Scottish Government

Strategic Environmental Assessment of the Draft Energy Strategy and Just Transition Plan

Environmental Report

Final report
Prepared by LUC
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Scottish Government

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Environmental Report

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Chapter 1
Non-Technical Summary

Introduction to the draft Energy Strategy and Just Transition Plan

1.1 The draft Energy Strategy and Just Transition Plan provides an update to the 2017 Energy Strategy. The draft Energy Strategy and Just Transition Plan sets out a vision that, by 2045, Scotland will have a flourishing, climate friendly energy system that delivers affordable, resilient and clean energy supplies for Scotland's households, communities and businesses. The draft Energy Strategy and Just Transition Plan is structured around the following areas of action:

- Delivering a just transition for communities and regions across Scotland
- Delivering a just transition for Scotland's energy economy
- Scaling up renewable energy
- Reducing reliance on other energy sources
- Reducing demand and decarbonising energy use across heat, transport, industry and agriculture sectors
- Ensuring energy security and resilience
- Energy networks and market regulation

What is Strategic Environmental Assessment?

1.2 Strategic Environmental Assessment (SEA) is a way of considering the environment when preparing public plans, programmes and strategies. It identifies potential significant environmental effects and where necessary, describes how these effects can be avoided or reduced. Through consultation, SEA also provides an opportunity for the public to express their views on proposed policies and their potential environmental impacts.

1.3 SEA should begin at an early stage in a plan's preparation, as it is important that the future consultation on the plan and the Environmental Report takes place when ideas are forming, and policy options are still being actively considered. A SEA Scoping report was prepared and submitted to the SEA Gateway in June 2022.

How was the Strategic Environmental Assessment undertaken?

1.4 This is a strategic level assessment of a high-level draft Energy Strategy and Just Transition Plan and reflects the national perspective the draft Energy Strategy and Just Transition Plan takes. Specifically, the SEA takes the form of a baseline-led assessment, which compares the potential impacts of the draft Energy Strategy and Just Transition Plan against the current environmental baseline and understanding of the environmental effects of the strategy in order to assess the significance of any environmental effects that could arise for each SEA topic.

1.5 Due to the nature of the draft Energy Strategy and Just Transition Plan, the approach has focused separately on the direct and indirect effects of the Strategy. This reflects the role of the Strategy in enabling future energy development. The policy positions have been appraised against the SEA topics, reflecting the approach used in the assessment of the previous 2017 Energy Strategy, with scores being attributed to indicate the likely effects on each objective. The assessment used matrices for each policy area considered in the draft Strategy. The assessment also draws high level conclusions on the likely lifecycle greenhouse gas (GHG) emissions from each policy area.

Which reasonable alternatives have been considered?

1.6 The 2005 Act requires that the likely significant environmental effects of reasonable alternatives of a plan, programme or strategy are assessed as part of the SEA process.

1.7 However, based on the current legislative context, and the declared climate emergency, it was identified that the current ambition can only be to achieve the maximum emissions reductions possible. Therefore, no reasonable alternatives were considered.

What are the key environmental challenges relevant to the draft Energy Strategy and Just Transition Plan?

1.8 In terms of climatic factors, Scotland's total emissions of the seven greenhouse gases (GHGs) were estimated to be 40 $MtCO_2e$ in 2020[1], a decrease in source emissions of 11.9% from 2019. The main contributors to this decrease between 2019 and 2020 were reductions in emissions in the Energy Supply, Domestic Transport, Agriculture, International Aviation and Shipping, Waste Management, Industrial Processes and Forestry sectors. A 51% reduction in estimated GHG emissions between 1990 and 2020 was reported. At the level of national communications categories, domestic transport showed the third slowest rate of decarbonisation (after residential and agriculture), reducing by 29.9% between 1990 and 2020, and represented 24% of total net emissions in 2020. Transport emissions have decreased by 20.8% between 2019 and 2020. This significant decrease was likely influenced by travel restrictions imposed through the Covid-19 restrictions[2]. Land use, land use change and forestry play a crucial role in removing CO_2 from the atmosphere by serving as a carbon stock.

1.9 In terms of population and human health, the estimated population of Scotland in 2021 was 5.48 million[3]. Projections forecast that the population will continue to rise and will peak at around 5.53 million in 2033[4]. Approximately 71% of Scotland's people live in urban areas, which accounts for just 2.3% of Scotland's land surface[5]. Key findings from the 2020 Scottish Index of Multiple Deprivation show that 14 areas have been consistently among the 5% most deprived in Scotland since the 2004 Index[6].

1.10 Air pollution can result in adverse impacts on human health and can significantly affect many aspects of quality of life. The quality of the air around us is affected by the pollutants released into the atmosphere through human activities. Sulphur dioxide, oxides of nitrogen, particulates, and low-level ozone are generally considered to be of most importance in relation to human health and the environment.

1.11 In terms of soil and geology, it is estimated that Scotland's soils contain over 3 billion tonnes of historic carbon, making up over 53% of the UK's soil carbon. Degraded soil can act as a net carbon emitter, soils in good condition protect the carbon store and, depending on the vegetation cover, can continue to sequester carbon. Land use change and management practices can impact significantly on soil carbon stores and sequestration. Peatlands are of particular importance for mitigating climate change by acting as carbon 'sinks'. Approximately 1.6 billion tonnes of the

[1] Gov.scot (2022) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/Energy/?Section=WholeSystem&Chart=GHGEmissions
[2] Gov.scot (2022) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/Energy/?Section=WholeSystem&Chart=GHGEmissions
[3] National Records of Scotland (2022) Mid-2021 Population Estimates Scotland [online] Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates/mid-2021
[4] National Records of Scotland (2023) Projected Population of Scotland (2020-based) [online] Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/population-projections-scotland/2020-based
[5] National Records of Scotland (2022) Population estimates by urban rural classification [online] Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/2011-based-special-area-population-estimates/population-estimates-by-urban-rural-classification
[6] Scottish Government (2020) Scottish Index of Multiple Deprivation 2020 [online] Available at: https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/

carbon stored in Scottish soils is within peat. It is estimated that over 80% of Scotland's peatlands are degraded[7].

1.12 There have been significant improvements to water quality alongside significant reductions in pollution. Most of Scotland's seas, coasts, and estuaries are in good or excellent condition. Around 84% of Scotland's groundwater is in good condition[8]. Agriculture and the legacy of industrial activity are the main causes of regional-scale groundwater pollution problems. Flooding can have significant and long-lasting impacts on people, communities, and businesses. Flood Risk Management Strategies co-ordinate action to tackle flooding in Scotland. Scotland's peatlands play an important role in natural flood management. Woodland and forestry can help prevent flooding by intercepting precipitation, reducing surface water runoff through increased infiltration, and increasing the use of water through evapotranspiration.

1.13 In terms of biodiversity, flora and fauna, Scotland's protected areas included 251 SACs, 153 SPAs, 51 Ramsar sites and 2 Biosphere reserves as of 2020. There are 1,423 SSSIs, 231 Marine Protected Areas and 2 National Parks. The UK Biodiversity Action Plan identified 39 priority habitats and 197 priority species in Scotland. By May 2019, the proportion of nationally protected nature sites reported as being in a "favourable" condition decreased by 0.8% from 79.7% in 2018 to 78.9%[9].

1.14 Scotland's historical sites are unique and irreplaceable. While these assets are distributed widely throughout Scotland there are clusters of sites in and around our settlements and also around our coastlines. As of 2018, it is estimated that there are around 56,000 protected places across Scotland. However, whilst most of the historic environment is undesignated (90-95%), these known but undesignated assets provide important contextual information which helps us better understand designated sites[10].

1.15 Scotland's distinctive landscapes are a significant part of the country's natural and cultural heritage and make a significant contribution to both the country's economic performance and the well-being of its people. There are currently two National Parks (Loch Lomond and the Trossachs, and the Cairngorms) and 40 National Scenic Areas in Scotland. Over 13% of Scotland's land area has been classified as a National Scenic Area[11].

1.16 Scotland's natural resources are also material assets. Mineral resources and aggregates are used for purposes such as fuel, and construction.

1.17 Heating makes up approximately half of Scotland's energy consumption (52.9%) with transport (22.0%) and electricity (22.3%) making up approximately a quarter each[12]. It is estimated that 85.2% of Scotland's gross electricity consumption in 2021 came from renewable sources[13].

1.18 In 2021, 72.3% of all renewable electricity generated in Scotland was from wind. Hydro is Scotland's second highest source of renewable generation (18.0%). The remaining 9.7% was produced by other renewable energy technologies. Solar capacity has increased rapidly. Bioenergy and energy from waste accounts for 8.5% and whilst the current capacity of wave and tidal is considered to be relatively small, technology is developing and Scotland benefits from significant resource potential[14]. Since 2000, Scottish renewables have displaced an estimated 124 million tonnes of CO_2. In 2017 alone, Scottish renewable electricity has displaced an estimated 11.6 million tonnes of CO_2[15].

Which existing environmental protection objectives are relevant?

1.19 There are many established environmental protection objectives which form the context for the assessment. These include: international and national level policies and strategies that aim to protect and enhance the environment; climatic objectives focused on reducing Scotland's GHG emissions to net zero by 2045; objectives for population and human health aiming to prevent or limit exposure to environmental harm and nuisance such as air pollution, especially in urban areas; objectives for water and air aiming to reduce pollution, and to reverse the effects of past emissions; soil and geology objectives seeking to protect prime quality agricultural land

[7] Scotland's soils (2019) Peatland restoration [online] Available at: https://soils.environment.gov.scot/resources/peatland-restoration/
[8] SEPA (2020) Water Classification Hub Data for 2020 [online] Available at: https://www.environment.gov.scot/data/data-analysis/
[9] Scottish Government (2019) Ecosystems and biodiversity – knowledge account [online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/02/environment-strategy-scotland-vision-outcomes/documents/ecosystems-biodiversity-knowledge-account/ecosystems-biodiversity-knowledge-account/govscot%3Adocument/ecosystems-biodiversity-knowledge-account.pdf
[10] Historic Environment Scotland (2018) Scotland's Historic Environment in numbers 2018 [online] Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.environment.gov.scot/media/2556/shea_infographic_2018.pdf
[11] NatureScot (2023) National Scenic Areas [online] Available at: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/national-designations/national-scenic-areas
[12] Scottish Government (2021) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=WholeSystem&Chart=EnConsumption
[13] Scottish Government (2021) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=RenLowCarbon&Subsection=RenElec&Chart=RenElecTarget
[14] Scottish Government (2021) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=RenLowCarbon&Subsection=RenElec&Chart=RenElecTarget
[15] Scottish Government (2019) Annual Compendium of Scottish Energy Statistics [online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2019/05/annual-compendium-of-scottish-energy-statistics/documents/annual-compendium-may-2019/annual-compendium-may-2019/govscot%3Adocument/Annual%2BCompendium%2Bof%2BScottish%2BEnergy%2BStatistics.pdf

and valuable soil resources including the protection of peatlands and remediation of contaminated land; biodiversity objectives focused on protecting habitats and species from damage and disturbance and improving natural heritage networks; cultural heritage objectives ranging from the protection of World Heritage Sites and Marine Protected Areas, to the recognition and management of more locally important buildings and archaeology, and their wider setting; landscape objectives reflecting the importance of all landscapes and the need to help to improve those that have become degraded; objectives for material assets seeking to contribute to the core planning objective and supporting sustainable development, reducing greenhouse gas emissions, and making the best use of Scotland's resources and existing infrastructure.

What are the likely significant effects of the draft Energy Strategy and Just Transition Plan?

1.20 The developments resulting from actions outlined in the draft Energy Strategy and Just Transition Plan will be subject to a number of regulatory and consenting processes and potential adverse impacts arising during both construction and operation may be mitigated through a combination of regulatory and planning mechanisms, such as Environmental Impact Assessment (EIA), appropriate siting and design, local consultation and engagement and on-site management measures. Furthermore the draft Energy Strategy and Just Transition Plan includes some existing policy which has already been subject to SEA, and these previous findings are reflected where appropriate.

Climatic factors

1.21 Almost all of the policy positions and actions set out in the draft Energy Strategy and Just Transition Plan will contribute towards reducing GHG emissions and meeting Scotland's target for net zero. The policy positions are cumulatively expected to make a significant positive contribution to Scotland's commitment to reduce GHG emissions and meet national targets. The extent to which these policy positions will contribute towards emission reductions varies, with complementary roles of the policy positions, resulting in overall positive cumulative effects.

1.22 For example, measures aimed at promoting energy efficiency within the building and industry sectors and the use of renewable energy will be complemented by those that provide investment, support supply chains and develop the infrastructure to facilitate this.

1.23 The actions targeted at scaling up renewable energy cumulatively reduce GHG emissions and have a positive effect in relation to climatic factors through supporting the use of a variety of renewable energy technologies while enhancing Scotland's energy system in terms of reliability and flexibility. This includes development of wind, hydrogen, solar, bioenergy, pumped hydro storage and marine energy. These policy positions therefore could make a significant contribution towards meeting net zero targets, and ensuring a broad mix of energy sources will help improve the energy supply. This will be important in order to meet future energy challenges.

1.24 Likewise, the actions in relation to reducing demand and decarbonising energy use and supporting industry to reduce demand and decarbonise energy use collectively support reducing energy and heat demand across many sectors, while supporting the use of heat networks and CCUS. This will have direct effects on reducing GHG emissions.

1.25 Furthermore, actions related to delivering a just transition for Scotland's energy economy collectively support investment into the energy sector allowing it to grow, particularly in relation to renewable energy. This will also help to drive the export of renewable energy and enhance its supply chain. This is further supported by the community focused actions to reduce GHG emissions and adapt to climate change. These policy positions support a reduction in GHG emissions and will help Scotland to meet its national targets.

Population and human health

1.26 The majority of the actions support investing in Scotland's renewable energy sector. This brings health benefits in terms of reduced air pollution associated with fossil fuel use. Increasing security of supply also supports health and wellbeing. The actions for a just transition offer some cumulative positive effects in relation to jobs, with associated positive effects on human health and wellbeing from access to employment. It is anticipated that there will be secondary benefits from increased action on energy efficiency and renewable energy, leading to greater awareness and empowerment amongst communities. Conversely, some communities may experience localised negative cumulative impacts from construction and development activities.

Air

1.27 Many of the policy positions and actions are likely to have cumulative positive effects for air quality in Scotland. As air pollution often originates from the same sources and activities that contribute to the release of GHG emissions, proposals which support the use of renewable energy, and seek to decarbonise the energy sector are expected to have associated benefits for air quality. The actions support the use of a variety of renewable energy sources that will reduce reliance on fossil fuels. However, some renewable energy sources have potentially adverse impacts on air quality, including the combustion of hydrogen and transport emissions, including those associated with trade.

Biodiversity, flora and fauna

1.28 Several actions are likely to have minor negative effects for biodiversity, flora and fauna, with potentially significant negative effects identified for offshore wind which could impact across a large area, and pumped hydro storage which would be more localised in effect, but result in significant loss. The majority of negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy.

1.29 Some of the renewable energy developments will be more localised in extent, such as solar energy. However, renewable energy developments such as offshore and onshore wind energy will be at quite a substantial scale. There is uncertainty over the spatial distribution of onshore wind developments. However, policy positions which avoid future development relating to coal, onshore oil and gas and unconventional oil and gas will have a positive effect on biodiversity, flora and fauna through the avoidance of future adverse effects.

Soil and geology

1.30 Several actions are likely to have negative effects on soils and geology in Scotland in onshore and offshore environments. The majority of these negative effects may arise as a result of construction activities for the extensive infrastructure requirements. There is uncertainty over the likely impacts on valuable soil resources, such as high carbon soils or agricultural land, however there is an action to ensure adequate tools and guidance are available to inform the assessment of net carbon impacts of development proposals on peatlands and other rich carbon soils.

Water

1.31 Several actions are likely to have negative effects on water, with potential significant negative effects identified in relation to hydrogen production in relation to supply and quality, which will be long term in effect. Some negative effects may also arise as a result of construction activities, and would be temporary. However, continuing to not support the extraction of coal, onshore conventional oil, unconventional oil and gas or development of nuclear power plants will have a positive effect by avoiding future development and the associated impacts on the water environment.

Cultural heritage and the historic environment

1.32 Several actions within the draft Energy Strategy and Just Transition Plan are likely to have minor negative effects for cultural heritage and historic environment in Scotland.

1.33 Actions seeking to improve the energy efficiency of buildings and encouraging the uptake of renewable energy technologies may have adverse effects on cultural heritage and the historic environment. In particular, the retrofitting of buildings to include new technologies (e.g. solar panels or heat pumps) and siting of new development may alter the setting of heritage assets, or change the appearance or fabric of a historic asset. Negative effects are likely as a result of cumulative developments.

1.34 Additionally, some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. The location of the majority of this renewable energy development is currently unknown. Some of the renewable energy developments will be more localised in effect, such as solar energy. However, renewable energy developments such as offshore and onshore wind energy will be at a substantial scale and may impact on setting. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

Landscape and geodiversity

1.35 Several actions or policy positions within the draft Energy Strategy and Just Transition Plan are likely to have significant or minor negative effects for landscape in Scotland. Policy positions seeking to improve the energy efficiency of buildings and encouraging the uptake of renewable energy technologies may have adverse effects on townscape. Additionally, negative effects may arise as a result of development. Some of the renewable energy developments will be more localised such as solar energy. However, renewable energy developments such as offshore and onshore wind energy, and energy transmission infrastructure will be at a substantial scale with significant negative effects possible. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

1.36 However, continuing to not support the extraction of coal, onshore conventional oil, unconventional oil and gas or development of nuclear power plants will have a positive effect on landscape by avoiding associated future development. The policy positions will help protect Scotland's natural environment from further disruption through extraction processes and take up of land for these purposes.

Material assets

1.37 The majority of the policy positions are expected to have mixed effects or positive effects in relation to material assets. Many policy positions support increasing renewable energy infrastructure. This will result in negative effects due to use of raw materials and construction. However, enhancing the

renewable energy sector will provide positive benefits to Scotland's material assets through developing a more reliable energy system; and increased renewable energy generation capacity. There is the potential for positive secondary effects through community energy; regional climate action hubs; existing power sector transition from fossil fuels; and skills and supply chains.

1.38 A number of the policy positions also support the viability of local communities and the local economy, in particular island and rural communities, while ensuring the development of sustainable buildings that will be long lasting and can adapt to climate change. This will enhance Scotland's material assets.

What measures could be put in place to avoid, reduce or manage the environmental effects of the draft Energy Strategy and Just Transition Plan?

1.39 Mitigation and enhancement measures have informed the draft Energy Strategy and Just Transition Plan and further consideration will be given in the final Strategy. This assessment has identified offshore and onshore wind, pumped hydro storage, hydrogen and energy network investment as policy areas that are likely to result in direct significant adverse effects.

1.40 National Planning Framework 4 (NPF4) sets out the Scottish Government's strategy for working towards a net-zero Scotland by 2045, signaling the key priorities for 'where' and 'what' development should take place at a national level and is combined with national planning policy on 'how' development planning should manage change. The renewable energy policy provides a more enabling approach to developments outwith National Parks and National Scenic Areas whilst continuing to protect homes and communities as well as our most valued international and national natural and cultural heritage assets.

1.41 Mitigation was identified across some of the policy areas:

- Improve the evidence base on water use in hydrogen production.
- Develop specific tailored to address the technology specific impacts of development on biodiversity, flora and fauna for offshore wind.
- Develop specific design guidance for energy efficiency and renewable energy development in relation to areas of high landscape value, ensuring it reflects future technologies and scale of development.
- Undertake lifecycle assessment of materials for developments proposed.

1.42 A variety of areas for enhancement were identified across the majority of the policy positions. A number of the enhancements recommended relate to reducing the environmental effects of infrastructure development associated with decarbonising the energy sector. Other areas of enhancement include ensuring that the policy positions are maximised so that Scotland can reach national emission reduction targets and transition to net zero and more strongly supporting the principles of a circular economy in renewables development.

Next Steps

1.43 Consultation responses to the Environmental report can be submitted via the Scottish Government Citizen Space website address https://consult.gov.scot/energy-and-climate-change-directorate/energy-strategy-and-just-transition-plan/. Responses can also be submitted by email to: energystrategy@gov.scot or by post to:

Energy and Climate Change Directorate

Scottish Government

St Andrew's House

Regent Road

Edinburgh

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Chapter 2
Introduction

Purpose of this Report

2.1 The Scottish Government has prepared a draft Energy Strategy and Just Transition Plan which sets out a vision that, by 2045, Scotland will have a flourishing, climate friendly energy system that delivers affordable, resilient and clean energy supplies for Scotland's households, communities and businesses.

2.2 LUC was appointed by the Scottish Government in May 2022 to undertake a Strategic Environmental Assessment (SEA) of the draft Energy Strategy and Just Transition Plan. The SEA of the draft Energy Strategy and Just Transition Plan presents an important opportunity to ensure that environmental considerations are brought to the forefront of the decision-making process and influence the outcome of the draft Energy Strategy and Just Transition Plan.

2.3 Although the draft Energy Strategy and Just Transition Plan is driven by an environmental imperative, it is important to ensure that impacts on the wider environment are identified, evaluated and where possible avoided or minimised. Equally, there may be opportunities to enhance wider benefits delivered by the draft Energy Strategy and Just Transition Plan.

2.4 The purpose of this Environmental Report is to present the findings of the SEA process.

Key facts

2.5 Table 2.1 sets out the key facts for the Draft Energy Strategy and Just Transition Plan.

Table 2.1: Key facts for the Draft Energy Strategy and Just Transition Plan

Responsible Authority	Scottish Government
Title	Draft Energy Strategy and Just Transition Plan
Subject	Energy
Period Covered	2022 - 2045
Area covered by the policy	Scotland

Responsible Authority	Scottish Government
What prompted the preparation of the strategy and plan?	The draft Energy Strategy and Just Transition Plan provides an update to the 2017 Scottish Energy Strategy and is Scotland's first sectoral Just Transition plan.
Purpose and/or objectives of the policy	The draft Energy Strategy and Just Transition Plan sets out a route map of ambitions, milestones and actions that the Scottish Government will take to deliver the vision that Scotland will have a flourishing, climate friendly energy system that delivers affordable, resilient and clean energy supplies for Scotland.
Contact	energystrategy@gov.scot

Context for draft Energy Strategy and Just Transition Plan

2.6 The Climate Change (Scotland) Act 2009[16] ("the 2009 Act") established the legal framework for emissions reductions by 2050. It set targets for the reduction in carbon emissions of 42% by 2020 and 80% by 2050, compared to the 1990 baseline. The Climate Change Plan (CCP) (2018) published by the Scottish Government, outlined policies and proposals to meet the emission targets as outlined in the 2009 Act, over the plan period of 2018 - 2032.

2.7 The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[17] amended the 2009 Act, including a commitment to achieve net zero emissions by 2045. Following the amendments to emissions reduction targets by the 2019 Act, the Scottish Government committed to updating the CCP.

2.8 The CCP update (CCPu) published in December 2020 promotes a whole system energy approach with decarbonisation across the whole energy system. The CCPu commits the Scottish Government to provide £180 million for an Emerging Energy Technologies Fund, supporting the development of hydrogen, Carbon Capture Utilisation and Storage (CCUS), and providing impetus to the development of Negative Emission Technologies (NETs).

2.9 The draft Energy Strategy and Just Transition Plan provides an update to the 2017 Energy Strategy[18] and combines this with Scotland's first Just Transition Plan, which includes the Scottish Government's response to the energy recommendations of the Just Transition Commission.

Scotland's Energy System

2.10 Scotland is an energy rich nation, initially through the development of coal, oil and gas reserves and now through the development of renewable energy. The way energy is produced, transported and used will change dramatically to achieve net zero. The last two coal stations in Scotland (Cockenzie and Longannet) have closed, with the carbon intensity of Scottish electricity generation falling by close to 90% between 2000 to 2018[19].

2.11 A combination of improving energy efficiency and greater electrification based on zero carbon electricity can make a significant contribution to the decarbonisation of Scotland's energy system. 87.7% of the electricity generated in Scotland during 2021 came from renewable or low carbon sources[20]. Alongside electrification, producing hydrogen in zero-carbon and low-carbon ways and use of bioenergy can also contribute to energy demands for heat, transport and industry[21].

2.12 Domestic transport continues to be Scotland's biggest emitting sector, accounting for 23.8% of emissions in 2020[22], although this figure reflects the impact of Covid-19 on travel patterns. By 2030, Scotland will have phased put the need for new petrol and diesel cars and vans; Scotland will have almost completely decarbonised its passenger railways; and

[16] The Scottish Government (2009) Climate Change (Scotland) Act 2009 [online] Available at: http://www.legislation.gov.uk/asp/2009/12/contents (accessed 09/06/2022)
[17] Scottish Government (2019) The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 [online] Available at: http://www.legislation.gov.uk/asp/2019/15/enacted (accessed 09/06/2022)
[18] Scottish Government (2017) Scottish Energy Strategy: The future of energy in Scotland [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2017/12/scottish-energy-strategy-future-energy-scotland-9781788515276/documents/00529523-pdf/00529523-pdf/govscot%3Adocument/00529523.pdf
[19] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/
[20] Scottish Government (2020) Scottish Energy Statistics Hub [online] Available at https://scotland.shinyapps.io/Energy/?Section=RenLowCarbon&Subsection=RenElec&Chart=ElecGen
[21] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/
[22] Scottish Government (2020) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=WholeSystem&Chart=GHGEmissions

Scotland will have begun to work to decarbonise challenging transport modes, such as HGVs, ferries and aviation.

2.13 Emissions from industry continue to constitute a large proportion, around 30%, of total Scottish emissions[23]. There has been a considerable decline in Scotland's industrial emissions since 1990, falling by 51% (41.6 MtCO2e) between 1990 and 2020[24]. This was driven by the closure of heavy emitting sites, particularly in the steel and paper sectors, but also by the deployment of innovative and more energy efficient technologies and processes[25].

2.14 The need to invest in renewable generation, networks and related infrastructure to reduce greenhouse gas emissions is critical to creating green jobs as part of Scotland's longer-term energy transition. In 2018, the low carbon electricity sector directly supported 7,800 full time equivalent jobs across Scotland and contributed more than £3.6 billion to the Scottish economy[26].

Scottish Government's draft Energy Strategy and Just Transition Plan

2.15 The Scottish Government has committed to developing an Energy Strategy and Just Transition Plan. The Energy Strategy and Just Transition Plan will help Scotland reach net zero by ensuring that Scotland's energy system is fit for purpose and offers energy security.

2.16 The draft Energy Strategy and Just Transition Plan is structured around the following areas of action:

- Delivering a just transition for communities and regions across Scotland
- Delivering a just transition for Scotland's energy economy
- Scaling up renewable energy
- Reducing reliance on other energy sources
- Reducing demand and decarbonising energy use across heat, transport, industry and agriculture sectors
- Ensuring energy security and resilience
- Energy networks and market regulation.

Strategic Environmental Assessment

2.17 Part 1, paragraph 5 of the Environmental Assessment (Scotland) Act 2005 ('the 2005 Act')[27], is a means to judge the likely impact of the plan, programme or strategy on the environment and to seek ways to minimise adverse effects, if likely to be significant.

2.18 The SEA process comprises a number of stages:

- Pre-screening
- Screening (preparation of a Screening Report)
- Scoping (preparation of a Scoping Report)
- Environmental Assessment (preparation of an Environmental Report)
- Main consultation on the Environmental Report
- Preparation of a Post-adoption SEA Statement
- Monitoring the significant environmental effects of implementing the final Energy Strategy and Just Transition Plan.

2.19 A Scoping Report was prepared and submitted to the SEA Gateway in June 2022.

The UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021[28]

2.20 Section 15 of the Continuity Act places a duty on responsible authorities to have due regard to the guiding principles on the environment when preparing a plan, programme or strategy requiring a SEA under the Environmental Assessment (Scotland) Act 2005. Whilst not yet in force, nonetheless the guiding principles are set out below and will be taken into account in the preparation of the Environmental Report: The guiding principles as set out in Section 13 (1) of the Act are:

a. the principle that protecting the environment should be integrated into the making of policies,

b. the precautionary principle as it relates to the environment,

c. the principle that preventative action should be taken to avert environmental damage,

[23] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/

[24] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/

[25] Scottish Government (2020) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=WholeSystem&Chart=GHGEmissions

[26] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/

[27] Scottish Government (2005) The Environmental Assessment (Scotland) Act 2005 [online] Available at: https://www.legislation.gov.uk/asp/2005/15/contents

[28] UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021. [online] Available at: https://www.legislation.gov.uk/asp/2021/4/enacted

d. the principle that environmental damage should as a priority be rectified at source,

e. the principle that the polluter should pay.

2.21 The draft Energy Strategy and Just Transition Plan falls within section 5 (3) of the Environmental Assessment (Scotland) Act 2005 and can proceed directly to the scoping stage.

Structure of the Environmental Report

2.22 This chapter has described the background to the draft Energy Strategy and Just Transition Plan and the requirement to undertake SEA. The report is structured into the following chapters, and bold highlights illustrate where these meet the requirements of the 2005 Act.

- Chapter 1: Includes the **Non-Technical Summary (NTS)** of the Report
- Chapter 2 (this chapter): Outlines the **contents and main objectives** of the draft Energy Strategy and Just Transition Plan and its relationship with other qualifying plans and programmes.
- Chapter 3: Describes the approach to the assessment including the **difficulties encountered**.
- Chapter 4: Describes the **environmental policy context** and describes the **environmental baseline** including key trends and environmental problems.
- Chapter 5: Describes the **significant environmental effects** expected from the draft Energy Strategy and Just Transition Plan.
- Chapter 6: Presents the approach to **reasonable alternatives.**
- Chapter 7: Describes the **mitigation and enhancement** measures proposed against the SEA findings.
- Chapter 8: Describes the approach to **monitoring** the SEA.
- Chapter 9: Describes the next steps for the draft Energy Strategy and Just Transition Plan.

