in conjunction with stakeholders, may wish to further explore the potential for monitoring. Monitoring of muirburn practice is not likely to be covered under the SCCB, as the proposed SCCB provision only extends to providing flexibility on applicable dates; however, the potential for monitoring should be considered as a useful element of further research, to identify those policy areas where monitoring indicators would be most usefully reported.

5.8 The benefits of improved monitoring would be to:

- Better identify and quantify the total area of land under muirburn management;
- Quantify emissions associated with muirburn and also quantify emission risk averted/ managed through muirburn control of wildfire.

5.9 Such monitoring may be difficult to achieve due to number of variables, but possibly worth exploring suitable mechanisms, through any future research, to more clearly define the future value of muirburn practice in relation to wildfires, especially in the context of potentially drier climatic conditions.

5.10 It is possible that future monitoring on the effectiveness of the provision can be reported through the Scottish Climate Change Bill reporting mechanisms. Therefore, it may prove useful to include a requirement to record, report and monitor the use of the provision under the Scottish Climate Change Bill for a number of reasons:

- Identify where the timing of muirburn practice is being modified in response to seasonal change;
- Help build a spatial picture of seasonal change across Scotland;
- Record local evidence of the benefits/ impacts of the provision.

5.11 To the extent that such monitoring might, in the future, be necessary on a statutory basis, it may be possible to use the enabling power proposed for the SCCB to place a duty on a relevant public sector body to take action on climate change.

5.12 Paragraph 27-31 of the Scottish Government's response to the consultation on the SCCB describe this policy intention. The response is available online at: http://www.scotland.gov.uk/Publications/2008/10/response

5.13 Any improved monitoring measures should be used to update muirburn baseline data, as and when information becomes available.

6 Indicators, Monitoring and Reporting

6.1 Section 19 of the Environmental Assessment (Scotland) Act 2005 requires that Responsible Authorities monitor significant environmental effects of the implementation of the PPS. This must be done in such a way as to also identify unforeseen adverse effects and to take appropriate remedial action.

6.2 With respect to a provision to amend dates for allowing muirburn activities, there are not expected to be any significant adverse environmental impacts. The provision is anticipated to provide a pragmatic solution that allows the appropriate continuation of muirburn under changing seasonal conditions.

6.3 However, with respect to reporting, it would be useful to state clearly how the provision is to be enacted, ie. whether specific permission needs to be granted to land managers for muirburn outwith current dates and whether these permissions will be recorded, or if the permissible dates are to be revised periodically and muirburn allowed to be carried out, under best practice, within the revised periods without the need for specific permission.

6.4 It will be important to identify how reporting requirements will inform future muirburn policy and how any unforeseen negative impacts are identified and addressed, through the future identification of effective indicators.

6.5 There is, at present, no direct monitoring of muirburn practice and no single effective muirburn indicator available. Until further research and analysis is commissioned, there are proxy measures that could be made more explicit, should the need be identified, including:

- SEPA water quality monitoring – regular sampling programmes could help identify any significant impact on water quality, as a result of damaging muirburn practice, with responsibility and cause assigned upon a SEPA investigation. Examples could include muirburn leading to soil erosion and increased sediment load. There are no issues in this area at present, as muirburn does not have a significant impact, however such systems could flag up any future problems.

- Opportunities to realise synergies with the upcoming Scottish Soil Framework, which states an intention to develop a National Soil Monitoring Network. This links closely with another of the intentions of the SCCB, which is to protect high carbon peat soils to prevent additional emissions from these large organic carbon stores.

- Potential mechanisms through Agricultural Cross Compliance and Land Management Contracts under the Scottish Rural Development Programme.

7 Next Steps

7.1 The Scottish Government Landscapes and Habitats Division undertook a consultation on the proposed provision to amend muirburn dates. This consultation closed on the 17th of November 2008. (http://www.scotland.gov.uk/Publications/2008/08/Muirburn)

7.2 The consultation stated that a SEA Environmental Report has been published for the Scottish Climate Change Bill proposals and that these additional muirburn assessments, conducted in part in response to consultation comments, would be included in a revised Environmental Report and resultant SEA Post Adoption Statement.

7.3 This assessment document has been added as a new Appendix I to this revised edition of the original SEA Environmental Report, and the assessments will be referred to within the SEA Statement.

7.4 The SEA Statement will be published for submission to the Scottish Ministers as soon as is practicably possible after the submission of the Scottish Climate Change Bill.

ISBN 978 0 7559 6971 5 (web only publication)