2.23 The main body of the report is supported by **Appendix A** which presents the review of plans, programmes and environmental protection objectives of relevance to the draft Energy Strategy and Just Transition Plan. **Appendix B** includes the assessment matrices.

Chapter 3
Approach to Assessment

Requirement under the 2005 Act

3.1 The draft Energy Strategy and Just Transition Plan is considered to fall under Section 5(3) of the 2005 Act and as such, an SEA is required.

3.2 Schedule 3(6) of the 2005 Act requires the Environmental Report to consider "*The likely significant effects on the environment, including (a) on issues such as – (i) biodiversity; (ii) population; (iii) human health; (iv) fauna; (v) flora; (vi) soil; (vii) water; (viii) air; (ix) climatic factors; (x) material assets; (xi) cultural heritage including architectural and archaeological heritage; (xii) landscape; and (xiii) the inter-relationship between the issues referred to in heads (i)–(xii); (b) short, medium and long-term effects; (c) permanent and temporary effects; (d) positive and negative effects; and (e) secondary, cumulative and synergistic effects".*

Scoping of SEA Topics

3.3 In accordance with Schedule 2 of the 2005 Act, consideration has been given as to whether the environmental effects (both positive and negative) of the draft Energy Strategy and Just Transition Plan are likely to be significant.

3.4 Given the anticipated environmental effects of the proposed measures that could be set out in the draft Energy Strategy and Just Transition Plan, it is considered that all SEA topics required to be considered by the 2005 Act should be scoped into the SEA process. These are set out in **Table 3.1.**

Table 3.1: Proposed scoping in/out of SEA topics

SEA Topic	Scoped in
Biodiversity, flora and fauna	✓
Population and human health	✓
Soil	✓
Water	✓
Air	✓
Climatic factors	✓
Cultural heritage and the historic environment	✓

SEA Topic	Scoped in
Landscape and geodiversity	✓
Material assets	✓

Approach to the Assessment

3.5 This is a strategic level assessment of a high-level draft Energy Strategy and Just Transition Plan and reflects the national perspective the draft Energy Strategy and Just Transition Plan will take. Specifically, the SEA takes the form of a baseline-led assessment which compares the potential impacts of the draft Energy Strategy and Just Transition Plan against the current environmental baseline and understanding of the environmental effects of the strategy in order to assess the significance of any environmental effects that could arise for each SEA topic.

3.6 Due to the nature of the draft Energy Strategy and Just Transition Plan, the approach has focused separately on the direct and indirect effects of the draft Strategy. This reflects the role of the draft Strategy in enabling future energy development.

3.7 The policy positions have been appraised against the SEA topics, reflecting the approach used in the assessment of the previous 2017 Energy Strategy, with scores being attributed to indicate the likely effects on each objective.

3.8 Where appropriate, reference has been made to existing SEA of the policy actions, although this requires the summary of these findings within this Environmental Report.

3.9 The assessment used matrices for each policy area considered in the draft Strategy. The assessment also draws high level conclusions on the likely lifecycle greenhouse gas emissions from each policy area.

3.10 The matrices use a colour coded symbol showing the score for each action and target against each of the SEA objectives and include a concise justification for the score given. The SEA matrices are presented in **Appendix B**

3.11 The use of colour coding in the matrices allows for likely significant effects (both positive and negative) to be easily identified, as shown in Table 3.2 below.

Table 3.2: SEA Framework Symbol and Colour Coding

Symbol and Colour Code	Description
++	Significant positive effect likely
++/-	Mixed significant positive and minor negative effects likely
+	Minor positive effect likely
+/-	Mixed minor positive and minor negative effects likely
-	Minor negative effect likely
--/+	Mixed significant negative and minor positive effects likely
--	Significant negative effect likely
0	Negligible effect likely
?	Uncertain effect
N/A	Not applicable or relevant

3.12 Where a potential positive or negative effect is uncertain, a question mark has been added to the relevant score (e.g. +? Or -?) and the score colour coded as per the potential positive, negligible or negative effect.

Consideration of Reasonable Alternatives

3.13 Part 14(2) of the 2005 Act requires that:

"The report shall identify, describe and evaluate the likely significant effects on the environment of implementing (a) the plan or programme; and (b) reasonable alternatives to the plan or programme, taking into account the objectives and the geographical scope of the Plan or Programme".

3.14 Therefore, the SEA must appraise not only the Plan or Programme's objectives and actions, but "reasonable alternatives" to these. This implies that alternatives that are not reasonable do not need to be subject to appraisal. It is important to note that when considering the scope of alternatives, the 2005 Act does not specify whether this means considering an alternative plan, programme, or strategy, or different alternatives within the plan, programme, or strategy itself that should be assessed. Part (b) of Regulation 14(2) above notes that reasonable alternatives will take into account the objectives of the plan, as well as its geographical scope. Therefore, alternatives that do not meet the objectives of national policy are unlikely to be reasonable.

Reasonable Alternatives

3.15 The 2005 Act requires that the potential for significant environmental effects of reasonable alternatives of a plan, programme or strategy be assessed as part of the SEA process.

3.16 The draft Energy Strategy and Just Transition Plan uses three Energy System Scenarios[29], to generate insights into how Scotland could approach the transition to our future energy system and explore pathways available to meet Scotland's emission reduction targets.

3.17 The scenarios are based on a combination of societal and technological change, where societal change tracks the level of action taken by society to reduce their own carbon footprint (for example, reduced road traffic, increased home efficiencies etc.), and technological change measures the amount of large-scale deployment of new technologies (renewables, CCUS, hydrogen etc.). The three scenarios modelled are: large-scale technology deployment with minimal societal change; high levels of societal change with reduced technological deployment; and a balance of both.

3.18 These scenarios do not represent Scottish Government policy, nor are they designed to be the primary driver for the draft Energy Strategy and Just Transition Plan. Instead, they formed part of a wider evidence base that supported discussions as part of stakeholder engagement over the summer of 2022 on the challenges and the options available for future whole system energy policies.

3.19 Based on the current legislative context, and the declared climate emergency, it was identified in discussion with the Scottish Government that the current ambition can only be to achieve the maximum emissions reductions possible. Therefore, no reasonable alternatives were considered.

Defining the scope of the SEA of the draft Energy Strategy and Just Transition Plan

3.20 Due to the nature of the draft Energy Strategy and Just Transition Plan and the hierarchy in which it sits, the assessment will be undertaken at a strategic and national level. This approach to the assessment will reflect the national status of the draft Energy Strategy and Just Transition Plan and the high-level nature of assessment it requires.

3.21 The draft Energy Strategy and Just Transition Plan builds upon a variety of other detailed sectoral energy plans, programmes and strategies, tying them together in a whole-systems view of the energy system. Many of these plans, programmes and strategies have themselves undergone SEA, which have been used to inform the assessment for the draft Energy Strategy and Just Transition Plan.

Likely significance of effects

3.22 Schedule 2 of the 2005 Act identifies criteria for determining the likely significance of effects on the environment (see Table 3.3) which will be reflected in the approach to assessment.

[29] Scottish Government (2022) Scottish whole energy system scenarios: context document. [online] Available at: https://www.gov.scot/publications/scottish-whole-energy-system-scenarios-context-document/

Table 3.3: Criteria for assessing the likely significant effects

SEA Assessment Criteria	Breakdown and Description
a) the probability, duration, frequency and reversibility of the effects	Probability Low – Not likely to have an effect Medium High – Highly likely to have an effect Duration Short-term – 0-5 years Medium-term – 5- 10 years (up to the end of the action plan period) Long-term – 10+ years (beyond the end of the action plan period) Frequency Continual; defined by number of occurrences; or intermittent Reversibility Whether the effect can be reversed (i.e., can the receptor return to baseline condition) without significant intervention
b) the cumulative nature of the effects	Where several options each have insignificant effects but together have a significant or combined effect. This includes synergistic effects, which is when effects interact to produce a total effect greater than the sum of the individual effects.
c) the transboundary nature of the effects	Effects beyond Scotland's boundary.
d) the risks to human health or the environment	Whether the impact of the effect would present a risk for people and the environment.
e) the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected)	Magnitude High – High proportion of the receptor affected Medium Low – Low proportion of the receptor affected Spatial extent National/Transboundary – Effects on Scotland or England International – Effects extending to the UK or beyond
(a) the value and vulnerability of the area likely to be affected due to: (i) special natural characteristics or cultural heritage (ii) exceeded environmental quality standards or limit values f) intensive land-use	Impact of the effect on the value or condition of the existing area.
g) the effects on areas or landscapes which have a recognised national, Community or international protection status	Impacts on areas with national, community or international protection.

Assessment of SEA topics

3.23 The appraisal is based around the SEA topic areas and takes a strategic view of environmental effects on each topic, reflecting the nature of the draft Energy Strategy and Just Transition Plan. Table 3.4 sets out the considerations in relation to each SEA topic. These have been used to inform the approach to the narrative assessment.

Table 3.4: SEA assessment scope for the Draft Energy Strategy and Just Transition Plan

SEA Topic Area	SEA assessment scope
Climatic Factors	Climate change mitigation including emissions avoided and emissions reductions Climate change adaptation and vulnerability to climate impacts Decarbonisation of transport and sustainable travel, use of net zero emissions fuel sources Lifecycle emissions
Biodiversity, flora and fauna	Terrestrial and aquatic habitats and species of international, national, regional or local importance, and habitat fragmentation. Protection and enhancement of biodiversity
Population and human health	Protect and enhance health, quality of life and living environment including air and water quality, greenhouse gas emissions, and active travel opportunities
Soil	Protection and enhancement of soil resources and functions Protection and enhancement of high-quality agricultural land and carbon rich soils which are carbon sinks Reuse of vacant and derelict land
Water	Quality and quantity of watercourses and waterbodies (surface water and groundwater) including coastal and estuarial waters and flood risk. Taking into account climate change impacts on water supply and scarcity.
Air	Air pollution, particularly changes in areas where air quality is a known issue
Cultural heritage and the historic environment	Protection and enhancement of terrestrial and marine designated and undesignated heritage assets and the quality of the wider built environment
Landscape and geodiversity	Protection and enhancement of designated and undesignated landscape and seascape, and geodiversity
Material assets	Existing resources and development of new material assets Sustainable materials and sustainable use of resources Circular economy, waste production and management

3.24 The findings from the SEA of the draft Energy Strategy and Just Transition Plan are presented as a narrative for each component of the draft Energy Strategy and Just Transition Plan in the main body of the Environmental Report.

3.25 The narrative reflects the significance of the effect. In order to determine significance the text considers the following factors (see **Table 3.2**):

- The **magnitude** of the draft Energy Strategy and Just Transition Plan's effects, including the degree to which the plan sets a framework for projects, the degree to which it influences other plans and environmental problems relevant to the draft Energy Strategy and Just Transition Plan.
- The **sensitivity** of the receiving environment, including the value and vulnerability of the area, exceeded environmental quality standards, and effects on designated areas or landscapes.
- The **effect characteristics**, including probability, duration, frequency, reversibility, cumulative effects, transboundary effects, risks to human health or the environment, and the magnitude and spatial extent of the effects.

3.26 The likely effects of the objectives and actions scoped into the assessment need to be determined and their significance assessed, which inevitably requires a series of judgments to be made.

Mitigation and monitoring proposals and opportunities for enhancement

3.27 A key part of the SEA process is the identification of mitigation for adverse effects and opportunities to enhance benefits, in addition to the development of proposals for monitoring post adoption. It is anticipated that existing initiatives such as the Scottish Government's Hydrogen Policy Statement and Climate Change Plan update may contribute to the delivery of the monitoring requirements identified in the SEA. Where possible, existing data sources, environmental indicators and monitoring programmes will be identified in the SEA.

3.28 Any recommendations for monitoring made in the SEA process are likely to focus on areas where the assessment identifies the potential for significant environmental effects, and the need to address data gaps. These are likely to be linked to the implementation of mitigation or enhancement measures where appropriate.

Difficulties encountered

3.29 Difficulties encountered included understanding the implications of some policy positions where, although an activity may not be supported within Scotland, there may be continued reliance on imports, for example coal which is used for manufacturing. Therefore the impact of the policy position relates to the direct environmental effects of extraction within Scotland, but not the climatic impacts of continued use and transport of these fuel sources.

3.30 There was also a lack of detail on the scale of some of the policy actions, which meant it was more challenging to determine whether effects were minor or significant, particularly in relation to climatic factors.

3.31 There is also uncertainty regarding the environmental impacts of activities such as hydrogen production and water use, or uncertainty over the location of development and impact on the significance.

Chapter 4
Context of the Draft Energy Strategy and Just Transition Plan

Relationship with other Plans, Programmes and Strategies and Environmental Objectives

Introduction

4.1 The draft Energy Strategy and Just Transition Plan is not being prepared in isolation and is greatly influenced by other plans, programmes and strategies (PPS), and by broader environmental objectives. The draft Energy Strategy and Just Transition Plan needs to be consistent with international and national guidance and strategic planning policies and should contribute to the goals of a wide range of other programmes and plans. It must also conform to environmental protection legislation and the environmental objectives established at the international, national and local level.

4.2 Schedule 3 of the 2005 Act requires:

- *(1) "An outline of the contents and main objectives of the plan or programme, and of its relationship (if any) with other qualifying plans and programmes.*
- *(5) The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation"*.

4.3 Chapter 2 has outlined the contents and main objectives of the Scottish Government's draft Energy Strategy and Just Transition Plan.

4.4 In order to establish a clear scope for the SEA, it is necessary to review and develop an understanding of the environmental objectives contained within international and national plans and programmes that are of relevance to the draft Energy Strategy and Just Transition Plan. The review is not, and cannot be, exhaustive. Appendix A identifies the relationship that the PPSs have with the development of the draft Energy Strategy and Just Transition Plan, and shows how the environmental objectives have been taken into account during the preparation of the SEA Framework. The following sections of this chapter provide an overview by SEA topic area of the overarching objectives considered most

relevant in the context of the preparation of the draft Energy Strategy and Just Transition Plan.

Climatic Factors

Environmental Protection Objectives

4.5 Scotland's ambition on tackling climate change is set out in the *Climate Change (Scotland) Act 2009* ("the 2009 Act")[30]. Through this legislation, Scotland contributes to international (EU and UN) efforts on climate change mitigation and adaptation. The 2009 Act creates the statutory framework for greenhouse gas (GHG) emissions reduction in Scotland and set targets for reduction in emissions of the seven Kyoto Protocol GHG.

4.6 *The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019*[31], amends the *Climate Change (Scotland) Act 2009*, and sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045 at the latest, with interim targets for reductions of at least 56% by 2020, 75% by 2030, 90% by 2040.

4.7 The 2019 Act also requires that annual GHG emissions targets are set, by Order, for all other years in the period 2021-2045, with the levels being determined directly from the long-term targets.

4.8 *The Climate Change Plan*[32] (2018) sets out a vision that by 2032 Scotland will have reduced its emissions by 66% relative to the 1990 baseline. Specifically, the emissions from electricity production are expected to fall by 28% within that period, emissions from buildings by 33%, emissions from transport by 37%, emissions from industries by 21%, emissions from waste by 52%, and emissions from agriculture by 9%. In addition, land use, land use change and forestry should sequester 6.7 $MtC0_2e$ by 2032. However, following the introduction of the 2019 Act, the Scottish Government has updated the *Climate Change Plan (CCPu)*[33] to deliver the net-zero GHG emissions target for 2045. The update to the Climate Change Plan[34] sets out policies and proposals for delivering emissions reductions out to 2032. The CCPu acknowledges that many of the solutions rely on further technological innovation, market development and wider take up and adoption, as well as action by others. It also commits to securing a just and green recovery which prioritises economic, social and environmental wellbeing, and responses to the twin challenges of the climate emergency and biodiversity loss.

4.9 The first *Scottish Energy Strategy*[35] (2017) set out priorities for the local and national energy sector in order to support Scotland's long term climate change targets. It identified how low carbon electricity and hydrogen can contribute to a largely decarbonised energy system by 2050. It also set the framework for the development of other sectoral plans, including the Hydrogen Action Plan, the Offshore Wind Policy Statement and Onshore Wind Policy Statement.

4.10 The *Scottish Climate Change Adaptation Programme* (the Adaptation Programme)[36] addresses the impacts identified for Scotland in the *UK Climate Change Risk Assessment* (CCRA)[37]. The Adaptation Programme sets out Scottish Ministers' objectives in relation to adaptation to climate change, their proposals and policies for meeting these objectives, and the period within which these proposals and policies will be introduced. The Programme also sets out the arrangements for wider engagement in meeting these objectives.

4.11 At the Paris Climate Conference (COP 21) in December 2015, 195 countries adopted the first ever universal, legally binding global climate deal. The *Paris Agreement* is a bridge between today's policies and climate-neutrality before the end of the century. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2ºC[38]. The deal also states that countries should aim for the even more ambitious target of 1.5ºC[39]. A number of other agreements were reached on key issues such as mitigation through reducing

[30] The Scottish Government (2009) Climate Change (Scotland) Act 2009 [online] Available at: http://www.legislation.gov.uk/asp/2009/12/contents (accessed 09/06/2022)

[31] Scottish Government (2019) The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 [online] Available at: http://www.legislation.gov.uk/asp/2019/15/enacted (accessed 09/06/2022)

[32] Scottish Government (2018) Climate Change Plan [online] Available at: https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018-9781788516488/ (accessed 04/02/2021)

[33] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/ (access 05/02/2021)

[34] Ibid.

[35] Scottish Government (2017) Scottish Energy Strategy: The future of energy in Scotland [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2017/12/scottish-energy-strategy-future-energy-scotland-9781788515276/documents/00529523-pdf/00529523-pdf/govscot%3Adocument/00529523.pdf?forceDownload=true (accessed 18/3/2021)

36 Scottish Government (2019) Climate Ready Scotland Scottish Climate Change Adaptation Programme 2019-2024 [online] Available at: https://www.gov.scot/publications/climate-ready-scotland-second-scottish-climate-change-adaptation-programme-2019-2024/ (accessed 09/06/2022)

37 UK Government (2022) UK Climate Change Risk Assessment [online] Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022 (accessed 09/06/2022)

[38] UNFCC (2016) The Paris Agreement [online] Available at: http://unfccc.int/paris_agreement/items/9485.php (accessed 09/06/2022)

[39] Ibid.

emissions, adaptation and loss and damage[40]. The Agreement entered into force on 4th November 2016[41].

4.12 Scotland's contribution to the Paris Agreement: Indicative Nationally Determined Contribution[42] draws together Scotland's ambitious policy framework and commitments to climate change action. This indicative Nationally Determined Contribution (iNDC) sets out Scotland's approach to tackling climate change, including a distinct framework of statutory emissions reduction targets, and a focus on the necessity and opportunities of a just transition to net-zero emissions that creates green jobs, tackles inequalities and nurtures wellbeing. In this, Scotland recognises climate change as a human rights issue and action on climate change to be fundamentally important to the future prosperity of Scotland's people and the planet.

4.13 The 2021 *IPCC Assessment Report*[43] is the sixth in a series of reports which assess scientific, technical, and socio-economic information concerning climate change. The Working Group I contribution to the Sixth Assessment Report addresses the most up-to-date physical understanding of the climate system and climate change, bringing together the latest advances in climate science, and combining multiple lines of evidence from paleoclimate, observations, process understanding, and global and regional climate simulations.

4.14 A total of 234 scientists from 66 countries contributed to the first of three working group reports. Working group 1 (WGI) published The Physical Science Basis of Climate Change. The report's authors built on more than 14,000 scientific papers to produce the report, which was then approved by 195 governments. According to the report, it is only possible to avoid warming of 1.5 °C or 2 °C if massive and immediate cuts in greenhouse gas emissions are made.

Overview of Baseline

4.15 In March 2022, the Intergovernmental Panel on Climate Change published a report which reaffirms that the impacts and costs of global warming 1.5ºC above pre-industrial levels will be far greater than expected. It also highlights that the impacts will be much worse if global warming reaches 2ºC or more. Urgency for action is required as the report predicts such a level of global warming can be reached by 2030, and most certainly within 20 years without major reductions in CO_2 emissions. The Scottish Government has recognised a climate emergency and is acting accordingly[44].

4.16 Based on the most recent Scottish Greenhouse Gas Statistics, in 2020, Scottish source emissions of the basket of seven greenhouse gases were estimated to be 40.0 million tonnes carbon dioxide equivalent (MtCO2e). This is 11.9% lower than the 2019 figure of 45.4 MtCO2e; a 5.4 MtCO2e decrease. The main contributors to this decrease between 2019 and 2020 were reductions in emissions in the Domestic Transport (-2.5 MtCO2e), International Aviation and Shipping (-1.1 MtCO2e), and Energy Supply (-0.8 MtCO2e) sectors.[45]

4.17 A 51% reduction in estimated GHG emissions between 1990 and 2020 was also reported[46]. At the level of national communications categories, transport (including international aviation and shipping), showed the third slowest rate of decarbonisation, and this sector was the largest contributor in 2020 with 10.3 MtCO2e.[47].

4.18 Land use, land use change and forestry play a crucial role in removing CO_2 from the atmosphere.

4.19 In towns and cities, urban woodlands, forests and trees not only improve the general public realm but also deliver cooling, shade, better air quality and absorb CO_2 emissions.

Evolution of the Baseline – Pressure, Trends and Key Points

4.20 Major contributors to Scotland's GHG emissions include the domestic transport sector (excluding international aviation and shipping) (9.5 (MtCO2e)), business (7.8 MtCO2e), agriculture (7.4 MtCO2e), energy supply (5.3MtCO2e) and the residential sector (6.0 MtCO2e). Minor contributions were recorded for international aviation and shipping, public sector buildings, waste management and industrial processes. Land use, land use change and forestry (LULUCF) used to be considered as a net-sink of GHG emissions. However, after revisions to the scope of the GHG inventory, LULUCF emissions are now shown to be a net source of GHG for all periods, as this revision included the effect of the historical drainage and rewetting of peatlands that were previously not included. LULUCF is now a net source of GHG emissions in

[40] Ibid.

[41] Ibid.

[42] Scottish Government (2021) Scotland's contribution to the Paris Agreement: indicative Nationally Determined Contribution. [online] Available at: https://www.gov.scot/publications/scotlands-contribution-paris-agreement-indicative-ndc/

[43] IPCC (2021) IPCC Sixth Assessment Report [PDF] Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf

[44] IPCC (2022) Climate Change 2022 – Impacts, Adaptation and Vulnerability, Summary for Policymakers. [PDF] Available at: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf (accessed 09/06/2022)

[45] Scottish Government (2022) Scottish Greenhouse Gas Statistics 2020 [online] Available at: https://www.gov.scot/news/scottish-greenhouse-gas-statistics-2020/

[46] Scottish Government (2022) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/Energy/?Section=WholeSystem&Chart=GHGEmissions

[47] Ibid.

Scotland emitting 0.5 MtCO2e of emissions in 2020 (in 1990 emissions were 6.1 MtCO2e)[48].

4.21 In 2020, carbon dioxide (CO_2) made up 65.8% of Scotland's GHG emissions[49]. During 2020, CO_2 was the main GHG emitted in most sectors, with the exception of agriculture and waste management sectors. Methane (followed by carbon dioxide and nitrous oxide) was the main gas emitted by the agriculture sector and almost all emissions emitted by the waste management sector were in the form of methane.

4.22 It is predicted that the greatest direct climate change-related threats for the UK are large increases in flood risk, exposure to high temperatures and heat waves; shortages in the public water supply and for agriculture, energy production and industry; substantial risks to UK wildlife and natural ecosystems risks to domestic and international food production and trade[50]. New and emerging pests and diseases, and invasive non-native species affecting people, plants and animals have also been noted as a research priority[51].

4.23 Scotland's soils and peatlands are the biggest terrestrial store of carbon with peatlands alone holding around 3,000 megatonnes tonnes of carbon[52]; 60 times more than carbon stored by trees and other vegetation[53]. Inshore and offshore waters also store a significant resource of blue carbon, with an estimated 18 million tonnes of organic carbon stored in the top 10 cm of sediments across Scotland's seas[54]. Stocks of carbon within the habitats and surface sediments of offshore Marine Protected Areas are estimated at 9.4 Mt organic carbon and 47.8 Mt inorganic carbon[55].

4.24 The extent of the effects of climate change will vary by location and projections indicate that climate change trends observed over the last century will continue and intensify over the coming decades. Key long-term climate change trends for Scotland are that weather may become more variable, typical summers will be hotter and drier, winter and autumn will be milder and wetter and sea levels will continue to rise[56] and this will have an impact on coastal landscapes. Increases in summer heat waves, extreme temperatures and drought, as well as an increase in the frequency and intensity of extreme precipitation events, are also expected[57]. Urban areas in particular will be exposed to extreme heat conditions.

4.25 Climate change has been identified as a primary pressure on many of the SEA topic areas (i.e. soil, water, biodiversity, cultural heritage and the historic environment). These pressures and predicted impacts have been discussed further under the individual SEA topics. The complex interaction between air quality and climate change has also been considered under the SEA topic of "Air Quality".

4.26 Climate change can also give rise to indirect impacts arising from mitigation and adaptation measures. For example, renewable energy is crucial to meeting Scotland's emissions reduction targets. However, individual technologies can have negative environmental impacts such as localised visual effects, changes in landscape and land use, and impacts on biodiversity, water, and air quality, amongst others.

4.27 The Covid-19 pandemic has posed new challenges and highlighted the scale of changes required for achieving Scotland's emissions reduction targets. Despite strict lockdown regulations imposed across the world and resulting temporary local improvements in air quality, evidence suggests that the direct effect of the pandemic-driven response will be negligible in the longer term. However, the same research highlights a window of opportunity to reduce emissions if the economic recovery is tilted towards green stimulus and reductions in fossil fuel investments[58]. Importantly, the pandemic has demonstrated that radical change can be achieved if necessary.

Energy use and storage

4.28 Energy storage is likely to be an increasingly important part of the transition to delivering clean, affordable and secure supplies of energy[59]. For example, the continued development

[48] Scottish Government (2022) Scottish Greenhouse Gas Emissions 2020. [PDF] Available at: https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-2020/

[49] Ibid

[50] Committee on Climate Change (2022) UK Climate Change Risk Assessment 2022. [online] Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022 (accessed 09/06/2022)

[51] ibid

[52] SNH (2019) Managing nature for carbon capture [online] Available at: https://www.nature.scot/professional-advice/land-and-sea-management/carbon-management/managing-nature-carbon-capture (accessed 09/06/2022)

[53] Ibid.

[54] SNH (2014) SNH Commissioned Report 761 – Assessment of carbon budgets and potential blue carbon stores in Scotland's coastal and marine environment. [online] Available at: https://www.nature.scot/snh-commissioned-report-761-assessment-carbon-budgets-and-potential-blue-carbon-stores-scotlands (accessed 09/06/2022)

[55] SNH (2017) SNH Commissioned Report No. 957: Assessment of Blue Carbon Resources in Scotland's Inshore Marine Protected Area Network. [online] Available at: https://www.nature.scot/snh-commissioned-report-957-assessment-blue-carbon-resources-scotlands-inshore-marine-protected-area (accessed 09/06/2022)

[56] Adaptation Scotland (2018) Climate trends and projections [online] Available at: https://www.adaptationscotland.org.uk/why-adapt/climate-trends-and-projections (accessed 14/02/2020)

[57] ibid

[58] Forster, P. et al. (7 August 2020) Current and future global climate impacts resulting from COVID-19. Nature Climate change. [online] Available at: https://www.nature.com/articles/s41558-020-0883-0 [accessed on 09/06/2022]

[59] ClimateXChange (2016) Energy Storage in Scotland - Summary of reports on thermal and electrical energy storage [PDF] Available at: https://www.climatexchange.org.uk/media/1391/summary_energy_storage.pdf (accessed 09/06/2022)

of battery storage technologies and hydrogen fuel cells for vehicle use in the transport sector.

4.29 Renewable electricity capacity has increased over the past year to 13.6 GW in September 2022, up 1.4 GW since September 2021. Final figures for 2021 show that the equivalent of 85.2% of gross electricity consumption in Scotland (total generation minus net exports) came from renewable sources. 57.0% of all electricity generated in 2021 in Scotland was from renewable sources and 87.8% was from low carbon sources[60].

4.30 Renewable electricity capacity increased between September 2021 to September 2022 due to increases in onshore and offshore wind capacity. Overall wind energy generation in quarter 1 to quarter 3 of 2022 was 19,376 GWh, with hydro generation providing 3.243 GWh[61].

4.31 The majority of renewable capacity in Scotland comes from large installations, however, small-scale installations are also important. Solar capacity has increased in recent years[62], and whilst the current capacity of wave and tidal is considered to be relatively small, the technology is developing[63].

4.32 As Scotland's energy mix changes over the next few years, the electricity network (grid) that supports the balance between energy generation and demand will change significantly. Infrastructure will play a key role in ensuring security of supply and decarbonising our energy systems in the most cost effective, affordable way[64].

Population and Human Health

Environmental Protection Objectives

4.33 Many existing environmental protection objectives are relevant to population and human health, either directly or indirectly. For example, the *Air Quality Standards (Scotland) Regulations 2010*[65], the *Air Quality (Scotland) Regulations 2000*[66], the *Air Quality (Scotland) Amendment Regulations 2002*[67] and the *Air Quality (Scotland) Amendment Regulations 2016*[68] help set out current objectives and requirements for air quality with clear relevance for human health. Protection is also afforded through existing legislation against noise and vibration nuisance at both the European level through the *Environmental Noise Directive (2002/49/EC)*[69] and the national level through regulations such as the *Environmental Noise (Scotland) Regulations 2006*[70].

4.34 The *Pollution Prevention and Control (Scotland) Regulations 2012*[71] (PPC Regulations) also seek to provide protection for human health. The PPC Regulations introduce a consistent and integrated approach to environmental protection to ensure that industrial activities that may have a significant impact on the environment are strictly regulated. The regulations were designed to eliminate or minimise emissions to air, water and land and extended pollution controls to previously unregulated sectors.

4.35 *Cleaner Air for Scotland 2 – Towards a Better Place for Everyone*[72] sets out a long-term vision for air quality in Scotland by detailing how the Scottish Government and its partner organisations aim to reduce air pollution. As a result, this strategy will lead to improved human health, wellbeing, environment, placemaking and sustainable economic growth. Lastly, it will fulfil Scotland's legal responsibilities to reduce emissions.

4.36 Protection against disturbance, particularly from noise and vibration, has been set out in the Environmental Protection Act 1990[73] and Environmental Noise (Scotland) Regulations 2006[74], the latter resulting in various noise action plans[75], whilst the Pollution Prevention and Control (Scotland)

[60] Scottish Government (2022) Energy Statistics for Scotland – Q3 2022. [online] Available at: https://www.gov.scot/publications/energy-statistics-for-scotland-q3-2022/
[61] Energy Statistics for Scotland – Q3 2022. Available at https://www.gov.scot/publications/energy-statistics-for-scotland-q3-2022/pages/renewable-electricity-generation/
[62] Scottish Renewables (2021) Statistics [online] Available at: https://www.scottishrenewables.com/our-industry/statistics (accessed 09/06/2022)
[63] Ibid
[64] DECC (2015) Towards a Smart Energy System [PDF] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/486362/Towards_a_smart_energy_system.pdf (accessed 09/06/2022)
[65] The Air Quality Standards (Scotland) Regulations 2010 [online] Available at: http://www.legislation.gov.uk/ssi/2010/204/contents/made (accessed 09/06/2022)
[66] Scottish Government (2000) The Air Quality (Scotland) Regulations 2000 [online] Available at: http://www.legislation.gov.uk/ssi/2000/97/made (accessed 09/06/2022)
[67] Scottish Government (2002) The Air Quality (Scotland) Amendment Regulations 2002 [online] Available at: http://www.legislation.gov.uk/ssi/2002/297/introduction/made (accessed 09/06/2022)
[68] The Air Quality (Scotland) Amendment Regulations 2016 [online] Available at: http://www.legislation.gov.uk/sdsi/2016/9780111030837/contents (accessed 14/02/2020)
[69] Environmental Noise Directive 2002/49/EC [online] Available at: http://ec.europa.eu/environment/noise/directive_en.htm (accessed 14/02/2020)
[70] Environmental Noise (Scotland) Regulations 2006 [online] Available at: http://www.legislation.gov.uk/ssi/2006/465/made (accessed 14/02/2020)
[71] The Pollution and Prevention Control (Scotland) Regulations 2012 [online] Available at: http://www.legislation.gov.uk/ssi/2012/360/contents/made (accessed 14/02/2020)
[72] Scottish Government (2021) Cleaner air for Scotland 2 – Towards a Better Place for Everyone [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-2-towards-better-place-everyone/documents/ (accessed 09/06/2022)
[73] Environmental Protection Act 1990 [online] Available at: http://www.legislation.gov.uk/ukpga/1990/43/contents (accessed 11/05/2022)
[74] The Environmental Noise (Scotland) Regulations 2006, SSI 2006 No. 465 [online] Available at: http://www.legislation.gov.uk/ssi/2006/465/made (accessed 11/05/2022)
[75] Scottish Government (undated) Pollution: noise and nuisance [online] Available at: https://www.gov.scot/policies/pollution/noise-nuisance/ (accessed 11/05/2022)

Regulations 2000[76] seek to manage the impacts of industrial activities.

4.37 Physical health and access to the outdoors is covered by legislation and plans such as the Land Reform (Scotland) Act 2016[77] and the Active Scotland Delivery Plan[78]. Scotland's Active Travel Framework consolidates policies to improve the update of walking and cycling in Scotland[79].

4.38 The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act[80] sets statutory targets for reducing fuel poverty and was followed by the Fuel Poverty Strategy[81], which sets out how these targets are to be met.

4.39 Other plans and strategies which contain environmental objectives include the National Transport Strategy 2, which contains priorities to "reduce inequalities" and "improve our health and wellbeing"[82]. National Planning Framework 4 (NPF4) commits to a low carbon economy whilst ensuring sustainable places.

4.40 *Just Transition Commission: A National Mission for a fairer, greener Scotland*[83] started work in early 2019, with a remit to provide practical and affordable recommendations to Scottish Ministers. The report sets out some of the key challenges that need to be addressed to deliver a just transition in Scotland. It recommends practical steps that could be taken. Finally, the report looks ahead to the future of just transition in Scotland and considers what arrangements may be needed to maintain momentum behind this agenda.

4.41 *Just Transition: A Fairer, Greener Scotland – Scottish Government's response to the report of the Just Transition Commission*[84] sets out a long-term vision for just transition and provides details on the National Just Transition Planning Framework. It also outlines how Government will be held accountable for the delivery of a just transition.

Overview of Baseline

4.42 The estimated population of Scotland in 2021 was nearly 5.48 million, the highest to date, and has increased by 0.25% from 2020 [85].

4.43 Approximately 71% of Scotland's people live in urban areas, which accounts for just 2.3% of Scotland's land surface[86]. Most of the population and industry is concentrated in highly urbanised areas in the Central Belt and on the East Coast, and primarily in four key city regions (Aberdeen, Dundee, Edinburgh, and Glasgow) and several smaller cities and towns (e.g. Ayr, Inverness, Perth and Stirling). Around 12.4% of the population live in small towns of less than 10,000 people; of these, around 70% are located within a 30-minute drive of large urban settlements, with the other 30% located more remotely[87].

4.44 The Scottish Index of Multiple Deprivation ranks small areas (data zones) in Scotland from the most deprived to the least deprived. It analyses data from several indicators across the domains of income, employment, health, education, skills and training, housing, geographic access and crime. Key findings from the 2020 Index show that 14 areas have been consistently among the 5% most deprived in Scotland since the 2004 Index. Of these, 9 were in Glasgow City with the remainder located in Inverclyde, Renfrewshire, Highland, North Lanarkshire and North Ayrshire. Six council areas now have a larger share of the 20% most deprived data zones in Scotland compared to 2016, with the largest increases observed in Aberdeen City, North Lanarkshire, Moray, East Lothian, Highland and North Ayrshire[88].

Evolution of the Baseline

4.45 Air quality is important for both short and long-term human health. In general, healthy people may not suffer from any serious health effects from short-term exposure to the levels of pollution commonly experienced in urban environments. However, continual exposure can cause harm

[76] The Pollution and Control (Scotland) Regulations 2000, SSI 2000 No. 323 [online] Available at: http://www.legislation.gov.uk/ssi/2000/323/contents/made (accessed 11/05/2022)
[77] Land Reform (Scotland) Act 2016 [online] Available at: https://www.legislation.gov.uk/asp/2016/18/contents (accessed 24/05/2022)
[78] Scottish Government (2018) Active Scotland Delivery Plan [online] Available at: https://www.gov.scot/publications/active-scotland-delivery-plan/ (accessed 24/05/2022)
[79] Transport Scotland (2020) Active Travel Framework [online] Available at: https://www.transport.gov.scot/publication/active-travel-framework-1/ (accessed 24/05/2022)
[80] Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 [online]
[81] Scottish Government (2021) Tackling Fuel Poverty in Scotland [online] Available at: https://www.gov.scot/publications/tackling-fuel-poverty-scotland-strategic-approach/ (accessed 24/05/2022)
[82] Transport Scotland (2020) National Transport Strategy 2 [online] Available at: https://www.transport.gov.scot/publication/national-transport-strategy-2/(accessed 25/05/2022)
[83] Scottish Government (2021) Just Transition Commission: A National Mission for a fairer, greener Scotland [online] Available at: https://www.gov.scot/publications/transition-commission-national-mission-fairer-greener-scotland/
[84] Scottish Government (2021) Just Transition - A Fairer, Greener Scotland: Scottish Government response [online] Available at: https://www.gov.scot/publications/transition-fairer-greener-scotland/documents/ (accessed 14/10/2021)
[85] National Records for Scotland (2022) Mid-2021 population estimates . [PDF] Available at: https://www.nrscotland.gov.uk/files//statistics/population-estimates/mid-21/mid-year-pop-est-21-report.pdf (accessed 016/02/2023)
[86] Scotland's Environment (2014) Scotland's State of the Environment Report 2014 – 7 People and the environment [PDF] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 09/06/2022)
[87] ibid
[88] Scottish Government (2020) Introducing - The Scottish Index of Multiple Deprivation 2020 [online] Available at: https://www.gov.scot/publications/scottish-index-multiple-deprivation-2020/ (accessed 09/06/2022)

over the long term, and those with pre-existing health conditions such as heart disease, lung conditions, and asthma can be adversely impacted by exposure to air pollutants[89]. Research has shown that air pollution is one of the largest environmental risks to public health in the UK, reducing average life expectancy and often contributing to premature deaths[90]. Activities that generate air pollutants have been considered under the topic of Air Quality.

4.46 Transport is a significant contributor to poor air quality in urban areas[91] and Scotland's transport emissions in 2019 were 2.2% lower than in 2018, and 6.3% lower than in 1990[92]. However, 40% of car journeys are less than two miles in length and could be potentially covered by bicycle or on foot[93]. In addition to helping to reduce GHG emissions, active travel, such as cycling or walking, can provide access to the outdoors with additional benefits for physical and mental health and wellbeing, including reducing obesity and stress. Due to several common sources, most notably road traffic in urban areas, there is also a close relationship between air quality and environmental noise[94].

4.47 The Covid-19 pandemic has had a significant impact on transport statistics, complicating the datasets: for example, public transport journeys fell by 70%, with 153 million public transport journeys made by either bus, rail, air, or ferry in 2020-21. This was down from 502 million in 2019-20[95]. The pandemic saw a significant decrease in traffic on the roads, however, before the pandemic, private car use was gradually increasing; the 2019 statistics showed that a record 3 million motor vehicles were licensed[96]. Therefore, baseline data has to be contextualised against the impact the Covid-19 pandemic has had on how and how often people travel.

4.48 Heating and cooling homes and businesses accounts for approximately half of Scotland's GHG emissions. Challenging weather, poor energy efficiency and reduced heating options (especially in rural areas) can make fuel bills unaffordable, resulting in fuel poverty[97]. In 2019, the estimated rate of fuel poverty remained similar to the previous year at approximately 24.6% or around 613,000 fuel poor households, and 12.4% or 311,000 households were living in extreme fuel poverty[98]. This is similar to the 25% or 619,000 fuel poor households in 2018, with 11.3% (279,000 households) living in extreme fuel poverty[99].

Air

Environmental Protection Objectives

4.49 Scotland's air quality environmental protection objectives are largely derived from the *EC Air Quality Directive* (2008/50/EC)[100] and the *4th Air Quality Daughter Directive* (2004/107/EC)[101], via the *Air Quality Standards (Scotland) Regulations 2010*[102] which transpose these Directives into the Scottish context. There are also domestic objectives as part of the Local Air Quality Management system set under the *Environment Act 1995*[103] and associated regulations[104]. These objectives are largely aimed at reducing air emissions that are potentially harmful to human health and the environment, and together they set out the requirement for monitoring with a particular focus on areas where air pollution is concentrated.

[89] Scotland's Environment (2016) Air quality and health [online] Available at: https://www.environment.gov.scot/our-environment/air/air-quality-and-health/ (accessed 09/06/2022)

[90] Scottish Government (2019) Cleaner Air for Scotland strategy: independent review [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-strategy-independent-review/pages/6/ (accessed 09/06/2022)

[91] Scotland's Environment (2016) Air quality [online] Available at: https://www.environment.gov.scot/our-environment/air/air-quality/ (accessed 09/06/2022)

[92] Scottish Government (2021) Scottish Transport Statistics 2021. [online] Available at: https://www.transport.gov.scot/publication/scottish-transport-statistics-2021/chapter-summary-summary-accessible-chapter/ [Accessed on 178/02/2023]

[93] Transport Scotland (undated) Walking and cycling [online] Available at: https://www.transport.gov.scot/our-approach/active-travel/walking-and-cycling/#42959 (accessed 09/06/2022)

[94] Scottish Government (2019) Cleaner Air for Scotland strategy: independent review [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-strategy-independent-review/pages/6/ (accessed 09/09/2020)

[95] Transport Scotland (2022) Scottish Transport Statistics 2021 [PDF] Available at: https://www.transport.gov.scot/media/51299/summary-chapter-scottish-transport-statistics-2021.pdf

[96]Transport Scotland (2019) Scottish Transport Statistics, p.12 [PDF] Available at: https://www.transport.gov.scot/media/47300/scottish-transport-statistics-2019.pdf

[97] Scottish Government (undated) Home energy and fuel poverty [online] Available at: https://www.gov.scot/policies/home-energy-and-fuel-poverty/ (accessed 09/06/2022)

[98] Scottish Government (2020) Scottish house condition survey: 2019 key findings [online] Available at: https://www.gov.scot/publications/scottish-house-condition-survey-2019-key-findings/pages/6/ (accessed 09/06/2022)

[99] ibid

[100] The European Parliament and the Council of the European Union (2008) Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe [PDF] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0050&from=en (accessed 09/06/2022)

[101] The European Parliament and the Council of European Union (2004) Directive 2004/107/EC of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air [PDF] Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF (accessed 09/06/2022)

[102] The Air Quality Standards (Scotland) Regulations 2010 [PDF] Available at: http://www.legislation.gov.uk/ssi/2010/204/pdfs/ssi_20100204_en.pdf (accessed 09/06/2022)

[103] Environment Act 1995, c.25 [online] Available at: http://www.legislation.gov.uk/ukpga/1995/25/introduction (accessed 09/06/2022)

[104] Scottish Government (2016) Local Air Quality Management policy guidance [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/03/local-air-quality-management-policy-guidance-scotland/documents/00507617-pdf/00507617-pdf/govscot%3Adocument/00507617.pdf (accessed 09/06/2022)

4.50 The Air Quality (Amendment etc.) (EU Exit) (No. 1) Regulations 2018 contain amendments to directly applicable EU legislation. The Air Quality (Amendments) (EU Exit) (No. 2) Regulations 2018 contain amendments to EU-derived domestic legislation. There are also domestic objectives as part of the Local Air Quality Management system set under the *Environment Act 1995*[105] and associated regulations[106]. Scotland's *PPC Regulations* (2012)[107] allow for the regulation and monitoring of certain industrial activities that can generate airborne pollution. Together, they set a requirement for monitoring air quality with a particular focus on areas where air pollution is concentrated and seek to identify the sources.

4.51 These objectives are largely aimed at reducing air emissions that are potentially harmful to human health and the environment, and together they set out the requirement for monitoring with a particular focus on areas where air pollution is concentrated.

4.52 Scotland's *PPC Regulations* (2012)[108] allow for the regulation and monitoring of certain industrial activities in Scotland that can generate airborne pollution. Together with the *Air Quality Standards (Scotland) Regulations 2010*[109], the PPC Regulations enable regulators to monitor, manage and ultimately, improve Scottish air quality. It also sets a requirement for monitoring of air quality with a particular focus on areas where air pollution is concentrated and seeks to identify the sources.

4.53 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[110] sets out long term air quality objectives and policy options to further improve air quality in the UK. The strategy focuses on tackling the key air pollutants to air in the UK which include Particulate Matter (PM-PM10 and PM2.5), oxides of nitrogen (Nox), Ozone, sulphur dioxide, polycyclic aromatics hydrocarbons (PAHs), benzene, 1,3–butadiene, carbon monoxide, lead and ammonia. It sets out specific national objectives that consider European Directive limits and target values for protecting human health.

4.54 *Cleaner Air for Scotland 2 (CAFS 2) – Towards a Better Place for Everyone*[111] is the Scottish Government's new air quality strategy setting out how the Scottish Government will continue to deliver air quality improvements over the next five years. It supports Scotland's vision of having the best air quality in Europe. The actions set out in this strategy are built on the work of an independently-led review of Cleaner Air for Scotland completed in 2019.

4.55 The *Delivery Plan* for Cleaner Air for Scotland 2[112] is structured around 10 priorities which reflect the 10 high level themes from the independently led review of Cleaner Air for Scotland completed in 2019. These are:

1. Health
2. Integrated Policy
3. Placemaking
4. Data
5. Behaviour Change
6. Industrial Emissions Regulation
7. Tackling Non-Transport Emissions Sources
8. Transport
9. Governance, Accountability and Delivery
10. Further Progress Review

4.56 The delivery plan builds on the consultation exercise undertaken to inform CAFS 2, with its development continuing to engage with a range of partners. The plan outlines the Scottish Government's priorities, outcomes and actions as well as delivery timescales. It encompasses actions being led or supported by the Scottish Environment Protection Agency (SEPA), Transport Scotland, NatureScot, Local Authorities and Health Protection Scotland.

Overview of Baseline

4.57 As discussed in 'Population and Human Health', air pollution can result in adverse impacts on human health and can significantly affect many aspects of quality of life. Air

[105] Environment Act 1995, c.25 [online] Available at: http://www.legislation.gov.uk/ukpga/1995/25/introduction (accessed 04/02/2021)

[106] Scottish Government (2016) Local Air Quality Management policy guidance [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/03/local-air-quality-management-policy-guidance-scotland/documents/00507617-pdf/00507617-pdf/govscot%3Adocument/00507617.pdf (accessed 04/02/2021)

[107] Scottish Parliament, The Pollution Prevention and Control (Scotland) Regulations 2012 [PDF] Available at: http://www.legislation.gov.uk/sdsi/2012/9780111018408/pdfs/sdsi_9780111018408_en.pdf (accessed 04/02/2021)

[108] Scottish Parliament, The Pollution Prevention and Control (Scotland) Regulations 2012 [PDF] Available at: http://www.legislation.gov.uk/sdsi/2012/9780111018408/pdfs/sdsi_9780111018408_en.pdf (accessed 09/06/2022)

[109] The Air Quality Standards (Scotland) Regulations 2010 [PDF] Available at: http://www.legislation.gov.uk/ssi/2010/204/made/data.pdf (accessed 09/06/2022)

[110] DEFRA, Scottish Executive, Welsh Assembly Government and DENI (2007) The Air Quality Strategy for England Scotland Wales and Northern Ireland [PDF] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf (accessed 09/06/2022)

[111] Scottish Government (2021) Cleaner Air for Scotland 2: delivery plan [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-2-delivery-plan/

[112] Scottish Government (2021) Cleaner Air for Scotland 2: delivery plan [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-2-delivery-plan/

pollution can also cause adverse effects in the wider environment. For example, it can increase nutrient levels in water bodies and soil and contribute to acidification, both of which can impact on plant and animal life, as well as damage the fabric of buildings and monuments.

4.58 The quality of the air around us is affected by the pollutants released into the atmosphere through human activities, such as transport, industry and agriculture as well as pollutants arising from natural sources. The main air pollutants are nitrogen oxides (NO_x), particulate matter (PM_x), sulphur dioxide (SO_2), ammonia (NH_3), volatile organic compounds (VOCs), and ozone (O_3). Sulphur dioxide, oxides of nitrogen, particulates, and low-level ozone are generally considered to be of most importance in relation to human health and the environment[113].

Evolution of the Baseline – Pressure, Trends and Key Points

4.59 Air quality in Scotland has improved considerably over the last few decades. Between 2005 and 2020 there were decreases of 62% for carbon monoxide (CO), 61% for nitrogen oxides (NO_x), 19% for non-methane volatile organic compounds, 46% for fine particulate matter (PM_{10}) and 96% for SO_2[114]. However, air pollution is estimated to reduce the life expectancy of every person in Scotland by three to four months[115] and there are some areas of towns and cities where air quality has been identified as a concern.

4.60 Section 83(1) of the *Environmental Act 1995*[116] sets out a requirement that where air quality objectives are not being met or are unlikely to be met within the relevant period, Local Authorities must designate an Air Quality Management Area (AQMA). In Scotland 38 AQMAs have currently been declared, with 15 of Scotland's 32 Local Authorities having declared at least one. The majority of these are in urban areas as a result of NO_x alone or in combination with PM_{10} levels, and primarily as a result of traffic emissions[117].

4.61 Air pollution often originates from the same activities that contribute to climate change; notably transport, agriculture and energy generation. Transport is the most significant source contributing to poor air quality in urban areas[118]. While measures such as using alternative fuels sources and encouraging active travel can help improve air quality in addition to reducing GHG emissions, some measures aimed at reducing the impacts of climate change can also have a negative impact on air quality. For example, while emissions from well operated and well-maintained modern biomass boilers are generally lower than the coal equivalent, the burning of biomass feedstock does emit air pollutants such as particulates[119].

4.62 Cleaner air provides multiple benefits and actions taken to reduce air pollution, such as a shift towards low or zero emissions transport and energy sources, should provide mutual benefits for both air quality and climate change[120].

Soil and Geology

Environmental Protection Objectives

4.63 The importance of soil as a resource is recognised internationally through the *European Commission's Soil Strategy for 2030* [121]. Nationally, the protection of prime quality agricultural land and peatlands is set out in the *Scottish Soil Framework*[122], *Scotland's National Peatland Plan*[123] and the *Scottish Government's Onshore Wind Policy Statement 2022*[124].

4.64 The European Union Thematic Strategy for Soil Protection identifies the key soil threats as erosion, floods and landslides, loss of soil organic matter, salinisation, contamination, compaction, sealing, and loss of soil

[113] Scotland's Environment (2014) Scotland's State of the Environment Report 2014 [PDF] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 09/06/2022)

[114] National Atmospheric Emissions Inventory (2020) Air Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 2005-2020 [online] Available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2210251052_DA_Air_Pollutant_Inventories_2005-2020_FINAL_v1.2.pdf

[115] Scottish Government (2020) Air Quality – Summary knowledge account [online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/02/environment-strategy-scotland-vision-outcomes/documents/air-quality-knowledge-account/air-quality-knowledge-account/govscot%3Adocument/air-quality-knowledge-account.pdf

[116] Environment Act 1995, c.25 [online] Available at: http://www.legislation.gov.uk/ukpga/1995/25/introduction (accessed 09/06/2022)

[117] Air Quality in Scotland (2018) Air Quality Management Areas [online] Available at: http://www.scottishairquality.co.uk/laqm/aqma (accessed 09/06/2022)

[118] Scotland's Environment (2016) Air quality [online] Available at: https://www.environment.gov.scot/our-environment/air/air-quality/ (accessed 09/06/2022)

[119] ibid

[120] Scottish Government (2021) Cleaner air for Scotland 2: towards a better place for everyone [online] Available at: https://www.gov.scot/publications/cleaner-air-scotland-2-towards-better-place-everyone/ (accessed 09/06/2022)

[121] European Commission (2021) EU Soil Strategy for 2030 [online] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0699 accessed 16/01/2023)

[122] The Scottish Government (2009) The Scottish Soil Framework [online] Available at: https://www.gov.scot/publications/scottish-soil-framework/ (accessed 09/06/2022)

[123] SNH (2015) Scotland's National Peatland Plan, Working for our Future [online] Available at: https://www.nature.scot/scotlands-national-peatland-plan-working-our-future (accessed 09/09/2020)

[124] The Scottish Government (2022) Onshore Wind Policy Statement [online] Available at: https://www.gov.scot/publications/onshore-wind-policy-statement-2022/pages/1/#:~:text=The%20Onshore%20Wind%20Policy%20Statement,an%20onshore%20wind%20sector%20deal . (accessed 11/01/2023)

biodiversity.[125] Scottish policy and guidance includes the protection of valued soils such as prime quality agricultural land and peatlands in the Scottish Soil Framework[126]. NPF4 also sets out the commitment to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development. The Scottish Government has developed a carbon calculator to allow developers to calculate potential carbon losses and savings from windfarms on peatland.[127] Work is underway to assess the operation of, and if necessary update or replace, the carbon calculator. The Scottish Government will ensure that adequate tools and guidance are available to inform the assessment of net carbon impacts of development proposals on peatlands and other carbon-rich soils.

4.65 Geological sites receive protection through the designation of geological Sites of Special Scientific Interest (SSSIs) at the national level and at the international recognition through establishment of a network of Geoparks[128].

Overview of Baseline

4.66 Soil is a non-renewable resource and is fundamentally one of Scotland's most important assets[129]. It supports a wide range of natural processes and underpins much of our natural environment, helping to provide a wide range of environmental, economic and societal benefits. For example, soil provides the basis for food, controls and regulates environmental interactions such as regulating the flow and quality of water, and providing a platform for buildings and roads[130]. There is an intrinsic relationship between soil health and other environmental topics; biodiversity, water and air quality in particular. For example, soil erosion is one of the main contributors to diffuse water pollution[131].

4.67 Soils can play two significant roles with regards to carbon. It is estimated that Scotland's soils contain over 3 billion tonnes of historic carbon, 60 times the amount of carbon held in trees and plants, making up over 53% of the UK's soil carbon[132]. It is estimated that the loss of just 1% of soil carbon as carbon dioxide would triple Scotland's annual GHG emissions[133]. However, soil has also capacity to continue removing atmospheric carbon dioxide through additional sequestration.

4.68 Degraded soil can act as a net carbon emitter, soils in good condition protect the carbon store and depending on the vegetation cover can continue to sequester carbon. Land use change and management practices can impact significantly on soil carbon stores and sequestration. Energy infrastructure also poses a significant risk to soil.

4.69 Peatlands are of particular importance for mitigating climate change by acting as carbon 'sinks'. If peatlands are in good condition, they have the ability to deposit and continually sequester new carbon in peat-forming vegetation. Peatlands in Scotland extend over large areas of Scottish uplands but are most extensive in the north and west in areas with gentle slopes and poor drainage[134]. Blanket bog is the most extensive semi-natural habitat in Scotland covering around 23% of the land area[135]. Approximately 1.6 billion tonnes of the carbon stored in Scottish soils is within peat[136]. As with all soils, peats are at risk from land use change and the effects of climate change, and their loss or degradation (and the associated loss of carbon) has the potential to be a significant contributor to Scotland's GHG emissions[137]. If Scotland lost all of the carbon stored in its peat soils as CO_2, it would be the equivalent of more than 120 times Scotland's annual GHG emissions. It is estimated that over 80% of Scotland's peatlands are degraded[138].

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[125] Commission of European Communities (2006) Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Thematic Strategy for Soil Protection [online] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0231 (accessed 25/05/2022)

[126] The Scottish Government (2009) The Scottish Soil Framework [online] Available at: https://www.gov.scot/publications/scottish-soil-framework/ (accessed 25/05/2022)

[127] Scottish Government (2021) Carbon calculator for wind farms on Scottish peatlands [online] Available at: https://www.gov.scot/publications/carbon-calculator-for-wind-farms-on-scottish-peatlands-factsheet/ (accessed 25/05/2022)

[128] SNH (undated) Geoparks [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/geopark (accessed 09/06/2022)

[129] NatureScot (2020) Scotland's Soils Available at: https://www.nature.scot/landforms-and-geology/scotlands-rocks-landforms-and-soils/scotlands-soils (accessed 16/01/2023)

[130] Scottish Government (2009) The Scottish Soil Framework [online] Available at: http://www.scotland.gov.uk/Publications/2009/05/20145602/0 (accessed 09/69/2022)

[131] SEPA (undated) Soil [online] Available at: http://www.sepa.org.uk/environment/land/soil/#effect (accessed 09/06/2022)

[132] Scotland's Soils – part of Scotland's Environment (2017) State of Scotland's soils – State of Scotland's Soil Report 2011 [online] Available at: http://soils.environment.gov.scot/soils-in-scotland/state-of-scotlands-soils/ (accessed 09/06/2022)

[133] ibid

[134] SNH (2014) Commissioned Report No. 701 - Scotland's peatland – definitions & information resources [PDF] Available at: https://www.nls.uk/e-monographs/2014/701.pdf (accessed 09/06/2022)

[135] ibid

[136] Climate X Change (2018) Soil Carbon and Land Use in Scotland Final Report [PDF] Available at: www.climatexchange.org.uk/media/3046/soil-carbon-and-land-use-in-scotland.pdf (accessed 09/06/2022)

[137] Scotland's Soils – part of Scotland's Environment (undated) Welcome to Scotland's soils [online] Available at: http://soils.environment.gov.scot/ (accessed 09/06/2022)

[138] Scotland's Environment (2019) Peatland Restoration [online] Available at: https://soils.environment.gov.scot/resources/peatland-restoration/ (accessed 09/06/2022)

Evolution of the Baseline – Pressures, Trends and Key Points

4.70 While Scotland's soils are considered to generally be in good health, there are a range of pressures on them. Climate change and loss of organic matter pose significant threats to Scottish soils, with both likely to affect soil function, including loss of soil carbon. The loss of valued soils in particular has the potential for national impacts which will be difficult to reverse. In the case of climate change, these impacts have the potential to be felt on a global scale[139]. As such, the management and use of these resources can affect the amount of CO_2 that is held or released. Peatlands in good condition remove CO_2 from the atmosphere and store carbon in the soil. Conversely, degraded peatlands may emit more CO_2 than they remove and become a net source of greenhouse gases[140].

4.71 Changes in land use and land management practices are also a key pressure on soil. These include activities such as energy infrastructure, transport and development including road building, and the expansion of agriculture and forestry[141]. At present, there is uncertainty and a lack of quantitative information regarding threats to soil functions and ecosystem services, particularly in relation to the extent of soil sealing, changes in soil biodiversity, and compaction of soils[142]. Estimates suggest the cost of soil erosion in Scotland is between £31 million and £49 million[143]. Estimates of soil sealing suggest figures of approximately 1000 hectares a year[144]. Soil contamination can also arise from many causes, including atmospheric deposition, agriculture and forestry operations, mining and historic land contamination, and can impact on soil function and biodiversity[145].

4.72 There are around 895 important rock and landform sites in Scotland of which approximately 75% are protected as notified Earth science features in SSSIs; their condition is monitored under Scottish Natural Heritage's site monitoring programme[146]. Furthermore, Edinburgh, West Lothian, East Dunbartonshire, Glasgow and East Lothian have completed local geodiversity audits, which note geodiversity resources and provide information about them[147].

Water

Environmental Protection Objectives

4.73 The condition of all Scottish water bodies is implemented by the Water Environment and Water Services (Scotland) Act 2003 as amended by the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019 and reflecting the original Water Framework Directive requirements, as part of retained EU Law. The legislation governs objectives for rivers, lochs, transitional waters, coastal waters and groundwater resources. The Water Framework Directive requires assessment of both chemical and ecological status, alongside the requirement to consider the status of biodiversity as an indicator in determining water quality. The Water Environment (Controlled Activities) (Scotland) Regulations 2011, The Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations 2013, and The Pollution Prevention and Control (Scotland) Regulations 2012 were all amended by the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019 to ensure they retained effect post the UK's exit from the EU. These regulations collectively aim to improve the overall condition of water bodies and control pollution relating to industry discharges.

4.74 Objectives relating to the condition of all water bodies are set through the *Water Framework Directive*[148]*(WFD)*, which governs objectives for rivers, lochs, transitional waters, coastal waters and groundwater resources. The Water Framework Directive sets out the requirement for an assessment of both chemical and ecological status, alongside the requirement to consider the status of biodiversity as an indicator in determining water quality.

4.75 These objectives are set in the Scottish context in a range of water, coastal and marine policies. Scotland's two River Basin Management Plans (RBMPs)[149] aim to improve

[139] ibid

[140] Scotland's Environment (2019) Peatland Restoration [online] Available at: https://soils.environment.gov.scot/resources/peatland-restoration/ (accessed 09/06/2022)

[141] Scotland's Environment (2011) Soils [PDF] Available at: https://www.environment.gov.scot/media/1213/land-soils.pdf (accessed 09/06/2022)

[142] European Commission (2016) JRC Technical Reports - Soil threats in Europe - Status, methods, drivers and effects on ecosystem services [PDF] Available at: http://esdac.jrc.ec.europa.eu/public_path/shared_folder/doc_pub/EUR27607.pdf (accessed 09/06/2022)

[143] Scottish Government (2020) Developing a method to estimate the costs of soil erosion in high-risk Scottish catchments, p.77 [online] Available at: https://www.gov.scot/publications/developing-method-estimate-costs-soil-erosion-high-risk-scottish-catchments/

[144] SEPA (2011) The State of Scotland's Soil [PDF] Available at: https://www.sepa.org.uk/media/138741/state-of-soil-report-final.pdf (accessed 09/06/2022)

[145] SEPA (2019) Guidance on consideration of soil in Strategy Environmental Assessment [PDF] Available at: https://www.sepa.org.uk/media/162986/lups-sea-gu2-consideration-of-soil-in-sea.pdf (accessed 09/06/2022)

[146] NatureScot (2021) Site condition monitoring [online] Available at: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/site-condition-monitoring

[147] NatureScot (2022) Local geodiversity action plans [online] Available at: https://www.nature.scot/landforms-and-geology/protecting-our-geodiversity/local-geodiversity-action-plans

[148] European Commission (2000) The Water Framework Directive [PDF] Available at: http://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF (accessed 09/06/2022)

[149] SEPA (2016) River Basin Management Planning, The Current Plans [online] Available at: https://www.sepa.org.uk/environment/water/river-basin-management-planning/ (accessed 09/06/2022)

the overall condition of water bodies. The protection of Scotland's water resources has also been translated through the establishment of legislation and regulations such as the *Water Environment and Water Services (Scotland) Act 2003*[150] and the *Water Environment (Controlled Activities) (Scotland) Regulations 2011*[151]. These complement the role of others such as the *Pollution Prevention and Control (Scotland) Regulations 2012*[152], developed to specifically control pollution relating to industry discharges.

4.76 The *Flood Risk Management (Scotland) Act 2009*[153] provides for the management of flood risk and translates the *EU Floods Directive*[154] into the national context. The Directive mandates the creation of Flood Risk Management Plans (FRMPs) for all inland and coastal areas at risk of flooding, integrating their development and employment with existing RBMPs.

4.77 *Scotland's National Marine Plan*[155] covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The plan provides direction to a wide range of marine decisions and consents made by public bodies and seeks to promote development that is compatible with the protection and enhancement of the marine environment.

Overview of Baseline

4.78 Scotland's water provides a wide range of benefits that support our health and prosperity, such as the provision of drinking water and as a resource for use in agriculture and industry[156]. These water resources also support a rich diversity of habitats and species, attract tourism, promote recreation and provide for the sustainable growth of the economy[157].

4.79 In recent decades, significant improvements to water quality in many rivers, canals, and estuaries have been observed alongside significant reductions in pollution[158]. Most of Scotland's seas, coasts, and estuaries are in good or excellent condition; however, some localised areas of concern remain. Nearly half of rivers in Scotland are now in good condition or better and almost two thirds of lochs surveyed were found to be in good or high condition[159].

4.80 Scotland's groundwater is a valuable asset for many, particularly rural communities, where it provides most of the private drinking water (75%)[160]. Around 84% of Scotland's groundwater is in good condition, although there are particular regions with widespread problems; for example, in the Central Belt[161]. Agriculture and the legacy of industrial activity are the main causes of regional-scale groundwater problems, whereas inadequate construction of private water supplies and inappropriate management of wastes can create localised problems[162].

4.81 Flooding can have significant and long-lasting impacts on people, communities, and businesses. Flood Risk Management Strategies[163] co-ordinate action to tackle flooding in Scotland setting out the national direction for flood risk management and helping target investment and coordinate action across public bodies. Flood maps have also been produced which help to show where areas are likely to be at risk of flooding from rivers, seas and surface water[164].

4.82 Scotland's peatlands play an important role in natural flood management. Peatland has the ability to soak up and store vast quantities of water, particularly in pools, hollows and depressions, thereby slowing flow of water through a catchment. This can prevent flooding downstream within catchments, particularly if large areas of peatland are present upstream[165]. Likewise, other habitats such as woodland may

[150] Water Environment and Water Services (Scotland) Act (2003) [online] Available at: http://www.legislation.gov.uk/asp/2003/3/contents (accessed 09/06/2022)

[151] Water Environment (Controlled Activities) (Scotland) Regulations (2011) [online] Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made (accessed 09/06/2022)

[152] The Pollution Prevention and Control (Scotland) Regulations (2012) [online] Available at: http://www.legislation.gov.uk/ssi/2012/360/contents/made (accessed 09/06/2022)

[153] The Flood Risk Management (Scotland) Act 2009 [online] Available at: http://www.legislation.gov.uk/asp/2009/6/contents (accessed 09/06/2022)

[154] European Commission, Directive 2007/60/EC of 23 October 2007 on the Assessment and Management of Flood Risks [PDF] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0060&from=EN (accessed 09/06/2022)

[155] Scottish Government (2015) Scotland's National Marine Plan [online] Available at: https://www.gov.scot/publications/scotlands-national-marine-plan/ (accessed 09/06/2022)

[156] Scotland's Environment (undated) Scotland's Freshwater [online] Available at: https://www.environment.gov.scot/our-environment/water/scotland-s-freshwater/ (accessed 09/09/2020)

[157] Scotland's Environment (2014) Scotland's State of the Environment Report 2014 [PDF] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 09/06/2022)

[158] Scotland's Environment (2014) Rivers and Canals [PDF] Available at: https://www.environment.gov.scot/media/1179/water-rivers-and-canals.pdf (accessed 09/06/2022)

[159] ibid

[160] Scotland's Environment (2011) Groundwater [PDF] Available at: https://www.environment.gov.scot/media/1230/water-groundwater.pdf (accessed 09/06/2022)

[161] SEPA (2015) Water Classification Hub [online] Available at: https://www.environment.gov.scot/data/data-analysis/

[162] Scotland's Environment (2011) Groundwater [PDF] Available at: https://www.environment.gov.scot/media/1230/water-groundwater.pdf

[163] SEPA (undated) Flood Risk Management Strategies [online] Available at: http://apps.sepa.org.uk/FRMStrategies/ (accessed 09/06/2022)

[164] SEPA (undated) Flood maps [online] Available at: http://www.sepa.org.uk/environment/water/flooding/flood-maps/ (accessed 09/06/2022)

[165] Allot et al. (2019) Peatland Catchments and Natural Flood Management [PDF] Available at: https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-11/COI%20Peatlands%20and%20NFM.pdf (accessed 09/06/2022)

also contribute towards natural flood management. Woodland and forestry can help prevent flooding by intercepting precipitation, reducing surface water runoff through increased infiltration, increased use of water through evapotranspiration[166]. Fallen branches and trees may also create natural dams along watercourses, helping to slow the flow of the water.

Evolution of the Baseline – Pressures, Trends and Key Points

4.83 Key pressures on the surface water environment include urbanisation, an increase in invasive non-native species, intensive agriculture/aquaculture and climate change. Rural and urban diffuse pollution remains a concern for water quality, particularly in relation to agriculture, forestry, and urban development[167].

4.84 Airborne pollution can impact upon water bodies. Heightened nitrogen concentrations can cause the acidification and eutrophication of water bodies. Eutrophication occurs when the concentrations of otherwise limiting nutrients increase, allowing aquatic plants and algae to grow unchecked and deplete oxygen levels.

4.85 The predicted effects of climate change such as increased temperatures and changes to rainfall patterns could affect flows in rivers and impact on water resource availability[168]. A changing climate is also expected to have ecological impacts, such as warmer sea temperatures and an increasing risk of non-native species spreading and becoming established in water environments[169].

4.86 Energy infrastructure may pose risks to the quality and availability of water, especially in the case of hydrogen generation. This may add to the existing issues in an area and lead to water shortages.

4.87 The risk of flooding from rivers, surface waters and sea is predicted to increase due to climate change. This can damage material assets, pose risks to population and human health through the spread of infectious diseases and also lead to a loss of habitats, resulting from erosion. Development can also lead to diffuse pollution in surface water. Water quality is considered "good" or better in 87% of Scotland's waters; this is compared to 82% in 2015[170]. Scotland's WFD aquatic monitoring strategy is to ensure that sufficient environmental data is collected to ensure that progress is being made towards the EU's Water Framework Directive[171]. Due to the nature of the draft Energy Strategy and Just Transition Plan, infrastructure development and decommissioning is likely to be a key water-related environmental consideration.

4.88 The development and operation of new infrastructure has the potential to negatively impact on water quality, either during construction or via pollution run-off. New structures on land can also affect the capacity of flood plains or flood defences.

Biodiversity, Flora and Fauna

Environmental Protection Objectives

4.89 Environmental protection objectives for biodiversity, flora and fauna are largely aimed at protecting habitats and species from damage and disturbance, principally through the identification and conservation of areas of particular value. The policies define a hierarchy of protection and include a range of international conventions, including the development of the *Aichi Targets for 2020*[172] and the *Convention on Biological Diversity*[173].

4.90 At European level, the Natura 2000 network of sites affords protection to key natural assets under the European Commission (EC) *Habitats Directive*[174] and *Birds Directive*[175]; both of which have been transposed into UK and Scottish regulations. The Natura 2000 network is made up of Special Areas of Conservation (SAC) and Special Protection Areas (SPA). The majority of SPAs and SACs are also underpinned by SSSI legislation[176].

4.91 The designation of European protected species and identification of species and habitats as being the most

[166] Natural Flood Management Network Scotland (2020). Woodland [online] Available at: https://www.nfm.scot/topics/woodland (accessed 09/06/2022)

[167] SEPA (2015) The river basin management plan for the Scotland river basin district: 2015–2027 [PDF] Available at: https://www.sepa.org.uk/media/163445/the-river-basin-management-plan-for-the-scotland-river-basin-district-2015-2027.pdf (accessed 09/06/2022)

[168] Scotland's Environment (2014) Scotland's State of the Environment Report 2014 [PDF] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 09/06/2022)

[169] SEPA (2015) The river basin management plan for the Scotland river basin district: 2015–2027 [PDF] Available at: https://www.sepa.org.uk/media/163445/the-river-basin-management-plan-for-the-scotland-river-basin-district-2015-2027.pdf (accessed 09/06/2022)

[170] Ibid.

[171] SEPA (2007) Scotland's WFD aquatic monitoring strategy [PDF] Available at: https://www.sepa.org.uk/media/38220/wfd_aquatic_monitoring_strategy-scotland_river_basin.pdf

[172] Convention on Biological Diversity (2011) Aichi Biodiversity Targets [online] Available at: https://www.cbd.int/sp/targets/default.shtml (accessed 09/06/2022)

[173] Convention on Biological Diversity (1993) Text of the CBD [online] Available at: https://www.cbd.int/convention/text/ (accessed 09/06/2022)

[174] European Commission, The Habitats Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm (accessed 09/06/2022)

[175] European Commission, The Birds Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm (accessed 09/06/2022)

[176] Scottish Government (undated) Natura 2000 [online] Available at: https://www.gov.scot/policies/biodiversity/natura-2000/ (accessed 09/06/2022)

threatened and requiring conservation action in the UK also demonstrates the prioritisation of conservation ambitions at European and national levels. *UK Biodiversity Action Plan,*[177] succeeded by the *UK Post 2010 Biodiversity Framework*[178] is a response to Article 6 of the Biodiversity Convention. It is a national strategy for the conservation of biological diversity, the sustainable use of biological resources and to contribute to the conservation of global biodiversity through all appropriate mechanisms.

4.92 The *2020 Challenge for Scotland's Biodiversity*[179] is Scotland's response to the 20 Aichi Targets set by the United Nations Convention on Biological Diversity, and the *European Union's Biodiversity Strategy for 2020*[180]. The 2020 Challenge supplements the 2004 *Scottish Biodiversity Strategy*[181] and focuses on the importance of healthy ecosystems and an outcome that *"Scotland's ecosystems are restored to good ecological health so that they provide robust ecosystem services and build on our natural capital".*

4.93 Beyond site and species designations there are also longer-term aspirations for enhancing biodiversity, improving landscape-scale ecological networks and addressing the impacts of climate change on the natural environment.

Overview of Baseline

4.94 Biodiversity is commonly used as a measure of the health of an ecosystem, and helps to provide the ecosystems services that are the basis of life including the regulation of air and water, soil formation, nutrient cycling, flood regulation and pollination, amongst many others[182]. Biodiversity, flora, and fauna is also closely linked with other environmental topics, particularly soil and water, which help to support an incredible diversity of life across Scotland and in its surrounding waters.

4.95 As of 2020, Scotland's protected areas included 251 SACs[183], 153 SPAs[184], 51 Ramsar sites[185] and 2 Biosphere reserves[186], amongst other internationally designated sites. There are further national level designations such as 1,423 SSSIs[187], 231 Marine Protected Areas[188] and 2 National Parks[189]. In addition to these, a recent consultation on proposed SPAs for Scottish Marine birds and site classifications set out additional sites to be designated[190]. In June 2019, a further consultation on proposals to designate four new MPAs in Scottish waters was launched[191].

4.96 The UK Biodiversity Action Plan[192] identified 39 priority habitats and 197 priority species either occurring, or known to have occurred until recently, in Scotland. Figures from NatureScot tracking the proportion of Scottish natural features in favourable or recovering condition show that, as of 31st March 2022, 77.9% of Scotland's natural features on protected nature sites are either in or recovering towards a favourable condition. This figure represents a 1.9 percentage point increase since the current protocols were established in 2007, despite a 0.4 percentage point decrease since 2021[193].

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[177] UK Government (1994) Biodiversity: The UK Action Plan [PDF] Available at: http://data.jncc.gov.uk/data/cb0ef1c9-2325-4d17-9f87-a5c84fe400bd/UKBAP-BiodiversityActionPlan-1994.pdf (accessed 09/06/2022)

[178] JNCC and Defra on behalf of the Four Countries' Biodiversity Group (2012) UK Post-2010 Biodiversity Framework [PDF] Available at: https://hub.jncc.gov.uk/assets/587024ff-864f-4d1d-a669-f38cb448abdc#UK-Post2010-Biodiversity-Framework-2012.pdf (accessed 09/06/2022)

[179] Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity – A Strategy for the conservation and enhancement of biodiversity in Scotland [online] Available at: https://www.gov.scot/publications/2020-challenge-scotlands-biodiversity-strategy-conservation-enhancement-biodiversity-scotland/ (accessed 09/06/2022)

[180] European Commission (2011) Our life insurance, our natural capital: an EU biodiversity strategy to 2020 [PDF] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0244&from=EN (accessed 09/06/2022)

[181] Scottish Government (2004) Scottish Biodiversity Strategy – It's in your hands [online] Available at: https://www.gov.scot/publications/scotlands-biodiversity---its-in-your-hands/ (accessed 09/06/2022)

[182] NatureScot (2020) Ecosystem services – nature's benefits [online] Available at: https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/ecosystem-approach/ecosystem-services-natures-benefits (accessed 16/01/2023)

[183] SNH (undated) Special Areas of Conservation [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/natura-sites/special-areas-conservation-sacs (accessed 09/06/2022)

[184] SNH (undated) Special Protection Areas [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/natura-sites/special-protection-areas-spas (accessed 09/06/2022)

[185] SNH (undated) Ramsar Sites [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/ramsar-sites (accessed 09/06/2022)

[186] SNH (undated) Biosphere Reserves [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/biosphere-reserve (accessed 09/06/2022)

[187] SNH (undated) Sites of Special Scientific Interest [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/sites-special-scientific-interest (accessed 09/06/2022)

[188] Scottish Government (2018) Scottish MPA network – Parliamentary Report [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/progress-report/2018/12/marine-protected-area-network-2018-report-scottish-parliament/documents/00544750-pdf/00544750-pdf/govscot%3Adocument/00544750.pdf (accessed 09/06/2022)

[189] Scottish Government (undated) Landscapes and outdoor access [online] Available at: https://www.gov.scot/policies/landscape-and-outdoor-access/national-parks/ (accessed 09/06/2022)

[190] Scottish Government (2019) Proposed Special Protected Areas for Scottish marine birds: Strategic Environmental Assessment. Available at: https://www.gov.scot/publications/proposed-special-protection-areas-scottish-marine-birds-supplementary-consultation-sea-site-classification/ (accessed 09/06/2022)

[191] Scottish Government (2019) A consultation on proposals to designate four Marine Protected Areas in Scottish waters. Available at: https://www.gov.scot/publications/arine-protected-areas-mobile-marine-species-consultation-proposals-designate-four-new-marine-protected-areas-scottish-waters/ (accessed 09/06/2022)

[192] UK Government (1994) Biodiversity: The UK Action Plan [PDF] Available at: http://data.jncc.gov.uk/data/cb0ef1c9-2325-4d17-9f87-a5c84fe400bd/UKBAP-BiodiversityActionPlan-1994.pdf (accessed 09/06/2022)

[193] NatureScot (2022) Statistical News Release: The Proportion of Scotland's Protected Sites in Favourable Condition 2022 Available at: https://www.nature.scot/statistical-news-release-proportion-scotlands-protected-sites-favourable-condition-

4.97 Areas of biodiversity value are not only found within this network of designated sites and many undesignated areas of Scotland also contain habitats and species that have important functions and roles. For example, urban greenspace such as public and private gardens, parks, woodlands, recreational grounds, green corridors, allotments and community growing spaces can provide habitats and ecosystems which are valuable to wildlife[194].

Evolution of the Baseline – Pressures, Trends and Key Points

4.98 Biodiversity loss has been well documented over the last 50 years, and today there is a range of pressures with the potential to impact on Scotland's wildlife and biodiversity. Key issues such as land use intensification and modification and pollution have been noted[195].

4.99 Climate change in particular has the potential to greatly impact on biodiversity on a global scale[196]. The predicted effects of climate change and the potential for associated impacts on biodiversity, flora and fauna are well documented, with evidence already showing the wide-ranging effects that a changing climate can have on flora and fauna species and their habitats[197]. Indirect impacts may also arise through climate change adaptation and the action taken in sectors such as agriculture, forestry, planning, water and coastal management in the face of a changing climate[198].

4.100 Habitat change, due mainly to increased and more intensive land management, urban development, pollution, nutrient enrichment, and over exploitation of natural resources are other known pressures.

Cultural Heritage and Historic Environment

Environmental Protection Objectives

4.101 Existing cultural heritage objectives are set out in legislation including the *Historic Environment (Amendment) Scotland Act 2011*[199], *Ancient Monuments and Archaeological Areas Act 1979 (as amended)* [200] and *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*[201]. These objectives are focused primarily on the protection of valued sites and features, including townscapes (i.e. places, buildings and open spaces), buildings, archaeological sites, battlefields, wrecks and landscapes that have been recognised at the international, national and local levels through a hierarchy of designations.

4.102 Policies such as *National Planning Framework 4* (NPF4)[202] aim to improve the quality of our settlements and built environment with a national level focus. These are complemented by the *Historic Environment Strategy for Scotland* (2014)[203] and the *Historic Environment Scotland Policy Statement*[204] which provide an overarching framework for historic environment policy in Scotland. Together, they emphasise the importance of preserving recognised sites, avoiding negative impacts on them and their wider setting, and contributing to their enhancement where appropriate. These key objectives also extend to taking into account, and avoiding damage to or loss of, currently unknown archaeology.

Overview of Baseline

4.103 Scotland's many and varied historical sites are unique and irreplaceable. These sites and features are regarded as making a valuable contribution to our quality of life, cultural identity, education and economy. While these assets are distributed widely throughout Scotland there are clusters of sites in and around our settlements and also around our coastlines.

2022#:~:text=The%20natural%20feature%20types%20with,%25)%20and%20birds%20(66.7%25). (accessed 16/01/23)

[194] SNH (undated) Urban habitats [online] Available at: https://www.nature.scot/habitats-and-ecosystems/habitat-types/urban-habitats (accessed 09/06/2022)

[195] SNH (undated) Key pressures on biodiversity [online] Available at: https://www.nature.scot/scotlands-biodiversity/key-pressures-biodiversity (accessed 09/06/2022)

[196] Convention on Biological Diversity (undated) Climate Change and Biodiversity – Introduction [online] Available at: https://www.cbd.int/climate/intro.shtml (accessed 09/06/2022)

[197] SNH (undated) Climate change impacts in Scotland [online] Available at: https://www.nature.scot/climate-change/climate-change-impacts-scotland (accessed 09/06/2022)

[198] JNCC (2010) Biodiversity and Climate Change – a summary of impacts in the UK [online] Available at: https://hub.jncc.gov.uk/assets/e2d77481-dcb2-4fb3-8fff-d8b1c0cfc97f (accessed 09/06/2022)

[199] The Historic Environment (Amendment) Scotland Act 2011 [online] Available at: http://www.legislation.gov.uk/asp/2011/3/contents/enacted (accessed 09/06/2022)

[200] Ancient Monuments and Archaeological Areas Act 1979 (as amended) [PDF] Available at: http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf (accessed 09/06/2022)

[201] Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 [online] Available at: http://www.legislation.gov.uk/ukpga/1997/9/contents (accessed 09/06/2022)

[202] Scottish Government (2022) National Planning Framework 4 Revised Draft. [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf (accessed 12/01/2023)

[203] Historic Environment Scotland (2014) Our Place in Time: The Historic Environment Strategy for Scotland [PDF] Available at: http://www.gov.scot/Resource/0044/00445046.pdf (accessed 09/06/2022)

[204] Historic Environment Scotland (2019) Historic Environment Scotland Policy Statement [online] Available at: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/legislation-and-guidance/historic-environment-scotland-policy-statement/ (accessed 09/06/2022)

4.104 Some parts of Scotland's historic environment are protected through a process of designation. The process aims to identify parts of the historic environment for their significance and enhance their protection. As of 2018, there are around 56,000 protected places across Scotland[205]. Designated assets currently include World Heritage Sites, Listed Buildings, Scheduled Monuments, Conservation Areas, Designed Gardens and Landscapes, Historic Marine Protected Areas, Scheduled Wrecks and Nationally Important Battlefields[206]. However, whilst most of the historic environment is undesignated (90-95%), these known but undesignated assets provide important contextual information which helps us better understand designated sites[207].

Evolution of the Baseline – Pressures, Trends and Key Points

4.105 Development is a key pressure on the historic environment and cultural heritage, both directly in terms of damage to known and unknown features and the potential for impacts on setting. Other known pressures include changing land use and land management, tourism and visitors, pollution and climate change.

4.106 It is projected that Scotland will become warmer and wetter as a result of climate change, resulting in the increased weathering of stone, rotting timbers and corrosion of metals. Rising sea levels and increased storm events may increase coastal erosion, endangering our historic landscapes, structures, buildings and archaeology in the coastal zone. Some of Scotland's unique and special sites, such as Skara Brae in Orkney, are at most risk[208].

4.107 Increased rainfall will mean that historic buildings and assets will be wetter for longer periods of time, and as such may result in the penetration of water, dampness, condensation and fungus growth, ground instability and structural collapse[209]. This can potentially have damaging effects on the fabric of buildings and the health of those using it. This threat will grow in the future, given the future predictions of the likely effects of global warming and climate change for the remainder of this century.

Landscape

Environmental Protection Objectives

4.108 Environmental protection objectives reflect the importance of all landscapes and also the need to help to improve those that have become degraded. The *European Landscape Convention*[210] lays the foundation for these objectives.

4.109 The establishment of key national programmes including the National Scenic Areas Programme[211] demonstrate a continuing commitment to protect the special qualities of nationally important landscapes and seascapes. The protection, restoration and enhancement of Scotland's natural assets is set out at the national level in NPF4 and are also referenced in relation to several national developments.

4.110 NatureScot Natural Heritage Futures[212] sets out guidelines for sustainable management and use of Scotland's nature and landscape until 2025. It aims to ensure utilisation of an integrated approach to work with Scotland's nature and land. It also provides basis for stakeholder engagement. It consists of 21 documents that cover the whole of Scotland as each of the areas has its own identity and distinct issues.

4.111 NatureScot Landscape Policy Framework[213] sets out to safeguard and enhance the distinct identity, the diverse character and the special qualities of Scotland's landscapes to ensure that in the future they will contribute to the quality of life. Its main priorities include promotion of the debate on Scotland's future landscapes, description of Scotland's landscape resources, monitoring of change in Scotland's landscape, landscape planning and management and action for Scotland's special landscapes.

4.112 NatureScot has undertaken research on areas which are viewed as wild land[214]. This is based on four attributes: perceived naturalness of land cover; ruggedness of the terrain; remoteness from public roads or ferries; and lack of

[205] Historic Environment Scotland (2018) Scotland's Historic Environment in numbers 2018 [online] Available at: https://www.environment.gov.scot/media/2556/shea_infographic_2018.pdf

[206] Scotland's Environment (undated) Historic Environment [online] Available at: https://www.environment.gov.scot/our-environment/people-and-the-environment/historic-environment/

[207] ibid

[208] Scotland's Environment (2014) Scotland's State of the Environment Report 2014 [PDF] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 09/06/2022)

[209] Historic Environment Scotland (2019) A Guide to Climate Change Impacts [online] Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=843d0c97-d3f4-4510-acd3-aadf0118bf82 (accessed on 16/01/2023)

[210] Council of Europe (2015) European Landscape Convention, ETS No. 176 [online] Available at: http://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/176 (accessed 09/06/2022)

[211] NatureScot (undated) National Scenic Areas [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/national-scenic-areas (accessed 09/06/2022)

[212] NatureScot (2002) Natural Heritage Futures: An Overview [PDF] Available at: https://www.nature.scot/about-naturescot/our-work/natural-heritage-futures (accessed 09/06/2022)

[213] NatureScot (2010) Landscape Policy Framework [PDF] Available at:https://www.nature.scot/professional-advice/landscape/framework-landscape-policy/naturescot-landscape-policy-framework (accessed 09/06/2022)

[214] NatureScot (undated) Landscape Policy: Wild Land [online] Available at: https://www.nature.scot/professional-advice/landscape/landscape-policy-and-guidance/landscape-policy-wild-land (accessed 17/02/2023)

buildings, roads, pylons and modern artefacts. Areas with stronger wild land characteristics are more commonly found in the north and west, particularly areas of higher ground, although additional areas of wild land are present in other areas of Scotland[215].

Overview of Baseline

4.113 Rich in diversity, Scotland's landscapes are internationally renowned. Scotland's distinctive landscapes are a significant part of the country's natural and cultural heritage and make a significant contribution to both the country's economic performance and the wellbeing of its people. Scotland's landscapes play a key role in attracting tourism, affording opportunities for business and providing the setting for outdoor recreation.

4.114 There are currently two National Parks (Loch Lomond and the Trossachs, and the Cairngorms) and 40 National Scenic Areas in Scotland. Over 13% of Scotland's land area has been classified as a National Scenic Area[216]. Designations such as Local Landscape Areas, Special Landscape Areas, Regional Scenic Areas and Areas of Great Landscape Value have also been established at a regional and local level by many local authorities[217]. These areas of important nature or landscape value have been designated locally for conservation purposes and are afforded protection from inappropriate development[218].

Evolution of the Baseline – Pressures, Trends and Key Points

4.115 Scotland's landscapes are constantly changing and evolving in response to both natural processes and the changing demands of society. Changes in landscape tend to occur over long periods of time, and gradual change, as a result of development such as housing, and changes in farming and forestry practice, can be difficult to determine[219].

4.116 Climate change is expected to lead to extensive landscape change across Scotland and is viewed as an increasing pressure on landscape, not only as a result of direct effects but also as a result of indirect impacts[220]. Direct impacts are likely as a result of changing temperatures and patterns of precipitation, weather events and sea level change[221]. Other commitments to adapting to the predicted effects of climate change is seen by many as a pressure on both visual amenity and the character of many rural landscapes. The construction of new transport infrastructure and working towards a national target for increasing forest cover in Scotland also has the potential to affect our landscapes and seascapes.

4.117 The greatest changes are likely to be seen in areas of highest population, such as lowland and coastal areas. Mitigation and adaptation measures are expected to have a greater influence on both Scotland's landscapes and the quality of life than that of the direct effects of climate change[222]. The coast and foreshore are under many pressures particularly from climate change, rising sea level and coastal erosion.

Material Assets

Environmental Protection Objectives

4.118 While existing policies relating to energy, waste, transportation and land use are wide-ranging, they largely share the aims of contributing to core planning objectives and supporting sustainable development, reducing GHG emissions, and making the best use of Scotland's resources and existing infrastructure.

4.119 There is a wealth of existing protection objectives and policy at the national and international levels relating to these broad topic areas. These include existing and forthcoming energy policy and climate change commitments in addition to current objectives and commitments set out in relevant policies.

4.120 *National Planning Framework 4* (*NPF4)* [223] sets out an overarching spatial strategy for Scotland in the future. NPF4 supports achieving net zero by 2045 through creating

[215] Ibid

[216] NatureScot (undated) National Scenic Areas [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/national-scenic-areas (accessed 09/06/2022)

[217] NatureScot (undated) Local Designations [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/local-designations (accessed 09/06/2022)

[218] Ibid

[219] Scotland's Environment (2014) Landscape [PDF] Available at: https://www.environment.gov.scot/media/1196/land-landscape.pdf (accessed 09/06/2022)

[220] NatureScot (2022) Landscape: Climate change [online] Available at: https://www.nature.scot/professional-advice/landscape/landscape-policy-and-guidance/landscape-climate-change (accessed 09/06/2022)

[221] Scotland's Environment (2014) Landscape [PDF] Available at: https://www.environment.gov.scot/media/1196/land-landscape.pdf (accessed 09/06/2022)

[222] NatureScot (2022) Landscape: climate change. Available at: https://www.nature.scot/professional-advice/landscape/landscape-policy-and-guidance/landscape-climate-change (accessed 09/06/2022)

[223] Scottish Government (2022) Scotland 2045 – fourth National Planning Framework – Revised draft [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf /

sustainable places, liveable places; productive places and distinctive places.

4.121 *Scotland's National Transport Strategy 2*[224] considers the whole transport system including walking, wheeling, cycling, travelling by bus, train, ferry, car, lorry and aeroplanes. It sets out the strategic framework within which future decisions on investment will be made.

4.122 *Infrastructure Investment Plan 2015*[225] sets out priorities for investment and a long-term strategy for the development of public infrastructure in Scotland. It sets out why the Scottish Government invests, how it invests and what it plans to invest in. A new Infrastructure Investment Plan was published in September 2021[226].

4.123 *Platforms for Change – Land use – getting the best from our land: strategy 2021 to 2026*[227] sets out the vision, objectives and policies to achieve sustainable land use. The strategy aims to provide a more holistic understand of our land, the demands we place upon it and the benefits we get from our land.

4.124 *The Heat in Buildings Strategy – achieving net zero emissions in Scotland's buildings*[228] sets out the vision for the future of heat in buildings and actions being taken in the buildings sector to deliver climate change commitments, maximise economic opportunities, and ensure a just transition, including helping address fuel poverty.

4.125 *The Scottish Energy Strategy: The future of energy in Scotland*[229] was published to guide energy related decisions of the Scottish Government. It directly builds on the Heat Policy Statement of 2015, and it continues to focus on energy and electricity. However, this strategy takes a whole-system view and also includes heat and transport sectors[230].

4.126 *Scotland's Forestry Strategy 2019-2029*[231] aims to achieve sustainable development of forests and woodlands, through good management and better integration with other land uses. Priorities include ensuring forests and woodlands are managed sustainably, increasing the adaptability and resilience of forests and woodlands and expanding the area of forests and woodlands, recognising wider land-use objectives. The Strategy sets out a vision of "*In 2070, Scotland will have more forests and woodlands, sustainably managed and better integrated with other land uses. These will provide a more resilient, adaptable resource, with greater natural capital value, that supports a strong economy, a thriving environment, and healthy flourishing communities".*

4.127 *Making Things Last: A Circular Economy Strategy for Scotland*[232] sets out priorities for moving towards a more circular economy with a long-term ambition. It articulates Scotland's aspirations and proposes a number of actions to take over the short to medium term and creates conditions for long term change. This strategy builds on the Zero Waste Plan (2010)[233] and the Safeguarding Scotland's Resources (2013)[234].

4.128 *Realising Scotland's full potential in a digital world: A Digital Strategy for Scotland*[235] sets out a vision for Scotland as a vibrant, inclusive, open and outward looking digital nation. It sets out plans to ensure that all aspects of life in Scotland will also have its digitalised form, as well as recognition of challenges which such a transition brings.

Overview of Baseline

4.129 While existing policies relating to energy, waste, transportation and land use are wide-ranging, they largely share the aims of contributing to core planning objectives, supporting sustainable development, reducing GHG emissions, and making the best use of Scotland's resources and existing infrastructure.

4.130 Scotland's natural resources are also material assets. Mineral resources and aggregates are used for purposes such as fuel (e.g. coal), and construction (e.g. sand gravel and rock). However, the quantity of these resources is finite and once they are used up, they cannot be replaced.

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[224] Scottish Government (2020) National Transport Strategy 2, Protecting our Climate and Improving Lives [PDF] Available at: https://www.transport.gov.scot/media/47052/national-transport-strategy.pdf (accessed 09/06/2022)

[225] Scottish Government (2015) Infrastructure Investment Plan [online] Available at: https://www.gov.scot/publications/infrastructure-investment-plan-2015/ (accessed 09/06/2022)

[226] Infrastructure Investment Plan 2021-2022 to 2025-2026 available at https://www.gov.scot/publications/infrastructure-investment-plan-2021-2022-2025-2026-programme-pipeline-update-september-2021/

[227] Available at https://www.gov.scot/publications/scotlands-third-land-use-strategy-2021-2026-getting-best-land/pages/4/

[228] Scottish Government (2021) Heat in Buildings Strategy – achieving net zero emissions in Scotland's buildings. [online] Available at: https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/

[229] Scottish Government (2017) Scottish Energy Strategy: The future of energy in Scotland [online] Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ (accessed 09/06/2022)

[230] The Energy Strategy and Just Transition Plan provides an update to the 2017 Energy Strategy

[231] Scottish Government (2019) Scotland's Forestry Strategy 2019 – 2029 [online] Available at: https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/ (accessed 09/06/2022)

[232] Scottish Government (2016) Making Things Last: A Circular Economy Strategy for Scotland [PDF] Available at: http://www.gov.scot/Resource/0049/00494471.pdf (accessed 09/06/2022)

[233] Scottish Government (2010) Zero Waste Plan [online] Available at: https://www.gov.scot/publications/scotlands-zero-waste-plan/ (accessed 09/06/2022)

[234] Scottish Government (2013) Safeguarding Scotland's Resources: blueprint for a more resource efficient and circular economy [online] Available at: https://www.gov.scot/publications/safeguarding-scotlands-resources-blueprint-more-resource-efficient-circular-economy/ (accessed 09/06/2022)

[235] Scottish Government (2017) Realising Scotland's full potential in a digital world: a digital strategy for Scotland [online] Available at: https://www.gov.scot/publications/realising-scotlands-full-potential-digital-world-digital-strategy-scotland/ (accessed 09/06/2022)

Energy

4.131 Heating makes up approximately half of Scotland's energy consumption (52.9%) with transport (22.0%) and electricity (22.3%) making up approximately a quarter each[236]. A breakdown by sector of non-transport energy consumption shows that 59.3% is accounted for by industrial and commercial sectors, with 40.7% consumed domestically[237]. Domestic consumption of electricity and heat dropped by 15.9% and 7.14% respectively in 2020, compared to the 2009 baseline. Energy consumption in transport decreased in 2020 by 17.8%. However, this significant decrease is likely as a result of travel restrictions imposed by the Covid-19 pandemic. It is estimated that non-domestic energy consumption has dropped by 24.8% compared to the 2005 baseline[238].

4.132 It is estimated that 65.4% of Scotland's total electricity consumption between January and December 2022 came from renewable sources; the highest level to date and an increase from 52.8% between January and December 2021. This is attributed to an increase in installed capacity for renewable electricity and heat[239].

4.133 There have been significant changes to the electricity generation mix in recent years with the vast majority of the electricity that Scotland generated from low carbon sources, 87.8% in 2021, compared to 10.9% generated from fossil fuels[240].

4.134 In 2020, the equivalent of 6.4% of non-renewable heat demand was met by renewable sources, an increase of 0.2 percentage points from 2019[241]. A rise in the generation of renewable heat by biomethane is attributed to this increase. Thermal energy from waste and heat pumps make up 7% and 8%, respectively, of renewable heat output[242].

4.135 As Scotland's energy mix changes over the next few years, the electricity network (grid) that supports the balance between energy generation and demand will change significantly. For example, as a result of the increased electrification of the transport and heat. Infrastructure will play a key role in ensuring security of supply and decarbonising our energy systems in the most cost effective, affordable way[243].

4.136 Since 2000, Scottish renewables have displaced an estimated 151 million tonnes of CO_2[244], assuming that the same amount of electricity generation would have been generated by fossil fuels[245]. In 2019 alone, Scottish renewable electricity displaced an estimated 13.5 million tonnes of CO_2[246].

Hydrogen

4.137 The use of hydrogen in Scotland may further contribute towards reduced GHG emissions. The Scottish Hydrogen Assessment[247] identifies 38 existing hydrogen projects in Scotland. Grangemouth is an industrial cluster and refinery that represents a potential high demand for hydrogen. It currently produces its own 'grey' hydrogen through steam methane reforming and has potential to switch to low-carbon or renewable hydrogen. Mossmorran chemical plant also produces grey hydrogen, which relies on natural gas stocks.

4.138 Aberdeen has been described as the 'Hydrogen Model Region'[248], paving the way as an early adopter of hydrogen buses. The Hydrogen Bus Project has a fleet of ten buses powered by renewable hydrogen, with an additional 15 to be added to the fleet[249], which are serviced by a refuelling station in Kittybrewster. In addition, the proposed Acorn Carbon Capture Utilisation and Storage (CCUS) project located at the St Fergus Gas Terminal near Aberdeen include plans for a low-carbon hydrogen production plant producing hydrogen from natural gas landed at St Fergus, coupled with a CCUS facility that will capture the CO_2 from hydrogen production, as well as other sources, and transport it for storage in the North Sea.

4.139 The Orkney Islands have made significant progress in the production of renewable hydrogen, with the Shetland and

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[236] Gov.scot (2020) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=WholeSystem&Chart=EnConsumption

[237] ibid

[238] ibid

[239] gov.scot (2022) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=RenLowCarbon&Subsection=RenElec&Chart=ElecConsumptionFuel

[240] ibid

[241] Renewable heat in Scotland, 2020 – Energy Savings Trust. Available at https://energysavingtrust.org.uk/report/renewable-heat-in-scotland-2020/

[242] Scottish Government (2020) Annual Compendium of Scottish Energy Statistics December 2020 Update [online] Available online: https://www.gov.scot/publications/annual-compendium-of-scottish-energy-statistics/

[243] DECC (2015) Towards a Smart Energy System [PDF] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/486362/Towards_a_smart_energy_system.pdf

[244] Across the GB system

[245] https://scotland.shinyapps.io/sg-scottish-energy-statistics/?Section=RenLowCarbon&Subsection=RenElec&Chart=DisplacedEmissions

[246] Gov.scot (2020) Scottish Energy Statistics Hub [online] Available at: https://scotland.shinyapps.io/sg-energy/?Section=WholeSystem&Chart=EnConsumption

[247] Scottish Government (2020) Scottish Hydrogen Assessment [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2020/12/scottish-hydrogen-assessment-report/documents/scottish-hydrogen-assessment/scottish-hydrogen-assessment/govscot%3Adocument/scottish-hydrogen-assessment.pdf (accessed 09/06/2022)

[248] ibid

[249] Electrive (2019) Aberdeen orders another 15 hydrogen buses [online] Available at: https://www.electrive.com/2019/07/24/aberdeen-orders-another-15-hydrogen-buses/ (accessed 09/06/2022)

Outer Hebrides starting to follow suit. The Surf 'n' Turf project in Orkney delivered a 500 kilowatt (kW) renewable hydrogen production facility on the Isle of Eday. The hydrogen is produced using tidal power from deployed turbines at the European Marine Energy Centre (EMEC), along with 900 kW community wind generation. Once fully commissioned, 50 tonnes of hydrogen will be produced annually for local buildings and transported to Kirkwall for heat and power of harbour buildings, the marina, vessels and a refuelling station for road vehicles.

4.140 The *Hydrogen Action Plan*[250] sets out the actions that will be taken over the next five years to support the development of a hydrogen economy as a tool to help lower greenhouse gas emissions.

Transport

4.141 Transport and travel habits in Scotland were profoundly affected by the COVID-19 pandemic, with restrictions on travel and daily activity in place for large parts of 2020[251]. The following paragraphs summarise the Transport Scotland Scottish Transport Statistics 2021.

4.142 The estimated volume of traffic on Scotland's roads in 2020 was around 39 billion vehicle km: 22% less than the record high of 48.7 billion vehicle kilometres in 2019. In 2019, cars accounted for around three quarters (75%) of the total volume, while light goods vehicles and heavy goods vehicles contributed 17% and 5% respectively. Much smaller volumes were recorded for two wheeled vehicles, buses and cyclists. In 2020, 98% of all road vehicles in Scotland were fuelled by either petrol or diesel and there were 56,959 kilometres of public road. In 2019-2020 compared to the previous year, there was a 16% decrease in the volume of trunk road that was newly constructed, reconstructed, strengthened, or surface dressed, primarily driven by a fall in new roads constructed / opened. The share of newly registered cars that are ultra-low emission vehicles is increasing with new registrations more than doubling between 2019 and 2020.

4.143 Passenger journeys on ScotRail services were significantly affected by the pandemic and decreased by 85% to 14 million in 2020-21. There were 95 million rail passenger journeys in 2019-2020, up 25% from 2009. The total route length of the linear railway network in Scotland in 2019-20 was 2,696 km, of which 893km (33%) is electrified. In addition to freight only stations, there are 359 passenger and parcel stations.

4.144 In 2020, 21,127 million passenger journeys were made by bus in Scotland, down 65% on 2019-2020 (363 million). Prior to the pandemic the volume of bus journeys were trending down from the peak of 487 million in 2007-08. The declining trend in bus usage in Scotland contrasts with the upward trend in rail journeys.

4.145 In 2020, 7.1 million passengers travelled through Scottish airport terminals, 76% less than the reported 28.9 million air passengers in 2019. Passenger numbers had increased 39% from 2010 to a peak of 29.4 million in 2018. In 2019, Edinburgh had the highest number of terminal passengers, and Glasgow's share had decreased by 8% on 2018. A number of smaller airports are also run by Local Authorities in Scotland such as Oban Airport, and some of these provide connections to more remote areas.

4.146 Scotland's marine areas and coastal waters are utilised by a wide range of vessels and service a variety of industries. Ports and harbours are located all around the Scottish coastline. In 2020, 58 million tonnes of freight was handled by ports, down from 67 million tonnes in 2019. In addition to being an important means of distributing goods, the shipping sector also helps deliver lifeline ferry services, which are vital to island communities. A total of 8.7 million passengers travelled on ferry routes within Scotland in 2019. Larger ports such as Cairnryan support ferry services between Scotland and Northern Ireland with a further 1.8 million passengers travelling to Northern Ireland in 2019.

Evolution of the Baseline – Pressures, Trends and Key Points

4.147 As Scotland's energy mix changes over the coming years, the electricity network (grid) that supports the balance between energy generation and demand will change significantly, for example, as a result of the increased electrification of the transport and heat. Infrastructure will play a key role in ensuring security of supply and decarbonising our energy systems in the most cost effective, affordable way[252]. Energy storage is likely to be an increasingly important part of the transition to delivering clean, affordable and secure supplies of energy[253] and to support the integration of increasing volumes of renewables into the energy system and address intermittencies.

4.148 A shift towards reduced private transport, more active travel and decarbonisation of all transport modes is anticipated.

[250] Scottish Government (2022) Hydrogen Action Plan [online] Available at: https://www.gov.scot/publications/hydrogen-action-plan/documents/
[251] Transport Scotland (2021) Scottish Transport Statistics 2021. Available at: https://www.transport.gov.scot/publication/scottish-transport-statistics-2021/
[252] DECC (2015) Towards a Smart Energy System [PDF] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/486362/Towards_a_smart_energy_system.pdf (accessed 09/06/2022)
[253] ClimateXChange (2016) Energy Storage in Scotland - Summary of reports on thermal and electrical energy storage [PDF] Available at: https://www.climatexchange.org.uk/media/1391/summary_energy_storage.pdf (accessed 09/06/2022)

4.149 Hydrogen is a key opportunity for heavy-duty transport, maritime and aviation uses, offering longer range than electric only. However, a comprehensive hydrogen refuelling network will be required to support this. Hydrogen fuel cells are an opportunity for the rail network; however electrification is a key alternative, and hydrogen may play a more limited role, facilitating the transition in areas which are harder to electrify in the short term[254].

4.150 Hydrogen could be a future key opportunity for, for example, Scotland's only cement plant at Dunbar, and also for all other difficult to decarbonise industries through fuel switching technologies and utilising hydrogen as feedstock for chemical processes[255].

4.151 Flooding poses the greatest long-term climate related risk to infrastructure performance, however, growing risks posed from heat, water scarcity and slope instability caused by severe weather could also prove significant[256]. Therefore, selection of the location of hydrogen production infrastructure needs to consider the potential for these extreme weather events and climatic risks in order to minimise their potential future impacts on hydrogen production plants.

[254] Arup (undated) Hydrogen Transport – Fuelling the Future [PDF] https://www.arup.com/-/media/arup/files/publications/h/hydrogen-transport-fuelling-the-future-arup.pdf (accessed 09/06/2022)

[255] Scottish Government (2020) Deep Decarbonisation Pathways for Scottish Industries: A Study for the Scottish Government [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2020/12/deep-decarbonisation-pathways-scottish-industries/documents/deep-decarbonisation-pathways-scottish-industries-study-scottish-government-final-report/deep-decarbonisation-pathways-scottish-industries-study-scottish-government-final-report/govscot%3Adocument/deep-decarbonisation-pathways-scottish-industries-study-scottish-government-final-report.pdf (accessed 09/06/2022)

[256] Committee on Climate Change (2017) UK Climate Change Risk Assessment 2017 Evidence Report – Summary for Scotland [PDF]: https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Scotland-National-Summary.pdf (accessed 09/06/2022)

Chapter 5
Strategic Environmental Assessment Findings

Introduction

5.1 This chapter of the Environmental Report sets out the assessment findings and the significant environmental effects of the draft Energy Strategy and Just Transition Plan. The findings are grouped as direct or indirect effects. These are effects arising directly from the draft Energy Strategy and Just Transition Plan and any 'secondary' effects, which would indirectly impact on the environment. A lifecycle assessment of GHG emissions is also included within the SEA assessment of each policy position.

Direct effects

5.2 The following paragraphs present the assessment of the direct effects of the targets, priorities and actions that constitute the draft Energy Strategy and Just Transition Plan. The Just Transition Plan applies the eight national outcomes to each energy sector.

5.3 Due to the nature of the draft Energy Strategy and Just Transition Plan, and the hierarchy in which it sits, the assessment was undertaken at a strategic and national level. This approach reflects the national status of the draft Energy Strategy and Just Transition Plan and the high-level nature of assessment it requires.

Scope of the Energy Strategy and Just Transition Plan

5.4 Many areas of energy policy are reserved to the UK Government. This means that the Scottish Government needs to work with the UK Government to deliver the ambition in relation to: affordable energy; community energy; international opportunities; North Sea oil and gas extraction and exploration; offshore wind; marine energy; hydrogen; heat in buildings; transport; industrial decarbonisation; wholesale market; system restoration; energy system flexibility; and electricity networks. The areas of energy policy reserved to the UK Government are set out in Annex E of the draft Energy Strategy and Just Transition Plan.

Draft Energy Strategy and Just Transition Plan Policy Positions

Delivering a Just Transition for communities and regions across Scotland

People have access to affordable clean energy

5.5 The affordable energy actions relate to support for those who are struggling to heat their homes, support for installation of energy efficiency measures and support for those who are at risk of rationing or disconnection due to current prices, improving energy efficiency and, working with the UK Government supporting investment in and enabling consumers, communities and businesses to benefit from low-cost renewable power. Overall, only direct effects were identified in relation to climatic factors and population and human health, reflecting the direct impacts on energy use and quality of life.

5.6 **Minor negative direct effects** are identified in relation to **climatic factors** as supporting affordable energy reduces price as a driver of reduced GHG emissions, however this is partly balanced by investment in insulation. The negative effects on climatic factors from support for affordable energy costs, are expected in the short term, and the balance of positive effects from energy efficiency are in the medium to long term.

5.7 Actions on energy costs have **significant positive direct effects** in relation to **population and human health**. Assisting with winter heating costs, and investment in insulation will result in reduced energy bills and lower running costs of buildings. This will therefore, support Scotland's plan to tackle fuel poverty and reduce the cost of living for the people of Scotland and in particular those who need it the most. These effects are expected to be immediate and in the short term.

5.8 These actions reduce the role of price as a driver of lower energy use, although support for energy efficiency measures will help to reduce overall energy demand. The lifecycle assessment determined that overall these actions will have a net negative effect on achieving national greenhouse gas emissions targets, as there is a greater emphasis on financial support for those facing fuel insecurity than reduction of energy use.

Communities and places can participate in and benefit from the net zero energy transition

5.9 The community energy actions are in relation to shared ownership of renewables and supporting community benefits, including the Community and Renewable Energy Scheme (CARES). The effects of these actions are expected to begin in the medium term and continue into the long term. Direct effects were identified in relation to population and human health and climatic factors, reflecting the direct effects on renewable energy generation and human health from access to renewable energy. Indirect effects were also identified in relation to population and human health; and material assets.

5.10 Supporting communities will encourage local climate action and allow for public engagement. Shared ownership of renewables brings the opportunity for local communities to engage with, and benefit from, renewable energy generation in their local area. This will allow local communities to better engage in the development process. Additionally, revenues from the renewable energy development will be able to be invested back into the community and support locally important issues. Therefore, **significant positive direct effects** are identified in relation to **population and human health**. **Indirect positive effects** are expected in relation to providing support for decarbonising community buildings. Decarbonising community buildings will reduce energy demand. This should help reduce exposure to market price changes as communities will be less reliant on oil and gas.

5.11 Providing support to decarbonise community buildings will help to reduce greenhouse gas emissions by installing renewable technologies, such as heat pumps, and should help reduce energy costs. This will directly support a reduction in GHG emissions through a move away from fossil fuels and encourage more consideration and understanding of carbon footprints. Therefore, **minor positive direct effects** are identified in relation to **climatic factors**.

5.12 **Minor positive indirect effects** are identified in relation to **material assets** as supporting communities and offering opportunities for shared ownership of renewables may allow renewable energy developments to grow faster. Additionally, supporting the decarbonisation of community buildings will increase the energy efficiency of a property enhancing its value.

5.13 The lifecycle assessment concluded that an indirect reduction in GHG emissions is expected as a result of the community energy policy position. This is expected to be slow but gradual in the short term with decreasing levels of GHG emissions expected to continue into the long term. The shared ownership of renewables and providing support for decarbonising community buildings will help Scotland meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Regional and local opportunities

5.14 Regional and local climate action opportunities will provide an opportunity for communities to come together and

engage in collective climate action, and benefit from the transition. This includes Climate Action Hubs and Climate Action Towns, and the Carbon Neutral Islands project aimed at supporting islands to become carbon neutral by 2040. The islands included as part of the project are Hoy, Islay, Great Cumbrae, Raasay, Barra and Yell. The actions also provide support to local authorities for Local Heat and Energy Efficiency Strategies and Delivery Plans.

5.15 The effects from these actions are expected to begin in the short term and continue into the long term. Direct effects were identified in relation to population and human health only. Indirect effects were identified in relation to climatic factors and material assets.

5.16 Minor positive direct effects are identified in relation to **population and human health** as supporting climate action will allow people to get more involved in local community initiatives, and the carbon neutral islands project will support these communities, who are vulnerable to energy prices and fossil fuel reliance. Additionally, regional climate action hubs will act as an education tool to help understand the impacts of climate change and how to reduce carbon footprint. There will also be opportunities to help people and businesses in their transition to net zero. Building links between relevant groups will help develop partnerships allowing for better sharing of information.

5.17 Partnership working, raising awareness and encouraging climate action, including the carbon neutral island programme, will provide the information and tools for communities to take action against climate change. This can ensure that people and communities consider their carbon footprint. This will indirectly support a reduction in GHG emissions. Therefore, **minor positive indirect effects** are identified in relation to **climatic factors**.

5.18 Supporting climate action and partnership working could help to support community projects. Regional and local climate action and the carbon neutral islands project may offer the opportunity for local communities to access renewable energy and become more involved in renewable energy projects. Therefore, **minor positive indirect effects** are identified in relation to **material assets**.

5.19 The lifecycle assessment concluded that an indirect reduction in GHG emissions is expected as a result of regional and local climate action. Climate change action will help support Scotland achieving net zero. This is expected to be slow but immediate in the short term at the early stages of climate action with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Delivering a Just Transition for Scotland's energy economy

Creating a supportive policy environment and maximising the impact of government expenditure

5.20 The actions aim to support investment in green jobs, skills and energy transition, industry and manufacturing decarbonisation, heat and transport decarbonisation, infrastructure investment in the renewable energy sector including deep water ports and infrastructure for the decommissioning sector supporting a just transition. Overall, direct effects are identified in relation to climatic factors; population and human health; water; biodiversity, flora and fauna; cultural heritage and historic environment; landscape; and material assets. These effects are expected to begin in the medium term and continue into the long term.

5.21 Significant positive direct effects are identified in relation to **climatic factors** as infrastructure investment and investing in decommissioning will help lower GHG emissions and support the growth of the renewable energy sector. **Minor positive indirect effects** are identified in relation to **air** as lower GHG emissions will also improve air quality.

5.22 Infrastructure investment and investing in decommissioning and the energy transition and decarbonisation will directly support the renewable energy sector offering a variety of green energy to consumers, and provide employment opportunities, supporting health and wellbeing, alongside investment in green jobs and skills. Therefore, **minor positive direct effects** are identified in relation to **population and human health**.

5.23 Minor negative direct effects are expected in relation to **soils and geology** as coastal development projects have the potential to disturb sea beds through construction and operational activities. Therefore, **minor negative direct effects** are identified in relation to **water** and **biodiversity, flora and fauna**.

5.24 Infrastructure projects have the potential to affect marine cultural heritage, through dredging and construction works. Therefore **minor negative direct effects** are identified in relation to **cultural heritage and the historic environment**. **Minor negative direct effects** are identified in relation to **landscape** as coastal infrastructure projects have the potential to negatively impact the visual aspect of the landscape and result in loss or degradation to the environment.

5.25 Investing in infrastructure and offering funding for the net zero transition will support and help grow the renewable energy sector. Growing the renewable energy sector could indirectly support growth in the local or regional economy, and decommissioning undertaken in line with the principles of the

circular economy reduces resource use. Therefore, **minor positive direct effects** are identified in relation to **material assets**.

5.26 The lifecycle assessment concluded that indirect reductions in GHG emissions are expected as investment in renewable energy sector and infrastructure will help push forward the move towards achieving net zero. This investment will help Scotland to meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Attracting private investment

5.27 The actions relate to attracting private investment in relation to the renewable energy sector to support key areas of investment to facilitate the development of infrastructure and develop required skills.

5.28 Direct effects were identified in relation to population and human health and material assets only. Indirect effects were identified in relation to climatic factors and population and human health. These effects are expected to be in the short term to long term as investment continues.

5.29 Attracting private investment in the energy sector will indirectly support a reduction in GHG emissions through a move away from fossil fuels. **Minor positive indirect effects** are identified in relation to **climatic factors**.

5.30 Attracting private investment will directly support the renewable energy sector and enhance infrastructure. Additionally attracting private investment could indirectly lead to the creation of employment opportunities within the renewable energy sector, supporting health and wellbeing. Therefore, **minor positive direct** and **indirect effects** are identified in relation to **population and human health**.

5.31 Attracting private investment will help boost the renewable energy sector and offer opportunities for enhancement of infrastructure. This will increase the value of the renewables asset in Scotland. Therefore, **significant positive direct effects** are identified in relation to **material assets**.

5.32 The lifecycle assessment concluded that indirect reductions in GHG emissions are expected through attracting private investment. This is expected to be gradual but immediate in the short term at the early stages of investment with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Skills and jobs and boosting our domestic supply chain

5.33 The actions support enhancing Scotland's domestic supply chain and boosting skills and jobs within the energy sector. Direct effects are identified in relation to population and human health and material assets. Indirect effects are identified in relation to climatic factors, air and water. These effects are likely to occur in the short term, and continue into the longer term, as further renewable energy generation takes place. Uncertain effects are identified in relation to soils and geology, biodiversity, flora and fauna, cultural heritage and the historic environment and landscape.

5.34 Boosting Scottish supply chains and increasing manufacturing ability offers the opportunity to potentially drive further investment, innovation, productivity and inclusive growth. Providing funding for jobs and skills development will offer new employment opportunities within the energy sector. This could include the regeneration of areas and offer wider social and health benefits by providing opportunities for people to career change, get back into work or achieve promotion. There will also be opportunities for reskilling from traditional oil and gas jobs to green jobs. The growth of the hydrogen sector offers significant opportunities for regional and local economic growth, creating new high-quality green jobs in rural communities, islands and cities, and new opportunities for reskilling. The transition to low and zero-emission vehicles also has the potential to create green jobs and economic opportunities in Scotland. Therefore, **significant positive direct effects** are identified in relation to **population and human health**.

5.35 Investing in Scotland's supply chain and increasing manufacturing ability for renewable energy will support increased uptake of renewable energy. The increased uptake of renewables will decrease reliance on fossil fuels reducing GHG emissions. There is the potential for long-term increases in domestic transport emissions associated with materials and components, energy use for manufacturing processes and generation of waste which could lead to overall increases in GHG emissions. However, these activities are supporting future renewable energy development. The balance of GHG emissions from domestic manufacturing compared to importing fully fabricated products is unknown. Therefore, **significant positive indirect effects** are identified in relation to **climatic factors**.

5.36 **Mixed minor direct** and **indirect effects** are identified in relation to **material assets**. **Minor positive direct effects** are expected as boosting supply chains and increasing our manufacturing ability will help increase production and installation of renewable energy developments, increasing renewables infrastructure overall. Additionally, supporting more efficient manufacturing reduces resource use, and offering funding for skills development may help boost the

renewable energy sector. However, minor negative direct effects are expected due to the use of raw materials in infrastructure construction, the creation of storage facilities and the generation of waste.

5.37 Minor positive indirect effects are identified in relation to **air** as reductions in GHG emissions associated with investing in Scottish supply chain for renewable energy and renewable energy manufacturing processes will improve air quality. However, improvements in air quality are expected in the longer term as the supply chain supporting renewable energy is developed.

5.38 Investing in Scottish supply chain and manufacturing processes for renewable energy could increase the demand for water potentially having a negative impact on the marine environment and Scottish watercourses. Therefore, **minor negative indirect effects** are identified in relation to **water**.

5.39 There are **uncertain** effects in relation to **biodiversity, flora and fauna, cultural heritage and historic environment, and landscape**. It is unclear if boosting supply chain development will lead to new development, or if it will take place on existing manufacturing or brownfield sites.

5.40 The use of raw materials will be required in infrastructure works and development. However, this infrastructure will reduce reliance on fossil fuels through encouraging the use of renewable energy and lower greenhouse gas emissions in the long-term following construction. Indirect GHG emissions reductions will occur as increasing the number of green jobs will help to expand the renewable energy sector and encourage the move away from fossil fuels. Depending on the rate at which these changes are implemented, and the carbon footprint of materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. In the long term, it is likely that renewable energy could be used to power any manufacturing facilities. There is significant uncertainty over the carbon footprint of the materials involved, the scale of development enabled and the payback period from implementing the changes.

The net zero energy system is continuously innovative and competitive in domestic and international markets

5.41 The actions relate to investing in Scotland's renewable energy sector, publishing the Renewable Export Plan, implementing the Hydrogen Action Plan, supporting trade for renewable energy goods and services, including hydrogen and understanding the issues surrounding a CO_2 shipping industry centred on Peterhead, and publishing the Innovation Strategy. Overall, direct effects were identified in relation to climatic factors and air. Indirect effects were identified in relation to population and human health and material assets.

5.42 Minor positive direct effects are identified in relation to **climatic factors** as further development of net zero goods and services and improved trade will support the development of renewable energy within Scotland and overseas. The Hydrogen Action Plan will support the move away from fossil fuels through the use of hydrogen energy. Additionally, considering the potential regulatory, infrastructure and economic requirements of a CO2 emissions industry centred on Peterhead port will indirectly support future carbon capture and storage. These effects are expected to start in the medium term with long term reductions in GHG emissions. **Minor positive direct effects** are identified in relation to **air** as a reduction in GHG emissions will improve air quality.

5.43 Minor positive indirect effects for **population and human health** may arise from employment opportunities, with associated benefits for physical and mental health. These effects are expected to start in the medium term with continued long-term effects.

5.44 Mixed effects are identified in relation to **material assets**. **Minor positive direct effects** are identified through the investment and growth in the renewable energy sector will support growth in Scotland's national and local economies. However, infrastructure may be required to support a growth in Scotland's renewable energy sector, in particular to allow the export of renewable energy. This may require the use of raw materials and the production of waste to develop the needed infrastructure. Therefore, **minor negative direct effects** are identified. These effects are expected to start in the medium term with continued long-term effects.

5.45 Depending on the infrastructure required and the nature of the trade and inward investment and considering both direct and indirect effects, there will likely be an overall **net positive** impact on achieving national greenhouse gas emissions reduction targets.

Energy supply

Scale up renewable energy

Offshore Wind

5.46 This section is assessed in the context of the existing Offshore Wind Policy Statement[257] and SEA[258]. The Offshore Wind Policy Statement sets out the ambition to achieve 8-

[257] Scottish Government (2020) Offshore wind policy statement. [online] Available at: https://www.gov.scot/publications/offshore-wind-policy-statement/documents/

[258] Scottish Government (2019) SEA of Sectoral Marine Plan for Offshore Wind Energy [PDF] Available at: https://mst.dk/media/188824/sea-sectoral-marine-plan-offshore-wind-energy-strategic-environmental-assessment-environmental-report.pdf

11GW of offshore wind in Scottish waters by 2030, and the draft Energy Strategy and Just Transition Plan seeks views on whether an increased level of ambition should be set. It also sets out the commitment to revise Scotland's National Marine Plan, deliver research on consenting and planning risks and update guidance on community benefit from offshore renewable energy development.

5.47 Overall, direct effects were identified in relation to the nine SEA topics. These effects are expected to be in the short to long-term depending on the rate of wind developments and installation of wind turbines.

5.48 Supporting the development of offshore wind will reduce the reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale, and impacts on marine carbon sources alongside emissions from construction and maintenance reduce the overall positive effect. The impact of climate change on coastal infrastructure is also a consideration, including the impacts of sea level rise and coastal erosion. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive direct effects** are expected in relation to **air** as reducing reliance on fossil fuel will improve air quality.

5.49 The generation of increasing volumes of offshore wind energy could help to reduce energy bills in the longer term. Updating the Good Practice Principles for community benefit will allow communities to benefit from offshore wind developments whether through shared ownership or financial incentives. Energy development in near shore areas could have adverse impacts on population and human health as a result of underwater noise, shadow flicker, visual effects and impacts on navigational safety during the lifecycle of the project from surveys to decommissioning. Therefore, mixed **minor positive and minor negative direct effects** are identified in relation to **population and human health**. These effects are expected to be in the short to long term depending on the speed of offshore wind development.

5.50 The installation of wind turbines and transmission network offshore has the potential to negatively impact the coastal and marine environment including marine species from physical disturbance to the seabed, impacts on water quality, contamination from construction. Therefore, **minor negative direct effects** are identified in relation to **soils and geology;** and **water**.

5.51 Significant negative direct effects are identified in relation to **biodiversity, flora and fauna** as the installation and operation of wind turbines and offshore transmission network could cause the collision and displacement of seabirds, habitat loss from physical disturbance from the seabed, impacts on water quality, contamination from construction, noise and disturbance, including electromagnetic fields. These effects are expected to be in the short to long term depending on the rate of wind developments and installation of wind turbines.

5.52 There is potential for installation, operation and decommissioning to affect known historic sites and their exclusion zones, including protected sites (e.g. World Heritage (WHS) sites), coastal listed buildings such as lighthouses, scheduled monuments and other unknown, submerged or non-designated archaeological assets features or paleo-landscapes and the potential for the offshore transmission infrastructure to cause loss of or damage to known or unknown buried heritage from construction and maintenance/repair activities. Therefore, **minor negative direct effects** are identified in relation to **cultural heritage and historic environment**.

5.53 There is the potential for turbines and their supporting infrastructure (i.e., additional platforms, construction, maintenance or decommissioning vessels and equipment) associated with any of the offshore wind technologies, to adversely affect sensitive landscape and visual receptors such as designated or valued landscapes/seascapes. Therefore, **significant negative direct effects** are identified in relation to **landscape**.

5.54 Mixed effects are identified in relation to **material assets**. **Significant positive direct effects** on **material assets** are identified as a result of installation of wind turbines which will allow for the generation of renewable energy reducing reliance on fossil fuels. Additionally, offshore wind energy will support the enhancement of existing ports and harbors. Enhancing the supply chains and legislating on electricity generating consents will help boost investment within the offshore wind energy. **Minor negative direct effects** will arise from the resources required to implement wind energy. Additionally, materials will be required in the long term maintenance of wind turbines and potential increase in waste when the wind turbine is no longer useable.

5.55 The lifecycle assessment concluded that direct GHG emissions will arise from the production, transport and installation of materials required for wind turbines and transmission networks. These infrastructure changes will result in increased use of renewable energy. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Onshore Wind

5.56 This section is assessed in the context of the Onshore Wind Policy Statement 2022. As of June 2020, Scotland has 8.7GW installed capacity, with 11.3 GW in the pipeline in over 217 projects. Scotland has an ambition for an additional 12GW of onshore wind to be installed[259]. This policy position continues to support onshore wind developments.

5.57 Overall, direct effects were identified in relation to climatic factors; population and human health; air; soils and geology; biodiversity, flora and fauna; cultural heritage and historic environment; landscape; and material assets. These effects are expected to be in the short to long term depending on the speed of wind developments and installation of wind turbines.

5.58 Supporting the development of onshore wind turbines will encourage the use of renewable energy and reduce the reliance on fossil fuels. This will reduce GHG emissions. However, the extent of benefits will be dependent on factors such as scale, and the location of development and impacts on high carbon soils. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive direct effects** are expected in relation to **air** as reducing GHG emissions will improve air quality.

5.59 The installation of wind turbines and generation of wind energy could reduce energy bills by reducing reliance on fossil fuels that are subject to changes in market price. This could help relieve fuel poverty levels. Additionally, shared ownership can help to promote stronger relationships between local communities and the wind energy sector while benefiting financially from the energy generated. Additionally, representing the community energy sector at the wind strategic leadership group will give communities a voice when it comes to onshore wind. Therefore, **minor positive direct effects** are identified in relation to **population and human health**.

5.60 **Minor negative direct effects** are identified in relation to **soils and geology** as soil disturbance is expected during wind farm development**.** However, the Scottish Government is taking action to improve guidance to support both peatland and onshore wind aims, which will help to mitigate impacts on peat soils. **Minor negative direct effects** are identified in relation to **biodiversity, flora and fauna** as wind turbines could impact on species and their habitats in particular birds. **Minor negative direct effects** are identified in relation to **cultural heritage and the historic environment** in terms of impacts from construction and in terms of impacts on setting. The installation of wind turbines may alter the visual aspect of the wider landscape, although the impact will depend on the local context. However cumulative effects from the scale and extent of development means that **significant negative direct effects** are identified in relation to **landscape,** however there is some uncertainty depending on the location of this development.

5.61 **Mixed effects** are identified in relation to **material assets**. **Minor positive direct effects** on material assets are identified as a result of installation of wind turbines which will allow for the generation of renewable energy reducing reliance on fossil fuels. Additionally, there is support for the use of recycled and refurbished turbines. **Minor negative direct effects** will arise from the resources required to implement wind energy. Additionally, materials will be required in the long term maintenance of wind turbines and potential increase in waste when the wind turbine is no longer useable.

5.62 The lifecycle assessment concluded that direct GHG emissions will arise from the production, transport and installation of materials required for wind turbines. The wind turbines will result in increased production and use of renewable energy. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Wave and Tidal

5.63 Wave and tidal energy infrastructure is currently located along the coastline of Orkney and off the coastline of parts of Argyll and Bute. The actions set out a vision for wave and tidal energy and will continue to support the marine energy sector through research, development and innovation.

5.64 Overall, direct effects are identified in relation to climatic factors only. These effects are expected to be in the short to long term depending on the speed of marine energy developments and installation of infrastructure to support wave and tidal energy generation. Indirect effects are identified in relation to all other SEA topics.

5.65 Supporting the development of wave and tidal energy will encourage the use of renewable energy and reduce the reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**.

[259] Scottish Government (2022) Onshore wind: Policy Statement 2022 [online] Available at: https://www.gov.scot/publications/onshore-wind-policy-statement-2022/

5.66 Supporting the development of wave and tidal energy will lead to **minor positive indirect effects** for **air** as reducing GHG emissions will improve air quality.

5.67 Supporting the development of wave and tidal energy could increase availability and reliability of renewable energy. This could help relieve fuel poverty levels contributing to health and wellbeing. Therefore, **minor positive indirect effects** are identified in relation **to population and human health**.

5.68 The actions are enabling to support the future development of the sector, therefore indirect effects are identified. There is the potential for impacts on marine sediments and disturbance to the seabed during installation, as well as impacts on infrastructure such as cabling as it reaches shore. This could result in **minor indirect negative effects** in relation to **soils and geology**. Supporting the development of wave and tidal energy will potentially negatively impact the coastal and marine environment including marine and aquatic species through impacts such as noise, pollution and disturbance from construction and operation. Therefore, **minor negative indirect effects** are identified in relation to **water** and **biodiversity, flora and fauna**.

5.69 Supporting the development of wave and tidal energy has potential for long term negative impacts on both known and unknown, as well as designated and undesignated offshore archaeology and protections sites, including historic wrecks. There is also potential impact on seascape and coastal landscapes. Therefore, **minor negative indirect effects** are identified in relation to **cultural heritage and historic environment** and **landscape**.

5.70 Supporting the development of wave and tidal energy will have **mixed effects** on **material assets**. **Minor positive indirect effects** are identified as a result of installation of wave and tidal energy infrastructure which will allow for the further generation of renewable energy reducing reliance on fossil fuels. **Minor negative indirect effects** will arise from the resources required to implement wave and tidal energy. Additionally, materials will be required in the long-term maintenance of wave tidal equipment and potential increase in waste when the wave and tidal equipment is no longer useable.

5.71 The lifecycle assessment concluded that direct GHG emissions will arise from the production, transport and installation of materials required for wave and tidal energy generation. These infrastructure changes will result in increased production and use of renewable energy. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Solar

5.72 Solar capacity has increased rapidly in the first half of this decade. Solar energy generation ranges largely in scale across Scotland. There is currently 411 MW installed solar in Scotland, with over 750 MW of solar currently in the pipeline. The actions support the greater deployment of solar energy.

5.73 Overall, direct effects were identified in relation to climatic factors; population and human health; air; soils and geology; biodiversity, flora and fauna; cultural heritage and historic environment; landscape; and material assets. Indirect effects were identified for material assets. These effects are expected to be in the short to long-term depending on the speed of solar developments and rate of installation of PV panels.

5.74 The development of solar panels will encourage the use of renewable energy and reduce reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive direct effects** are expected in relation to **air** as reducing GHG emissions will improve air quality.

5.75 The installation of solar panels on properties could reduce energy bills by reducing reliance on fossil fuels that are subject to volatile changes in price. This could help relieve fuel poverty levels. Updating the Good Practice Principles will allow communities to benefit from offshore wind developments whether through shared ownership or financial incentives. Therefore, **minor positive direct effects** are identified in relation to **population and human health**.

5.76 Minor negative direct effects are identified in relation to **soils and geology** as land take up is expected when there is development of a solar farm.

5.77 Minor negative direct effects are identified in relation to **biodiversity, flora and fauna** as building and roofing works for the installation of solar panels could impact on certain species, such as bats. Although bats are a European protected species, a loss of suitable nesting sites would have a detrimental effect.

5.78 The uptake of solar energy may have adverse effects on landscape character and may alter the setting of a historic asset. In particular, the retrofitting of buildings to include new technologies such as solar panels and siting of new development. Therefore, **minor negative direct effects** are identified in relation to **landscape** and **cultural heritage and historic environment**.

5.79 Mixed effects are identified in relation to **material assets**, as raw materials are required to create solar panels. **Minor positive direct effects** on **material assets** are identified as a result of installation of solar panels which will add value to the property and make it more sustainable and eco-friendly. The development of solar energy generation increases the resilience of the energy system. **Minor negative indirect effects** will arise from the resources required to implement solar panels. Additionally, materials will be required in the long term maintenance of solar panels and potential increase in waste when the solar panel is no longer useable.

5.80 The lifecycle assessment concluded that direct GHG emissions will arise from the production, transport and installation of materials required for solar panels. However, these infrastructure changes will result in increased production and use of renewable energy. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Hydro[260]

5.81 The Scottish Government calls on the UK Government to support the development of pumped hydro power through an appropriate market mechanism. Overall, direct effects are identified in relation to all the SEA topics.

5.82 The development of further pumped hydro storage will have **significant positive direct effects** on **climatic factors**, facilitating reduced reliance on fossil fuels and increased energy storage capacity. Energy storage can also offer greater system flexibility and efficiencies, helping to manage fluctuations in energy demand, including managing the intermittency of energy generation from other renewable technologies, supporting adaptation to the impacts of climate change.

5.83 Potential minor direct negative effects are identified in relation to **population and human health** from construction and operation in the short term, such as noise and vibration, are likely to require consideration at project level with the scale of effects likely to depend on factors such as proximately of nearby populations. Negative implications may also arise for recreational users. Possible long term benefits could arise from reduced risk of disruption and increased diversity and resilience as pumped hydro can offer greater energy system flexibility and efficiencies, helping to manage fluctuations in energy demand, including managing the intermittency of energy generation from other renewable technologies. Greater storage of energy can also allow consumers to use energy differently and where this leads to energy efficiency, support reducing fuel poverty and wider poverty.

5.84 Construction and operation of pumped hydro storage can lead to short term negative impacts, including noise, vibration and dust, including from increased transports movements, which can in turn, affect human health and biodiversity.

5.85 Permanent loss of soil during reservoir construction and site development, including associated infrastructure requirements is expected. Extensive areas of land could be required where new reservoirs are created. The significance of this would be dependent on the scale of works proposed. There is the potential for further negative impacts to arise through sediment transportation. Therefore, **minor negative effects** are identified in relation to **soil**.

5.86 Construction of large storage or pumped storage hydropower can lead to blocking, diverting and changes to the natural course of river systems. **Negative effects** could include effects on **water** quality and quantity, morphological changes to standing and running waters. Potential adverse impacts could also arise due to sediment transportation, including potential for increased turbidity. Significance of potential effects will be influenced by factors such as location and the scale of works proposed in combination with existing activity, and are likely to require further consideration.

5.87 Pumped hydro storage projects have potential for **significant negative direct effects** on **biodiversity, flora and fauna** from loss of habitat and disturbance to species, changes in water levels and turbidity, pollution and changes in lighting or noise. Both terrestrial and freshwater habitats and species can be affected by pumped hydro schemes.

5.88 Pumped hydro storage has potential for **direct and indirect effects** on **cultural heritage and historic environment**, including designated and undesignated, features and their settings. Future projects brought forward, where locations are currently unknown are likely to require consideration at project level.

5.89 Pumped hydro storage infrastructure has the potential to give rise to significant landscape impacts depending on the location, scale, and number of developments. Access tracks, pipelines, grid connections and other components could have

[260] Scottish Government (2021) Appendix D - Proposed National Developments [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/impact-assessment/2021/11/scotland-2045-scotlands-fourth-national-planning-framework-draft-integrated-impact-assessment-environmental-report/documents/appendix-d-proposed-national-developments/appendix-d-proposed-national-developments/govscot%3Adocument/appendix-d-proposed-national-developments.pdf

significant impacts requiring mitigation through appropriate siting and post-construction restoration where possible. Effects during construction could be extensive, but temporary in nature. Operational effects include changes to landscape at a broad scale. The significance of these effects will depend on the character and sensitivity of the landscape within which developments are located. Projects at existing hydroelectric power plants have the potential to have less significant effects on landscapes. Construction of new underground caverns to accommodate plant tunnels and pipes could have significant impacts on geology. Therefore, **minor negative effects** are identified in relation to **landscape**.

5.90 Potential benefits should arise from pumped hydro storage through supporting diversification and increased resilience within the energy network. Consideration will need to be given at project level to mitigate the potential generation of waste materials that could arise, for example, the excavation of rock, depending on scale of work. Where possible, this should include consideration of re-use. Therefore, **minor positive effects** are identified in relation to **material assets**.

5.91 Depending on the nature of the project taken forward, and considering both direct and indirect effects, it is likely that this development will have a **net positive** effect due to the facilitation and enabling of renewable energy development across Scotland from the provision of energy storage and rapid capacity during demand peaks. The scale of this effect could range from medium to very high depending on the project details, the location and frequency of use. If the development enables significantly more renewable electricity to be generated, whilst minimising energy associated with construction and decommissioning, and effects on soil carbon, a very high positive effect will be expected. However, if renewable electricity generation provided by the development is lower, and there are more significant amounts of energy and carbon intensive materials used during construction, this positive effect might reduce to medium.

Bioenergy

5.92 The draft ESJTP sets out that the Scottish Government's aim is to see bioenergy used only where it can support Scotland's journey to net zero, and in the short to medium term only be used where its most effective in reducing emissions. Actions aim to develop a Bioenergy Action Plan, a strategic framework for the most appropriate use of finite resources. A bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Overall, only indirect effects were identified against the nine SEA topics as this policy position contains an enabling action. These effects are expected in the short to medium term following the strategy being published.

5.93 The development of a bioenergy action plan will potentially lead to increased use of bioenergy which will reduce reliance on fossil fuels. GHG emissions per unit of electricity generated from biomass can be lower or higher than those from fossil fuels depending on the type of biomass burnt and where it comes from. If bioenergy is combined with Carbon Capture and Storage (CCS), there is the potential to reduce emissions as this can be considered a negative emission technology due to the carbon sequestration associated with growing energy crops. Furthermore, if biomass is imported from overseas, there will be emissions associated with transport and there will be less control over the production methods employed. Assuming that the bioenergy action plan will develop the most efficient use of bioenergy resources, including CCS, **significant positive indirect effects** are identified in relation to **climatic factors**.

5.94 There is a risk that biofuel production can cause competition for land use between food production and fuel production. Therefore, **minor negative indirect effect**s are identified in relation to **population and human health**.

5.95 If bioenergy with Carbon Capture and Storage is utilised instead of fossil fuel for energy generation, as will be explored in the action plan, there will be a **minor positive indirect effect** for **air** due to the associated increase in air quality from a reduction in fossil fuel combustion.

5.96 Depending on the type of crop grown and where, there could be potential **mixed minor positive and minor negative indirect effects** on **soils and geology**. If bioenergy crops replace annual crops on farmland there may be reduced soil disturbance following establishment of the bioenergy crop. If annual bioenergy crops are produced there may be no change or greater soil disturbance.

5.97 Depending on the type of crop grown and where, there could be potential **mixed minor positive and minor negative indirect effects** on **water**, depending on the water demands of the crop grown. Depending on the type of crop grown and where, there could be potential **mixed minor positive and/or minor negative indirect effects** on **biodiversity, flora and fauna** as a result of competition with woodland creation and other habitats that may benefit biodiversity.

5.98 Depending on the type of crop grown and where, there could be potential, **mixed minor positive and/or minor negative indirect effects** on **cultural heritage and the historic environment** as a result of impacts on the setting of cultural heritage and historic environment features. There is the potential for **mixed minor positive and/or minor negative indirect effects** on **landscape** if the action plan enhances or detracts from the landscape qualities. Depending on the type and location of biomass grown, for example on brownfield land this will have different impacts on the landscape.

5.99 An increased uptake of biomass could cumulatively raise some challenges regarding material assets such as forestry expansion and agriculture. If expanded considerably, biomass would have a **minor negative indirect effect** on **material assets**.

5.100 The lifecycle assessment concluded that direct GHG emissions reductions are expected as the Bioenergy Action Plan will help reduce reliance on fossil fuels. If bioenergy is combined with CCS, this will help the transition to net zero. The transport and production of bioenergy will have associated emissions. However, the Bioenergy Action Plan will develop the most efficient use of bioenergy resources mitigating any production and transport related emissions. Developing a Bioenergy Action Plan is expected to make a significant contribution to reducing Scotland's GHG emissions and help reach net zero by 2045. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Hydrogen

5.101 This section is assessed in the context of the existing Hydrogen Action Plan and SEA[261]. The draft ESJTP restates the ambitions set out the hydrogen action plan[262] and consults on developing 5GW of renewable and low carbon hydrogen by 2030 and 25GW by 2045, alongside investment and actions to support consenting and skills development.

5.102 Hydrogen can be produced from a variety of resources, such as natural gas, nuclear power, biogas and renewable power like solar and wind[263]. Green hydrogen is hydrogen generated by renewable energy or from low-carbon power.

5.103 Scotland's first Hydrogen Energy Hub will become Operational in Aberdeen in 2023. The creation of regional hydrogen energy hubs by 2030 will be spread across the following areas: Shetland, Orkney, Western Isles, Cromarty Firth, Aberdeen & North East, Dundee, Fife, Grangemouth, Ayrshire, Glasgow and Argyll & Islands.

5.104 Overall, direct effects were identified in relation to climatic factors; air; soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment; landscape; and material assets. Indirect effects are identified for water and population and human health. These effects are expected to occur within the short term to long term as hydrogen production occurs.

5.105 The rollout of hydrogen infrastructure and using renewable and low carbon hydrogen would reduce GHG emissions. Streamlining the consenting procedures will help ensure that the rollout of hydrogen use is faster allowing Scotland to meet climate change targets more quickly. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**.

5.106 Minor positive indirect effects are identified in relation to **population and human health** as a result of increased skills development which supports health and wellbeing.

5.107 Current research[264] indicates that burning hydrogen may lead to NOx emissions having negative effects on the overall air quality. Burning hydrogen has similar or lower NOx emissions to those emitted when using methane fuel. However, there is a degree of uncertainty due to the scale of hydrogen production proposed. Therefore, **minor negative direct effects** are identified in relation to **air**.

5.108 Significant negative direct effects are identified in relation to **water** as hydrogen production needs substantial quantities of water. In offshore locations, or coastal locations with limited freshwater supply, the desalination process is required which results in a by-product, brine, which normally is released to the sea having negative effects on the marine ecosystems. It can cut levels of oxygen in the sea near desalination plants. Additional **minor negative indirect effects** on other species up the food chain are identified.

5.109 To ensure that hydrogen is available in strategic locations, it will be necessary to construct storage facilities across the country. This may result in additional land take up having permanent negative effects on biodiversity limiting space for habitats and species. Therefore, **minor negative direct effects** are identified in relation to **soils and geology** and **biodiversity, flora and fauna**.

5.110 Hydrogen production plants will require construction of new infrastructure which could have **minor negative direct effects** in relation to **cultural heritage and historic environment**. Hydrogen storage as part of infrastructure requirements may negatively impact on landscape setting especially in more remote areas and less developed locations. Therefore, **minor negative direct effects** are identified in relation to **landscape**.

5.111 Mixed effects are identified in relation to **material assets**. To enable the large-scale production of hydrogen, there is a requirement to develop hydrogen processing infrastructure, storage facilities, and facilities for producing fuel cells. This may require the use of raw materials throughout the life of the infrastructure to support hydrogen

[261] Scottish Government (2021) SEA of the Hydrogen Action Plan Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/11/draft-hydrogen-action-plan/documents/sea-draft-hydrogen-action-plan-scotland-environmental-report/sea-draft-hydrogen-action-plan-scotland-environmental-report/govscot%3Adocument/sea-draft-hydrogen-action-plan-scotland-environmental-report.pdf

[262] Scottish Government (2022) Hydrogen Action Plan. [online] Available at: https://www.gov.scot/publications/hydrogen-action-plan/documents/

[263] National Grid (undated) What is hydrogen? [online] Available at: https://www.nationalgrid.com/stories/energy-explained/what-is-hydrogen

[264] Clean Energy Group (2020) Hydrogen Hype in the Air [online] Available at: https://www.cleanegroup.org/hydrogen-hype-in-the-air/

use and waste as a result of maintaining and disposing of old infrastructure. Therefore, **minor negative direct effects** are identified. The development of hydrogen technologies will have **minor positive direct effects** on **material assets** by improving the reliability and security of energy supply, as well as the resilience of the energy sector.

5.112 The use of raw materials will be required in the construction and maintenance of hydrogen infrastructure. However, this infrastructure will reduce reliance on unabated fossil fuels. The lifecycle assessment concluded that depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Planning and consenting

5.113 The action aims to place climate and nature at the centre of the planning system in line with NPF4, and with clear support for renewable energy, low carbon and zero emissions technologies, including transmission and distribution infrastructure.

5.114 The effects are expected to be within the short to the long term as more renewable energy developments receive consent. Overall, only indirect effects were identified in relation to climatic factors; population and human health; and material assets.

5.115 A planning system with climate and nature at the core, which supports all forms of renewable, low carbon and zero emissions technologies will ensure that renewable energy development is approved at a faster rate encouraging the move away from fossil fuels through the generation of increased levels of renewable energy. This will indirectly result in reduced GHG emissions. Therefore, **minor positive indirect effects** are identified in relation to **climatic factors**.

5.116 Delivering more renewable energy through a clearer consenting system could improve access to renewable energy. It will also allow local communities to be able to access green energy. Therefore, **minor positive indirect effects** are identified in relation to **population and human health**. **Minor positive indirect effects** are identified in relation to **material assets** as greater consideration of climate and nature through planning and consenting for renewable, low carbon and zero emissions technologies energy generation will help grow these sectors in Scotland.

5.117 The lifecycle assessment concluded that indirect GHG emissions reductions are expected due to an increase in renewable energy generation associated with changes to the consenting system which provide greater support for renewable, low carbon and zero emissions technologies. Increasing renewable energy generation will help Scotland to meet national emissions reduction targets and move towards net zero. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Economic benefits

5.118 The economic benefits action will establish a Green Datacentres cluster to increase renewable energy adoption by datacentres. Datacentres powered by renewable energy and international fibre connections are key parts of the digital and data economy. A Green Datacentre is a service facility which utilises energy-efficient technologies, maximising energy efficiency. Overall, direct effects were identified in relation to climatic factors only. Indirect effects were identified in relation to air; population and human; and material assets. These effects are expected within the short to medium term.

5.119 The Green Datacentres Cluster Builder will support the datacentres with access to renewable energy. Overall, this will reduce GHG emissions associated with energy. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive indirect effects** are identified in relation to **air** as reducing GHG emissions will result in improvements in air quality.

5.120 Green Datacentres cluster builder will support the development of green datacentres in Scotland which will support digital connectivity and employment which contribute to health and wellbeing with **minor positive indirect effects** in relation to **population and human health**.

5.121 Minor positive indirect effects are identified in relation **material assets** as development of Green Datacentres will increase the sustainability of this infrastructure.

5.122 Significant direct GHG emissions reductions are expected as a result of the Green Data-Centres. Green Data-Centre Cluster Builder will ensure that datacentres make use of a variety of renewable energy sources. This will result in a further move away from fossil fuels and lower energy usage. The Green Datacentres are expected to help Scotland meet its national emissions reduction targets. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.

Economic benefits from exporting energy

5.123 This action supports research to maximise the economic benefits to households, communities and regional economies from Scotland's anticipated surplus energy.

Overall, indirect effects are identified for climatic factors, population and human health and material assets.

5.124 Minor positive indirect effects are identified in relation to climatic factors from greater utilisation of renewable energy, as a result of identifying increased economic benefit. Significant positive indirect effects are identified in relation to population and human health as a result of increased household, community and regional economic benefit from surplus renewable energy. This is likely to result in improved engagement in renewable energy development from local communities, and lower cost energy, supporting health and wellbeing.

5.125 Minor positive indirect effects are identified in relation to material assets as ensuring maximum benefit from surplus low-carbon energy may allow low-carbon energy developments to grow faster.

5.126 Indirect reductions in GHG emissions are expected as ensuring maximum benefit from Scotland's anticipated surplus energy will help push forward the continued move over to renewable energy and achieving net zero. This is expected to be in the medium term with decreasing levels of GHG emissions expected to continue into the long term. This policy position will help Scotland meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Reduce our reliance on other energy sources

North Sea oil and gas

5.127 The actions include supporting a rapid just transition for the oil and gas sector. Whilst licensing is reserved to the UK Government, actions also include calling on the UK Government to increase the rigor of climate compatibility checkpoint tests for offshore licensing, and consults on whether there should be a presumption against new exploration for oil and gas, reskilling of oil and gas workers, the development of green industries and jobs in the north east, and the development of the ultra-deep-water port at Dales Voe, Shetland to support the oil and gas decommissioning sector.

5.128 Overall, direct effects were identified in relation to climatic factors; air; water; biodiversity, flora and fauna; cultural heritage and historic environment; and material assets. Indirect effects are identified in relation to material assets. These effects are expected to be in the short to medium term.

5.129 A just transition for the oil and gas sector will support the move away from the production of fossil fuel-based oil and gas. It will help support Scotland's reliance on renewable sources. This will result in a decrease in GHG emissions for the oil and gas sector. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive direct effects** are expected in relation to **air** as reducing GHG emissions from the oil and gas sector and reliance on fossil fuels will improve air quality.

5.130 This policy position will support the re-skilling of oil and gas workers while offering new job opportunities. This will limit job losses from the transition away from oil and gas. It will also help to retain the viability of communities that are reliant on oil and gas jobs, with positive effects on health and wellbeing. Therefore, **significant positive direct effects** are identified in relation to **population and human health**.

5.131 Minor negative direct effects are expected in relation to **soils and geology** as deep-water ports have the potential to disturb sea beds, through dredging and changes in coastal deposition. Deep water ports have the potential to affect aquatic environments through changes in water quality, coastal hydrology and contamination. Therefore, **minor negative direct effects** are identified in relation to **water**.

5.132 Deep water ports have the potential to negatively affect aquatic species and habitats from the effects listed above, in addition to the impacts from vessel movements. Therefore, **minor negative direct effects** are identified in relation to **biodiversity, flora and fauna**.

5.133 Deep water ports have the potential to affect marine cultural heritage, through dredging and construction works. Therefore **minor negative direct effects** are identified in relation to **cultural heritage and the historic environment**. **Minor negative direct effects** are identified in relation to **landscape** as deep-water ports have the potential to negatively impact on landscape as a result of new infrastructure and vessel movement.

5.134 Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects to soils and geology; biodiversity, flora and fauna; water; cultural heritage and historic environment; and landscape.

5.135 Mixed effects are identified in relation **to material assets.** Investing in infrastructure and a net zero transition will support and help grow the renewable energy and low carbon sector. Growing the renewable energy sector could indirectly support growth in the local or regional economy. Therefore, **minor positive direct effects** are identified in relation to material assets. However, infrastructure may be required for a Just Transition resulting in the use of raw materials and production of waste. Therefore, **minor negative direct effects** are identified.

5.136 The lifecycle assessment concluded that a just transition for the oil and gas sector will result in a significant

reduction in GHG emissions. Depending on the rate at which these changes are implemented, the lifespan of the development and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Onshore conventional oil and gas

5.137 The preferred policy position for onshore conventional oil and gas is of no support for extraction in Scotland. Conventional oil and gas refers to petroleum, or crude oil, and raw natural gas extracted from the ground by conventional means and methods. The oil and gas industry use a range of techniques to extract oil and gas from underground reserves. Conventional oil and gas reserves can be exploited by drilling a well, with oil or gas then flowing out under its own pressure[265]. There is currently no onshore oil and gas production in Scotland, however onshore oil and gas hydrocarbon licenses cover an area south of Wick, and two locations in the central belt[266]. Overall, direct effects are identified in relation to population and human health; air; and landscape. These effects are likely to occur in the short term and be permanent.

5.138 This policy position reduces the availability of oil and gas overall, however onshore sources are unlikely to be significant in comparison to the existing licences for offshore oil and gas production. Therefore, a **negligible effect** is identified in relation to **climatic factors**. No new onshore conventional oil and gas extraction in Scotland avoids the population and human health impacts from extraction in areas close to where people live. This includes avoidance of air quality impacts on human health and other adverse impacts in terms of traffic, noise and impacts from development. However air quality impacts from offshore oil and gas production will continue. Therefore, **minor positive direct effects** are identified in relation to **population and human health** and **air** due to avoidance of impacts on communities.

5.139 No new onshore conventional oil and gas extraction avoids the negative effects on soils and geology; terrestrial water environment; local biodiversity; cultural heritage resources and local landscape from onshore exploration and extraction of oil and gas. However offshore impacts will continue. Therefore, **negligible effects** are identified in relation to **soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment; and landscape**. No new onshore conventional oil and gas extraction avoids the extraction and use of oil and gas and required infrastructure. Therefore, **negligible effects** are identified in relation to **material assets**.

5.140 No new onshore conventional oil and gas production is not expected to make significant contributions to reducing GHG emissions and Scotland's national emissions targets, due to the scale of continued production from the offshore industry, and minor contribution that onshore production could make overall.

Unconventional oil and gas

5.141 In October 2019, Scottish Ministers announced their finalised position of no support for unconventional oil and gas. The term "unconventional oil" refers to crude oil and gas that is obtained through methods other than traditional vertical well extraction. This policy position continues not to support unconventional oil and gas. Reflecting the previous SEA of this policy position[267], direct effects were identified in relation to climatic factors; population and human health; air; water; biodiversity, flora and fauna; and landscape. These effects are expected to begin in the short term and continue into the long term.

5.142 Significant positive direct effects are identified in relation to **climatic factors** from the avoidance of uncontrolled and controlled release of produced gas to the atmosphere, the release of greenhouse gases as a result of site development and the release of greenhouse gases from the processing and use of Scottish unconventional oil and gas. The combined effects of these greenhouse gas emissions could be significant.

5.143 Significant positive direct effects are identified in relation to **population and human health** as a result of the avoidance of potential risks to physical health and safety. **Significant positive direct effects** are identified in relation to **air** from the avoidance of direct gas emissions, and of exhaust emissions from construction activities and traffic serving the developments.

5.144 Significant positive direct effects are identified in relation to **water** from the avoidance of pollution of ground

[265] Scottish Government (2022) Onshore conventional oil and gas: call for evidence [online] Available at: https://www.gov.scot/publications/onshore-conventional-oil-gas-call-evidence/#:~:text=There%20is%20currently%20no%20onshore%20oil%20and%20gas%20production%20in%20Scotland

[266] Marine Scotland Oil and Gas – Onshore fields, licenses and wells [online] Available at: https://marine.gov.scot/information/oil-gas-onshore-fields-licences-and-wells

[267] Assessment based on findings set out in the SEA of the Scottish Government's preferred policy position on unconventional oil and gas (UOG) https://www.gov.scot/publications/strategic-environmental-assessment-environmental-report-unconventional-oil-gas-policy/ and 2019 addendum, https://www.gov.scot/publications/addendum-2018-consultation-policy-position-unconventional-oil-gas-uog-sea-environmental-report-bria/. The addendum concluded that in light of the consultation comments received, the Scottish Government do not consider that either the 'Business As Usual' or 'Pilot Project' as described in the assessment would meet the objectives of the preferred policy position and, therefore, are not considered to be 'reasonable' alternatives to the preferred policy.

and surface water due to the release of contaminated water, hazardous materials or saltwater intrusion, and the avoidance of the combined effects of pollution and the abstraction of water. **Significant positive direct effects** are identified in relation to **biodiversity, flora and fauna** from the avoidance of the loss and fragmentation of habitats and risks associated with accidental spills of hazardous materials, the spread of invasive species and impacts on wetland systems upon which particular species depend.

5.145 Significant positive direct effects are identified in relation to **landscape** from the avoidance of the impact of unconventional oil and gas development on the character and quality of landscapes, and the associated visual impacts of unconventional oil and gas extraction sites.

5.146 The lifecycle assessment concluded that direct positive effects are expected as not supporting unconventional oil and gas will result in lower future GHG emissions. An avoidance of future GHG emissions will support Scotland's move to net zero and meeting national emissions targets. The absence of unconventional oil and gas as an energy source will support the push to renewable energy also helping Scotland meeting its national targets. It is anticipated that this position could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Coal Extraction

5.147 Scotland has no coal fired power stations. There are currently no operational coal mines in Scotland. There are 18 licenses that are recorded as having an expiry date beyond May 2022; however 15 relate to the Scottish Coal Company, which has been in liquidation for some time. The remaining three sites are where restoration is underway or is complete. Therefore, no future coal mining can or will take place at any of these 18 sites[268]. The only future coal extraction would be under new licenses, which is not in line with the UK Government position on coal for power generation. However, coal is also used for other processes such as coking for steel making and domestic use for heating.

5.148 In 2021, the largest provider of coal imports to the UK were the USA (54%) and Russia (19%)[269]. In June 2021, the UK Government confirmed plans to bring forward the date to remove unabated coal from the UK's energy mix to October 2024; this will mean coal will no longer be used to generate electricity. The UK Government took the decision in December 2022 to approve the new coal mine in Whitehaven, Cumbria. They have also confirmed plans to decarbonise industries that still rely on coal[270]. This assessment reflects the Scottish Ministers' preferred policy position of no support for coal extraction in Scotland, although coal licensing is a reserved matter.

5.149 Overall, indirect effects are expected in relation to climatic factors; population and human health; air; soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment; and landscape. No direct effects were identified. These effects are expected to occur within the short term.

5.150 No Scottish coal extraction will still result in coal imports for industrial processes and heating. Importing coal internationally incurs additional GHG emissions associated with transport. However, as there is no current coal extraction in Scotland and Scotland is currently reliant on imports, the policy position does not change the existing baseline in relation to GHG emissions. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to **climatic factors**.

5.151 As there is no coal extraction in Scotland continuing no extraction of coal avoids the future impacts on landscape from mining, but does not alter the current baseline. Scotland is currently reliant on imports. The policy position avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to **population and human health; air; soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment;** and **landscape**.

5.152 Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to the use of coal. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **negligible effects** are identified in relation to **material assets**.

5.153 As Scotland does not currently extract coal, emissions reductions are not expected as a result of this action. However, the importing of coal from outwith the UK has associated oversea emissions that Scotland contributes too. Continuing to import coal will result in continued GHG transport related emissions.

Nuclear

5.154 Scotland has two privately owned nuclear stations. There are three Nuclear Decommissioning Authority (NDA)-owned civil nuclear sites at advanced stages of

[268] https://www.gov.scot/publications/coal-extraction-policy-call-evidence/
[269] National Statistics publication Energy Trends produced by the Department for Business, Energy and Industrial Strategy (BEIS). (2022) Excel spreadsheet Available at: https://assets.publishing.service.gov.uk › uploads › file
[270] Scottish Government (2022) Coal extraction policy: call for evidence [online[] Available at: https://www.gov.scot/publications/coal-extraction-policy-call-evidence/

decommissioning: Dounreay, Chapelcross and Hunterston A. The Scottish Government does not support the continued use of nuclear for energy generation. There are no plans to build new nuclear plants in Scotland.

5.155 The use of nuclear is considered a low carbon energy source. However, Scotland is a key driver in the generation of renewable energy sources that can be used to replace the use of nuclear power. Renewables were the largest source of electricity generated in Scotland in 202 (57%)[271]. Overall, direct effects were identified in relation to population and human health; air; soils and geology; water; biodiversity, flora and fauna; landscape; and material assets. These effects are expected in the short to the long term.

5.156 The construction of a nuclear power plant can generate significant amounts of GHG emissions which would be avoided by not generating nuclear power. Additionally, mining of uranium is a carbon intensive process, leading to significant embedded carbon emissions for nuclear power. However the lifecycle emissions from nuclear power are identified as lower than coal and gas. Therefore, a **negligible effect** is identified in relation to **climatic factors**.

5.157 Nuclear energy produces radioactive waste. Nuclear power plants pose a significant risk to human health from the potential risk of a nuclear accident. As such, not constructing nuclear power plants will remove the risk of a nuclear spill or accident. Additionally, nuclear energy produces radioactive waste which can contaminate the local environment posing a threat to human health. Therefore, a **minor positive direct effect** is identified in relation to **population and human health**.

5.158 One of the biggest concerns with nuclear power is the radioactive waste produced while generating nuclear power. There are a few types of radioactive material produced throughout the lifecycle of a nuclear power plant, most notably uranium mill tailings and used reactor fuel. This radioactive material that is produced has the potential to pollute air and contaminate soils and ground level. Therefore, **minor positive direct effects** are identified in relation to **air** and **soils and geology** by not generating nuclear power. This radioactive material also has the potential to cause genetic damage or mutation to animals and plants through contamination. Therefore, **minor positive direct effects** are identified in relation to **biodiversity, flora and fauna**.

5.159 The generation of nuclear power requires large volumes of water. During the cooling process, the water becomes contaminated with radionuclides (unstable atoms with excess energy) and must be filtered to remove as many radionuclides as possible. Heavy metals and salts also build up in the water used by nuclear plants, which when released back into the water environment could potentially harm the aquatic ecosystem. Therefore, **minor positive direct effects** are identified in relation to **water** by not generating nuclear power.

5.160 Minor positive direct effects are identified in relation to **landscape** from the avoidance of the impact of nuclear energy development on the character and quality of landscapes, and the associated visual impacts of nuclear power plants. However, a nuclear power plant produces significant power generation from a single location. **Minor positive direct effects** are identified in relation to **material assets** as no generating nuclear power will result in less raw materials being using in energy generation.

5.161 Nuclear power plants have lifecycle emissions of between 4 and 110 gCO2e/kWh[272] which is approximately 90% less than coal and 80% less than gas. Nuclear power is considered a low carbon energy source. However, Scotland generates a large amount of its electricity from renewable energy sources. No longer generating nuclear power is not likely to further reduce GHG emissions.

Reducing demand and decarbonising energy use across heat and transport sectors

Heating and cooling our buildings

5.162 The actions aim to improve energy efficiency of buildings while supporting the use of renewable energy in heat generation. Overall, direct effects are identified in relation to climatic factors; population and human health; air; soils and geology; cultural heritage and historic environment; and material assets. Indirect effects are identified in relation to population and human health; and biodiversity, flora and fauna. These effects will begin in the medium term, and continue over the longer term as further energy efficiency measures are implemented and as more renewables are developed.

5.163 Funding for emissions reductions, improved energy efficiency and increased renewables for homes and

[271]https://scotland.shinyapps.io/Energy/?Section=RenLowCarbon&Subsection=RenElec&Chart=ElecGen

[272]Bruckner T., I.A. Bashmakov, Y. Mulugetta, H. Chum, A. de la Vega Navarro, J. Edmonds, A. Faaij, B. Fungtammasan, A. Garg, E. Hertwich, D. Honnery, D. Infield, M. Kainuma, S. Khennas, S. Kim, H.B. Nimir, K. Riahi, N. Strachan, R. Wiser, and X. Zhang, 2014: Energy Systems. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA [online] Available at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter7.pdf

businesses has a **significant positive direct effect** on reducing GHG emissions. Funding to alleviate fuel poverty may have the effect of supporting continued use of fossil fuels, but supports the transition to improved energy efficiency and zero emission heat. Renewable heat offers opportunities to increase energy efficiency of buildings reducing heat demand. Heat networks also deliver improved energy efficiency and helps reduce reliance on fossil fuels.

5.164 **Significant positive direct effects** are identified for **population and human health** from the alleviation of fuel poverty, and improved energy efficiency of homes, reducing associated issues of condensation and damp which impact on health is likely to offer **minor positive indirect effects** in relation to **population and human health** through the creation of employment opportunities to support the renewable sector supply chains. Additionally, publishing a Public Engagement Strategy will support increased community engagement and education surrounding Scotland's energy system.

5.165 **Minor positive direct effects** are identified in relation to **air** as improved energy efficiency, increased use of renewables and zero emissions heat will improve air quality by reducing fossil fuel use. **Minor negative direct effects** are identified for **soils and geology** as a result of development of ground source heat pumps, however these would form part of a range of renewable technologies being developed, and the footprint of these varies depending on the approach used, and is localised in extent.

5.166 Improved energy efficiency of buildings could have **minor negative indirect effects** on **biodiversity, flora and fauna**. This could occur as a result of improved energy efficiency measures impacting on the availability of nesting space for bird and bat species which use buildings and roof space.

5.167 There are likely to be **minor negative direct effects** on **cultural heritage and historic environment** and **landscape** as a result of external changes and retrofitting to improve energy efficiency or retrofit renewable energy as these changes may impact on the character of the built environment and the urban landscape. However, these impacts will be localised, and not widespread.

5.168 There are likely to be **mixed effects** on **material assets**. **Minor positive direct effects** on material assets are identified as a result of improved energy efficiency and through the support for heat networks which not only improves the quality of individual buildings, but also reduces energy demand indirectly improving the resilience of the energy network. The development of local heat networks and renewable energy generation increases the resilience of the energy system. **Minor negative indirect effects** will arise from the resources required to implement the new development.

5.169 The lifecycle assessment concluded that direct GHG emissions will arise from the production, transport and installation of materials required for improved energy efficiency measures or renewable energy development. These infrastructure changes will result in more efficient use of energy and increased use of renewable energy. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive impact** on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Energy for Transport

5.170 The actions support decarbonising the transport sector. Overall, direct effects were identified in relation to climatic factors; population and human health; air; soils and geology; biodiversity, flora and fauna; cultural heritage and historic assets; landscape; and material assets. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.

5.171 Decarbonising the transport sector by encouraging the take-up of electric and ultra-low emission vehicles (ULEVs) will help to further reduce GHG emissions. Furthermore, supporting reduced travel journeys and active travel, as well as the decarbonisation of freight transport, and incentivising low emission aircrafts and sustainable aviation fuel may also contribute towards reductions in GHG emissions. The use of biofuels will help the transition away from fossil fuels. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**.

5.172 Decarbonising the transport sector will significantly reduce GHG emissions and other pollutants resulting in subsequent improvements in air quality benefiting human health. Funding for active travel and reducing car use will encourage walking and cycling. This will positively benefit human health through improvements in physical health and mental wellbeing. Therefore, **significant positive direct effects** are identified in relation to **population and human health** and **air**.

5.173 The development of infrastructure to support decarbonising the transport sector will require land take. Therefore, **minor negative direct effects** are identified in relation to **soils and geology** and **landscape**. Upgrades to or the creation of new infrastructure to facilitate decarbonisation of the transport sector will likely have **minor negative direct effects** in relation to **biodiversity, flora and fauna** due to disruption to habitats and species if there is development out

with urban centres. The siting of infrastructure, particularly those of larger scales, could have **minor negative direct effects** on the setting of **cultural heritage and the historic environment**.

5.174 The promotion of electric vehicles and vehicles fuelled by biofuel may have **mixed direct effects** in relation to **material assets**. Increased use of electric transport has the potential to increase electricity demand and put pressure on existing electricity networks if upgrades are not made to facilitate the transition towards decarbonisation. Infrastructure such as recharging points will be required to meet market demand.

5.175 The lifecycle assessment concluded that direct reductions in GHG emissions are possible through the decarbonisation of the transport sector, although there will be emissions associated with the installation of infrastructure. This will also support the move away from fossil fuels. Depending on the rate at which these changes are implemented and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive impact** on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Supporting industry to reduce demand and decarbonise energy use

Energy for industry

5.176 The actions will support the decarbonisation of industry. Overall, direct effects were identified in relation to climatic factors; population and human health; air, soils and geology, water, biodiversity flora and fauna, cultural heritage and the historic environment, landscape and, material assets.

5.177 Emissions from industry continue to constitute a large proportion, around 25%, of total Scottish emissions[273]. These emissions are generated from a variety of activities across a diverse range of sectors, predominantly manufacturing, as well as mining and construction. **Significant positive direct effects** are identified in relation to **climatic factors** from industrial decarbonisation which will contribute to greenhouse gas emission reductions. The installation of energy efficiency measures in industry could reduce the demand for electricity and heat from fossil fuel sources within industry. Sequestering carbon emissions through carbon capture technology is also likely to have **significant positive effects** by reducing greenhouse gas emissions.

5.178 Minor positive direct effects are identified in relation to **population and human health** as decarbonising industry should lead to employment and training opportunities, with positive effects on health and wellbeing. Regeneration through industrial decarbonisation also have the potential to improve access to key goods and services and lead to wider benefits. Improvements to air quality from decarbonisation are also positive for human health.

5.179 Minor positive direct effects are identified as the decarbonisation of industry will reduce emissions of air pollutants improving air quality.

5.180 Minor negative effects were identified in relation to **soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment; and, landscape**. The construction of new and upgraded infrastructure and operational activities for carbon capture and storage could lead to negative effects.

5.181 Minor positive direct effects are identified in relation to **material assets** as greater uptake of energy efficiency measures within industry will improve the energy efficiency of these assets and reduce energy demand, and thereby reduce pressure on existing supply and distribution networks.

5.182 Direct GHG emissions will arise from the production, transport and installation of materials required for decarbonising industry. These infrastructure changes will result in more efficient use of energy and the decarbonisation of industry. Depending on the rate at which these changes are implemented, carbon capture and storage capacity, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Carbon capture and storage

5.183 The actions support the development and use of carbon capture, utilisation and storage (CCUS). Captured carbon can be stored (CCS) or utilised (CCU), however geological storage will be at a more significant scale than utilisation[274]. CCUS will allow captured carbon to support the energy transition.

5.184 Overall, direct effects are identified in relation to climatic factors; population and human health; air, soils and geology;

[273] https://scotland.shinyapps.io/Energy/?Section=WholeSystem&Chart=GHGEmissions

[274] Baltac, S., Mitchell, A., Conde, EGC., Platt, R.(2022) Understanding Opportunities for Developing a CO2 Utilisation Economy. Climate Exchange. [online] Available at: https://www.climatexchange.org.uk/research/projects/developing-a-scottish-co2-utilisation-economy/

water; biodiversity, flora and fauna; and material assets. Indirect effects are identified in relation to climatic factors and air only. These effects are likely to occur in the medium to longer term, as further CCUS is developed.

5.185 Storing carbon is also likely to have significant positive effects by reducing GHG emissions, in the long term, in addition to carbon utilisation, which will be at a smaller scale. Further research into Negative Emissions Technology (NETs) will indirectly contribute to future reductions in GHG emissions. Therefore, **significant positive direct** and **indirect effects** are identified in relation to **climatic factors**.

5.186 The promotion of CCUS may provide alternative, flexible and responsive technologies to provide energy which will have **minor positive direct effects** on **population and human health**, by improving reliability and security of energy supply. CCUS will also improve air quality having a positive effect on human health.

5.187 While CCS may have an overall positive effect on air pollution, emissions of some pollutants may increase. Abated emissions require CCS technologies and for some capture processes approximately 15 – 25 % more energy (depending on the particular type of technology used), is required to capture carbon than the baseline unabated emissions. Whichever process is used, the carbon capture process means that overall direct emissions are lower overall than for a baseline unabated operation.

5.188 This increased fuel requirement can in turn lead to increased 'indirect emissions' caused by the extraction and transport of the additional fuel, with impacts on air quality. Based on the assumption of an overall improvement in air quality, **minor positive direct** and **indirect effects** are identified in relation to **air**.

5.189 CCUS infrastructure is likely to be located within industrial sites and to utilise existing oil and gas infrastructure but could result in land take and disturb soils. These effects are likely to be local or at project level. Therefore, **minor negative direct effects** are identified in relation to **soil** and geology. CCUS could lead to disturbance of the seabed and there is potential for accidental CO_2 leaks polluting the marine environment or watercourses as contaminants are carried with the CO_2 as it migrates to the surface. Therefore, **minor negative direct effects** are identified for **water**.

5.190 CCUS infrastructure could impact on local habitats and species. These effects are likely to be felt locally or at project level. Therefore, **minor negative direct effects** are identified in relation to **biodiversity, flora and fauna**. **Mixed effects** are identified in relation to **material assets**. The promotion of CCUS will provide infrastructure to support emissions reductions in the short term, with minor positive direct effects on material assets, but will also require materials to construct the infrastructure. Additionally, materials will be required to maintain infrastructure with a potential increase in waste from the disposal of materials when no longer required. This will result in **minor negative direct effects**.

5.191 CCUS infrastructure could impact on local landscape and known and unknown historic and cultural heritage assets. However, it is likely that development will take place in the context of existing industrial landscapes, and effects should be minimised. Therefore, **negligible effects** are identified for **cultural heritage and historic environment** and **landscape**.

5.192 The lifecycle assessment concluded that indirect reductions in GHG emissions are possible through CCUS. Depending on the rate at which these changes are implemented and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.

Energy in Agriculture

5.193 The actions support reducing energy demand in agriculture. Overall, direct effects were identified in relation to climatic factors; population and human health; soils and geology; water; biodiversity, flora and fauna; landscape; and material assets. These effects are likely to be minimal and occur in the short term, and continue into the longer term, as further work takes place.

5.194 Supporting farming and crofting businesses to reduce their energy demand emissions, and exploring opportunities to generate their own energy, would increase the resilience of the businesses to these increased costs, reduce their reliance on fossil fuels, and therefore reduce their carbon footprint. Therefore, **minor positive direct effects** are identified in relation to **climatic factors**.

5.195 Diversification into renewable energy could provide an additional income stream, allowing farms to sell surplus energy or contribute to local community energy schemes. Therefore, **minor positive direct effects** are identified in relation to **population and human health**, as this will further support the viability of farming.

5.196 Infrastructure for on-site energy generation on farms is likely to occur on cultivated soils but due to the scale of development any negative effects are likely to be minimal. The diversion of farm waste can result in a by-product being produced from biomethane generation. This by-product can be used as a fertiliser and enrich soils. Therefore, **minor positive direct effects** are identified in relation to **soils and geology**.

5.197 If farm waste is diverted and used in the generation of biomethane, there will be reduced run-off from farm waste entering the local water environment. Therefore, **minor positive direct effects** are identified in relation to **water**. On-site energy generation on farms is likely to be small scale with very minimal land take up on cultivated soils with lower biodiversity interest. The move towards regenerative farming and nature rich farming will enhance biodiversity and ecosystems. Therefore, **minor positive direct effects** are identified in relation to **biodiversity, flora and fauna**.

5.198 On-site energy generation on farms is likely to be small scale with very minimal visual impact within the local landscape and wider countryside. However, the infrastructure to support anaerobic digestors can be quite substantial having a negative impact on the local landscape including visual impact. Therefore, **minor negative direct effects** are identified in relation to **landscape**.

5.199 Minor positive direct effects are identified in relation to **material assets**. The installation of on-site energy generation will add a positive asset to farms and reduce the use of fossil fuels. However, the construction of energy generation infrastructure will require raw materials but this is expected to be minimal. There will also be a potential reduction in farm waste from waste diversion to generate biomethane, CO_2 and digestate.

5.200 Increasing on-site energy generation on farms is likely to have a minor effect on meeting Scotland's national emissions targets. The carbon footprint of the materials used in constructing the required infrastructure is unknown. It is anticipated that these changes could have a **net positive impact** on achieving national greenhouse gas emissions targets.

Emissions trading

5.201 The actions support the continued industrial decarbonisation within Scotland from industry which continues to constitute a large proportion, around 30%[275], of total Scottish emissions. These emissions are generated from a variety of activities across a diverse range of sectors, predominantly manufacturing, as well as mining and construction[276]. Emissions trading supports decarbonisation of the industrial sector. Overall, only direct effects are identified in relation to climatic factors; population and human health; air and material assets. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.

5.202 Significant positive direct effects are identified in relation to **climatic factors** as investing in industrial decarbonisation will contribute to greenhouse gas emission reductions. The installation of energy efficiency measures in industry could reduce the demand for electricity and heat from fossil fuel sources within industry. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place. **Minor positive direct effects** are identified in relation to **air** as investing in decarbonisation of industry will reduce emissions of air pollutants improving air quality.

5.203 Minor positive direct effects are identified in relation to **population and human health** as inward investment in decarbonising industry should lead to employment and training opportunities, with positive effects on health and wellbeing. Improvements to air quality from decarbonisation are positive for human health.

5.204 Minor positive direct effects are identified in relation to **material assets** as greater uptake of energy efficiency measures through investing in decarbonising industry will improve the energy efficiency of these assets and reduce energy demand thereby reducing pressure on existing supply and distribution networks.

5.205 There is the potential for soil disturbance; impacts on the marine environment; wildlife and habitats; unknown historic and cultural heritage assets; and the local landscape from decarbonisation actions. However, these effects are expected to occur in relation to existing sites, and effects should be minimal. Therefore, **negligible effects** are identified in relation to **soils and geology; water; biodiversity, flora and fauna; cultural heritage and historic environment**; and **landscape**.

5.206 The lifecycle assessment concluded that direct GHG emissions savings will arise from the industrial decarbonisation policy position. Depending on the rate at which these changes are implemented, carbon capture and storage capacity, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials

[275] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online] Available at: https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/7/

[276] Scottish Government (2021) Update to the Climate Change Plan 2018 – 2032 [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/12/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/documents/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero/govscot%3Adocument/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero.pdf

involved and the payback period from implementing the changes.

Ensuring energy security and resilience

Energy security

5.207 The action supports an interconnected North Sea grid, supporting future export of Scottish renewable energy and ensuring maximum benefits to Scotland from the growth of the renewables industry. Overall, no direct effects were identified. Indirect effects were identified in relation to climatic factors; population and human health; and, material assets. These effects are expected to begin in the medium term and continue into the long term.

5.208 Exporting renewable energy will help the Scottish renewable energy sector grow. This will reduce reliance on fossil fuels reducing GHG emissions. Additionally, exporting renewable energy will help other importing countries to move away from fossil fuels and transition to net zero. Therefore, **significant positive indirect effects** are identified in relation to **climatic factors**.

5.209 The exporting of renewable energy will help Scotland's renewable energy sector to grow. This may open up employment opportunities particularly for people who work within the oil and gas industry. Additionally, revenues from the renewable energy sector will be able to be invested back into the community and support locally important issues. Therefore, **significant positive indirect effects** are identified in relation to **population and human health**.

5.210 Mixed effects are identified in relation to **material assets.** Minor positive indirect effects are identified in relation to material assets as exporting renewable energy may allow low-carbon energy developments to grow faster and help boost the local and national economy. However, infrastructure works to the North Sea grid will be required to support this which could result in the use of raw materials and waste being produced. Therefore, **minor negative indirect effects are** identified**.**

5.211 Indirect reduction in GHG emissions are expected as ensuring maximum benefit out of surplus low-carbon energy will help push forward the continued move over to renewable energy and achieving net zero. This is expected to be in the medium term with decreasing levels of GHG emissions expected to continue into the long term. This policy position will help Scotland meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Energy system operability and restoration

5.212 System restoration (previously known as Black Start) is the procedure to recover from a total or partial shutdown of the National Electricity Transmission System. System restoration services are designated generators that are able to restore electricity to the grid without using an outside electrical supply. Overall, direct effects were identified in relation to climatic factors, air and material assets. These effects are expected to be delivered within the long term.

5.213 Minor positive direct effects are identified in relation to **climatic factors** as system restoration from renewable energy reduces the need to maintain fossil fuel powered capacity to provide this service. This will enable further decarbonisation of the energy system, reducing levels of GHG emissions. **Minor positive direct effects** are identified in relation to **air** as less reliance on fossil fuel powered system restoration will lead to reduced GHG emissions improving air quality.

5.214 There are likely to be **mixed effects** on material assets. **Minor positive direct effects** on **material assets** are identified as a result of system restoration services being a critical resource to maintain the reliability and resilience of the electric power system without relying on fossil fuels. **Minor negative direct effects** will arise from the resources and raw materials required to provide system restoration services which could include batteries, storage and generators.

5.215 Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on **soils and geology; water; biodiversity, flora and fauna; cultural heritage and the historic environment;** and **landscape** as it is likely to involve minor alteration to existing or planned renewable energy generation capacity. Additionally, **negligible effects** are identified in relation to **population and human health** due to the scale of change proposed.

5.216 The lifecycle assessment determined that direct GHG emissions reductions are expected as a result of transition from reliance on fossil fuels in system restoration. Depending on the rate at which these changes are implemented, renewable system restoration services are anticipated to have a **net positive** impact on achieving national greenhouse gas emissions targets. There is uncertainty over the carbon footprint of the materials involved in setting up generators and storage and therefore, the payback period from implementing the changes.

Pumped hydro storage

5.217 This action is already assessed under 'Scale up renewable energy'.

Flexibility

5.218 These actions support enhancing ancillary service markets and exploring opportunities for Vehicle to grid technology and EV battery recycling. Direct effects were identified in relation to climatic factors; population and human health; air; soils and geology; biodiversity, flora and fauna; landscape; and, material assets. These effects are expected in the short term and continue over the long term.

5.219 Making the ancillary service markets more accessible for Battery Energy Storage Systems (BESS) and other low carbon alternatives will support the move away from fossil fuels by increasing the flexibility of the grid. Reducing reliance on fossil fuels will lower GHG emissions. The vehicle to grid technology will provide back-up storage cells to the electricity grid. This will offer increased flexibility in the electricity networks improving energy efficiency. Therefore, **significant positive direct effects** are identified in relation to **climatic factors**. **Minor positive direct effects** are identified in relation to **air** from a reduction in GHG emissions that will help improve air quality.

5.220 Minor positive direct effects are identified in relation to **population and human health** as greater flexibility and capacity for back up storage cells to the electricity grids are likely to be positive for consumers offering a variety of renewable energy sources to use and a more reliable energy source. The introduction of greater flexibility could help to enhance the security and resilience of energy supply which should help reduce energy demand through increased efficiency of energy use.

5.221 There could be **minor negative direct effects** on **soils and geology** due to infrastructure works and installation of back up storage cells to increase energy storage that could negatively impact local geology or undisturbed soils. Additionally, recycling facilities may be required to support EV battery recycling which could disturb undisturbed soils. These impacts would occur in the short term, reflecting the development stage of any works undertaken.

5.222 Minor negative direct effects are identified in relation to **biodiversity, flora and fauna** due to infrastructure works and installation of back up storage cells and recycling points for EV batteries may give rise to some localised negative effects on biodiversity. **Minor negative direct effects** are identified in relation to **landscape** due to infrastructure works and installation of back up storage cells and recycling points for EV batteries may give rise to localised negative effects on terrestrial and marine environment. More significant effects could occur in more sensitive landscapes. **Minor negative direct effects** are identified in relation to **cultural heritage and the historic environment** due to infrastructure works and installation of back up storage cells and recycling points for EV batteries, which may give rise to some localised negative effects on cultural heritage and historic environment. These effects will occur in the short term, and continue into the longer term.

5.223 Mixed direct effects are identified in relation to **material assets**. Significant positive effects could arise through support for energy grid infrastructure and potential to increase flexibility, efficiency and resilience of the energy network as a whole, greater flexibility in managing demand and supply with increased resilience of significant importance in rural, remote and fragile locations. Improving the flexibility of the system to cater for variations in energy demand and further decentralising energy production, could reduce pressure on existing supply and distribution networks and improve longer term resilience to climate change impacts. Additionally, the recycling of EV batteries will have a positive effect as it will reduce the volume of waste going to landfill and ensure that materials are re-used where possible. However, minor negative effects are expected due to the demand for raw materials to create back up storage cells and recycling points for EV batteries.

5.224 Direct GHG emissions will arise from the production, transport and installation of back up storage cells and recycling points for EV batteries. This may include energy intensive materials for the production of batteries, concrete, cabling and power generating infrastructure. However, these developments improve flexibility in Scotland's energy system resulting in reductions in GHG emissions over a long time period as improvements to the flexibility of the energy system are made. Improving the flexibility of the energy system and increasing energy storage will help Scotland meet its national targets of GHG emissions reductions. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Energy network resilience

5.225 The energy network resilience action aims to ensure that the energy network remains resilient against the effects of climate change, including climate adaptation. It supports the use of digital technologies to support the transition, and linked to the use of digital technologies is the need to ensure resilience to cyber security risks. The actions are expected to be delivered from the short to the long term. Overall, only direct effects were identified in relation to population and human health. Indirect effects were identified in relation to climatic factors and population and human health.

5.226 Minor positive direct effects are identified in relation to **population and human health** as continuing to work with the UK Government will help support energy network resilience with benefits for all users, and particularly those in more vulnerable communities. Minor positive indirect effects are identified for population and human health as increasing

public engagement will support reduced energy demands offering wider benefits of lower energy costs and levels of fuel poverty. **Minor positive indirect effects** are identified for **population and human health** as increasing public engagement will support reduced energy demands offering wider benefits of lower energy costs and levels of fuel poverty. **Minor positive indirect effects** are identified in relation to **climatic factors** as continuing to work with the UK Government will provide the tools and information to ensure resilience of the network to climate change, through adaptation measures.

5.227 Indirect reductions in GHG emissions are expected as a result of energy network resilience. This is expected to be slow in the short term at the early stages of increased resilience with decreasing levels of GHG emissions due to lower energy demand expected from wider enhanced resilience. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Climate impacts

5.228 The actions will support the development of the next Climate Change Adaptation Programme and improve the response to climate related events. Direct effects were identified in relation to climatic factors; population and human health; and material assets. These effects are expected in the short to the long term.

5.229 Improved adaptation and an improved response to climate related events will result in **significant positive direct effects** in relation to **climatic factors**.

5.230 Development of the Climate Change Adaptation Programme will help to better understand the risks that climate change can present to communities and businesses. This will indirectly benefit communities and businesses by being able to adapt to climate change. An additional indirect benefit to decarbonising buildings through improved energy efficiency (through insulation for example) is increased resilience to hot weather/heatwaves. It will also help communities and businesses to adapt to climate change. The rollout of the Persons At Risk Distribution system will help communities and individual people respond to the effects of climate change. This will improve community resilience to climate change. This will result in **further positive indirect effects** in relation to **population and human health**.

5.231 Minor positive indirect effects are identified in relation **material assets** as this policy will ensure that Scotland can adapt to climate change and remains resilient. This will improve the resilience of infrastructure and indirectly help reduce any risks posed from climate change.

5.232 Indirect reductions in GHG emissions are expected as this policy position will help support continued climate change resilience. Climate change adaptation will help support Scotland achieving net zero as people and communities better understand their carbon footprint and impact on the environment and climate change. This is expected to be slow but immediate in the short term at the early stages of climate action with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets.

Energy markets and network regulation

Electricity market arrangements, network investment, grid charging methodologies and constraint costs

5.233 Across the whole of Scotland there will be continued support for network infrastructure enhancement, addressing barriers to delivery of these enhancements and market mechanisms to improve access to the benefits of low-cost renewable power. To achieve net zero by 2045, the electricity network across Scotland will continue to be decarbonised with an increasing amount of electricity being generated from renewable sources and increased flexibility provided within the electricity network which will reduce GHG emissions. Overall, direct effects were identified against all SEA topics. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.

5.234 Providing electricity network improvements will support the development of renewable energy and addressing transmission charging will increase the roll out of renewable energy, by reducing this as a barrier. Therefore, **significant positive direct and indirect effects** are identified in relation to **climatic factors**.

5.235 Network infrastructure enhancement will deliver a more efficient energy system that has the potential to be more reliable and flexible. Reforming wholesale market arrangements will also reduce the costs of renewable electricity, reducing fuel poverty. Therefore, **significant positive direct and indirect effects** are identified in relation to **population and human health**.

5.236 Minor positive direct effects are identified in relation to **air** as upgrading the electricity network, increasing the efficiency and resilience of the system will reduce GHG emissions from non-renewable sources, which will also improve air quality.

5.237 Minor negative direct effects are identified in relation to **soils and geology** as soil disturbance is expected during upgrades to electricity networks. Additionally, there is the potential for sediment disturbance and loss and compaction of soils through investing in infrastructure.

5.238 Minor negative direct effects are identified in relation to **water** as potential for negative impacts to affect water environments from the construction of new and upgraded infrastructure and operational activities to support electricity networks. **Minor negative direct effects** are identified in relation to **biodiversity, flora and fauna** as upgrading electricity networks could impact on species and their habitats. There is also particular threat to habitat fragmentation. Potential for long term negative effects on both known and unknown historic and cultural heritage assets are likely to be associated with investing in infrastructure and providing charging infrastructure. Therefore, **minor negative direct effects** are identified in relation to **cultural heritage and historic environment**.

5.239 The upgrading of electricity networks has the potential to impact on the local landscape and countryside. Therefore, **significant negative direct effects** are identified in relation to **landscape**. The siting of new infrastructure and charging infrastructure may have a visual impact on the urban landscape. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.

5.240 Mixed effects are identified in relation to **material assets**. Upgrading the electricity network and improving the flexibility may require additional infrastructure using raw materials during the construction and maintenance. There will also likely be an increase in waste during construction and maintenance of infrastructure. Therefore, minor negative direct effects are expected. Minor positive direct effects are identified as upgrading the electricity networks will improve their efficiency and allow for increased use of renewable energy.

5.241 Upgrading and enhancing Scotland's electricity networks will make significant contributions to reducing GHG emissions. Improvements to the electricity network will support the continued use of renewable energy and improve the efficiency and reliability of the electricity network. However, investing in infrastructure may require the use of raw materials. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a **net positive** impact on achieving national greenhouse gas emissions targets. In the long term, it is likely that upgrading electricity networks will continue to support a renewable energy system helping to achieve net zero by 2045.

Cumulative, secondary and synergistic effects

5.242 The following paragraphs set out the potential cumulative, secondary and synergistic effects likely to arise from the draft Energy Strategy and Just Transition Plan.

Climatic factors

5.243 The policy positions and actions set out in the draft Energy Strategy and Just Transition Plan are cumulatively expected to make a significant contribution to Scotland's commitment to reduce GHG emissions and meet national targets.

5.244 Almost all of the actions set out in the draft Energy Strategy and Just Transition Plan will contribute towards reducing GHG emissions and meeting Scotland's target for net zero, thereby having significant positive effects on climatic factors. The extent to which these will contribute towards emission reductions varies, with complementary roles of the policy positions and actions resulting in overall **positive** cumulative effects. For example, measures aimed at promoting energy efficiency within the building and industry sectors and the use of renewable energy will be complemented by those that provide financial mechanisms, provide supporting infrastructure and ensure the most efficient use of energy to support this.

5.245 The actions under Scale-up renewable energy, cumulatively reduce GHG emissions and have a positive effect in relation to climatic factors through supporting the use of a variety of renewable energy technologies while enhancing Scotland's energy system in terms of reliability and flexibility. This includes wind, hydrogen, solar, bioenergy, pumped hydro storage and wave and tidal energy. These actions therefore could make a significant contribution towards meeting net zero targets, and ensuring a broad mix of energy sources will help improve energy security. This will be important in order to meet future energy challenges.

5.246 Likewise, the actions in relation to reducing demand and decarbonising energy collectively support reducing energy and heat demand across domestic, industry, transport and agriculture while supporting the use of heat networks and CCUS. This will have direct effects on reducing GHG emissions, and subsequent benefits for other SEA topics, in particular population and human health as a result of improved air quality.

5.247 Furthermore, actions under Delivering a just transition for Scotland's energy economy collectively support investment into the energy sector allowing it to grow particularly in relation to renewable energy. This will also help to drive the export of renewable energy and develop the supply chain. This is further supported by the community focused actions to reduce GHG emissions and adapt to climate change. These policy positions support a reduction in GHG emissions and will help Scotland to meet its national targets. In addition, there is an action to support climate change adaptation, through energy network resilience.

5.248 The actions also support having appropriate infrastructure in place to enable the transition, which supports material assets.

5.249 There is a positive synergy between the actions to support supply chains and skills and the increased development of renewable energy.

Population and human health

5.250 Many of the actions set out within the draft Energy Strategy and Just Transition Plan are likely to have benefits for air quality in Scotland and reduce reliance on fossil fuels, with a related positive effect on population and human health. Air quality issues are often associated with the release of GHG emissions, which are frequently derived from the transport, industry and energy sectors. Therefore, actions which seek to reduce emissions from these sources are likely to provide benefits to population and human health.

5.251 Additionally, the actions collectively support the use of a variety of renewable energy sources that will further reduce reliance on fossil fuels. This will help support a reduction in fuel costs at a domestic level, supporting health and quality of life.

5.252 Conversely some communities may experience localised negative cumulative impacts from construction and development activities. This may be particularly relevant in coastal areas where infrastructure makes landfall from offshore developments, and also where the scale of onshore wind development may impact on communities. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

5.253 However, the majority of the policy positions and actions support investing in Scotland's renewable energy sector which offer some significant cumulative benefits in relation to employment opportunities, and re-skilling particularly as the energy system is decarbonised, which further supports health and wellbeing.

5.254 The Delivering a Just Transition for communities and regions across Scotland actions will cumulatively benefit the people of Scotland through supporting community engagement and involvement within the renewable energy sector, including receiving economic benefit from renewables development and raising awareness of climate change adaptation.

5.255 Secondary effects are possible where displacement of fossil fuels leads to improved air quality through the Regional and local opportunities actions. There is the potential for secondary benefits from a just transition for workers through opportunities for career change, and new employment opportunities through the existing power sector transition from fossil fuels.

5.256 It is anticipated that there will be further secondary benefits from increased action on energy efficiency and renewable energy leading to greater awareness and action at a domestic and business level. Additionally, developing a more diverse and resilient renewable energy system will help Scotland to become more self-sufficient and future proof against any future increases in fuel costs.

Air

5.257 Many of the policy positions and actions set out within the draft Energy Strategy and Just Transition Plan are likely to have benefits for air quality in Scotland. As air pollution often originates from the same sources and activities that contribute to the release of GHG emissions, notably the use of fossil fuels, proposals which support the use of renewable energy, and seek to decarbonise the energy sector are expected to have associated benefits for air quality. Therefore, reducing emissions from this source is likely to improve air quality at both local and national levels.

5.258 Actions which support the use of renewable energy, will help to lower GHG emissions by reducing reliance on fossil fuels such as oil and gas. Additionally, the policy positions support a reduction in energy demand which will reduce GHG emissions. However, the combustion of hydrogen as a fuel may lead to nitrogen oxide emissions having negative effects on the overall air quality. Burning hydrogen has similar or lower NOx emissions to those emitted when using methane fuel.

5.259 However overall positive cumulative positive effects are identified for air quality with notable benefits seen to air for the actions under energy supplies and energy demand.

Soils and Geology

5.260 Several policy positions and actions within the draft Energy Strategy and Just Transition Plan are likely to have minor negative effects on soils and geology in Scotland in onshore and offshore locations.

5.261 Some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. Some of the renewable energy developments will be more limited in extent such as solar energy, or more localised impacts from pumped hydro storage. However, renewable energy developments such as offshore and onshore wind energy will be at a substantial scale. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

5.262 However, continuing to not support the extraction of coal, onshore conventional and unconventional oil and gas or development of nuclear power plants will have a positive effect on soils and geology through the avoidance of future development.

Water

5.263 Several policy positions and actions within the draft Energy Strategy and Just Transition Plan are likely to have minor negative effects on water in Scotland with significant negative effects identified in relation to hydrogen production, which has high water requirements which can be sourced from freshwater or desalinised seawater. Desalinised water has impacts on water quality, and freshwater impacts on water availability, which can be impacted by localised and short-term dry periods, exacerbated by climate change.

5.264 Some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. The scale of this development is currently unknown. Some of the renewable energy developments will be more localised in extent such as wave and tidal energy. However, renewable energy developments such as offshore wind energy will be at a substantial scale. Potential impacts primarily relate to sediment disturbance and pollution risk. In many instances, adverse impacts during both construction and operation may be mitigated through a combination of planning mechanisms such as Environmental Impact Assessment (EIA), appropriate siting and design, local consultation and engagement and on-site management measures.

5.265 However, continuing to not support the extraction of coal, and development of nuclear power plants will have a positive effect on water through the avoidance of future development and potential contamination.

5.266 Overall, cumulative minor negative effects are identified for water.

Biodiversity, flora and fauna

5.267 Several policy positions and actions within the draft Energy Strategy and Just Transition Plan are likely to have minor negative effects for biodiversity, flora and fauna in Scotland, with potential significant negative effects identified for offshore wind, which could impact across a large area, and pumped hydro storage which would be more localised in effect but result in significant loss.

5.268 Some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. The scale of this renewable energy development is significant, particularly in relation to onshore and offshore wind. Some of the renewable energy developments will be more localised in extent, such as solar energy. In many instances, adverse impacts during both construction and operation may be mitigated through a combination of planning mechanisms such as Environmental Impact Assessment (EIA), appropriate siting and design, local consultation and engagement and on-site management measures. However, continuing to not support the extraction of coal and development of nuclear power plants will have a positive effect on biodiversity, flora and fauna. The policy positions will help to protect Scotland's natural environment from further disruption through extraction processes and development.

Cultural heritage and the historic environment

5.269 Several policy positions and actions within the draft Energy Strategy and Just Transition Plan are likely to have minor negative effects for cultural heritage and the historic environment in Scotland.

5.270 Policy positions seeking to improve the energy efficiency of buildings and encouraging the uptake of renewable energy technologies may have adverse effects on cultural heritage and the historic environment. In particular, the retrofitting of buildings to include new technologies (e.g. solar panels or heat pumps) and siting of new development may alter the setting of heritage assets, or change the appearance or fabric of a historic asset. Negative effects are likely as a result of cumulative developments.

5.271 Additionally, some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. Some of the renewable energy developments will be more localised such as solar energy. However, renewable energy developments such as offshore and onshore wind energy will be at a substantial scale, with potential for more significant negative cumulative effects on setting. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

Landscape

5.272 Several policy positions and actions within the draft Energy Strategy and Just Transition Plan are likely to have significant or minor negative effects for landscape in Scotland.

5.273 Policy positions seeking to improve the energy efficiency of buildings and encouraging the uptake of renewable energy technologies may have adverse effects on landscape character. For the built environment, the retrofitting of buildings to include new technologies (e.g. solar panels) may impact on the character of buildings, and siting of new renewables development may alter the character of the landscape.

5.274 Additionally, some negative effects may arise as a result of construction activities relating to the development and improvement of infrastructure to support the use of renewable energy. Some of the renewable energy developments will be more localised such as solar energy. However, renewable energy developments such as offshore and onshore wind energy, and energy transmission infrastructure will be at quite a substantial scale with significant negative effects possible. In many instances, adverse impacts may be mitigated through a combination of planning mechanisms and on-site management measures.

5.275 However, continuing to not support the extraction of coal and development of nuclear power plants will have a positive effect on landscape. The policy positions will help protect Scotland's natural environment from these developments.

Material assets

5.276 Several of the policy positions and actions are expected to have mixed effects in relation to material assets. The majority of the policy positions support increasing renewable energy infrastructure within Scotland. This will result in negative effects due to raw materials being required to facilitate new and updated infrastructure to support a growing renewable energy sector. However, enhancing the renewable energy sector will provide positive benefits to Scotland's material assets through a more reliable energy system and the generation of renewable energy.

5.277 A number of the actions also support the viability of local communities and the local economy in particular island and rural communities while ensuring the development of energy efficient buildings that will be long lasting and can adapt to climate change. This will enhance Scotland's material assets.

5.278 Policy positions relating to investment, providing funding and innovation will have synergistic effects in that they will help enable future growth of the renewable sector. It will also offer opportunities to improve the technology that is available and help to fill the skills and supply chain gap. This will help Scotland achieve net zero and meet the national targets for reducing GHG emissions.

5.279 There is the potential for secondary positive effects as supporting community projects through community energy; regional and local opportunities and the Islands actions may help the growth of the local and regional economy. The existing power sector transition from fossil fuels offers secondary benefits as communities could become more self-sufficient by transitioning to net zero.

5.280 There are potential minor positive secondary effects through the skills and jobs and boosting our domestic supply chain actions as increasing the manufacturing process may offer opportunities to innovate the manufacturing process making it more efficient and reducing resource and energy use.

5.281 There are potential minor negative cumulative effects from waste generated from the widespread construction and maintenance of large-scale infrastructure.

Chapter 6
Reasonable Alternatives assessment findings

6.1 Part 14(2) of the 2005 Act requires that:

"The report shall identify, describe and evaluate the likely significant effects on the environment of implementing (a) the plan or programme; and (b) reasonable alternatives to the plan or programme, taking into account the objectives and the geographical scope of the Plan or Programme".

6.2 The context for the alternatives is limited by the requirement to meet the ambitious climate change targets. The 2005 Act requires that the Scottish Government also identify, describe and evaluate the likely significant effects on the environment of any reasonable alternatives to the draft Energy Strategy and Just Transition Plan. This section outlines what has been assessed, including the reasonable alternatives that have been considered.

6.3 In considering what a "reasonable" alternative is, the Scottish Government's commitment to decarbonise the whole energy system and tackle climate change has been taken into account. The draft Energy Strategy and Just Transition Plan will reflect the increased ambition of the new targets set in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

6.4 The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, which amends the Climate Change (Scotland) Act 2009, sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045 at the latest. To help ensure delivery of the long-term targets, Scotland's climate change legislation also includes annual targets for every year to net-zero. The 2019 Act also embeds the principles of a just transition, which means reducing emissions in a way which tackles inequality and promotes fair work, at the heart of Scotland's approach to reaching net-zero.

6.5 The Scottish Government recognises that the energy system is becoming increasingly complex with many interdependencies. As we transition to Scotland's future energy system and move towards net zero, these interactions will grow in both number and scale.

6.6 The draft Energy Strategy and Just Transition Plan uses Whole Energy System Scenarios modelling, which explores the impact that different decisions, targets and technological disruptions can have on decarbonisation efforts. The scenarios provide an inclusive and strategic framework that enables whole system thinking and decision making. They are designed to be used to explore and navigate what might

happen, not what should happen or what the Scottish Government wants to happen. They do not represent policy, but help to reach a shared understanding of how areas of the energy system interact. Scenarios can be a useful communication tool to explore issues, system interactions and trade-offs.

6.7 In line with the approach set out in the SEA of the Climate Change Plan update, due to the requirement of meeting ambitious climate change targets, the scope for alternatives is limited. In considering what a "reasonable" alternative is, the Scottish Government's commitment to decarbonise the whole energy system and tackle climate change has been taken into account. The draft Energy Strategy and Just Transition Plan has been developed in light of the increased ambition of the new targets set in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

6.8 Based on the current legislative context, and the declared climate emergency, it was identified that the current ambition can only be to achieve the maximum emissions reductions possible, reflected across all sectors based on current technical and practical limitations, and no reasonable alternatives were identified as a consequence. The context for the alternatives is limited by the requirement to meet the ambitious climate change targets. The 2005 Act requires that the Scottish Government also identify, describe and evaluate the likely significant effects on the environment of any reasonable alternatives to the draft Energy Strategy and Just Transition Plan. This section outlines what has been assessed, including the reasonable alternatives that have been considered.

6.9 In considering what a "reasonable" alternative is, the Scottish Government's commitment to decarbonise the whole energy system and tackle climate change has been taken into account.

6.10 In considering potential reasonable alternatives to be included in the assessment the approach to alternatives for the 2017 Environmental Report for the Scottish Government Energy Strategy was considered.

6.11 The previous assessment was based on two targets for meeting Scotland's energy needs from renewable energy in Scotland: achieving 50% of Scotland's energy needs from renewable sources by 2050, and achieving 30% by 2020.

6.12 However, based on the current legislative context, and the declared climate emergency, it was identified that the current ambition can only be to achieve the maximum emissions reductions possible. The previous approach to alternatives is therefore no longer reasonable in the current legislative context.

Chapter 7
Mitigation and Enhancement

Introduction

7.1 The 2005 Act states that 'the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme' are outlined within the Environmental Report. These measures are often referred to as mitigation measures. The following paragraphs set out key opportunities for mitigation of adverse environmental effects and enhancement of positive environmental effects for each sector.

7.2 The Scottish Government is delivering a draft Energy Strategy and Just Transition Plan to set out the vision that, by 2045, Scotland will have a flourishing, climate friendly energy system that delivers affordable, resilient and clean energy supplies for Scotland's households, communities and businesses. Mitigation and enhancement measures will inform development and implementation of the Strategy.

7.3 This assessment has identified that offshore and onshore wind, pumped hydro storage, the hydrogen ambition and the network investment actions are likely to result in direct significant adverse effects.

Mitigation

7.4 The following actions are required to address adverse effects or avoid the potential for such effects to occur.

7.5 The focus of this draft Strategy is long-term, and it therefore provides strategic actions towards achieving the 75% emission reduction by 2030 and 2045 net zero targets. These actions would lead to tangible developments taking place in the lead up to 2030 and 2045. The Environmental Report identifies some mitigation opportunities that could address the direct effects identified. Many potential impacts are likely to be mitigated by existing mechanisms such as the planning system, SEPA regulation, EIA, HRA and on-site management measures.

7.6 Areas identified for mitigation include:

- In relation to hydrogen, there are potential impacts from the quantities of water required, the locations for extraction, the use of freshwater or desalinised seawater, and the impacts of climate change on freshwater availability. There is a need to improve the evidence base on water use in hydrogen production, taking into account the likely production methods and

water sources to be used in Scotland to enhance understanding of the environmental effects.

- In relation to on and offshore wind energy, there are potential impacts from habitat loss, introduction of non-native species, collision risk (with wind turbines or underwater turbines) associated with renewable energy and associated infrastructure. It is recommended to develop specific guidance tailored to address the technology specific impacts of development on biodiversity, flora and fauna.
- Reflecting potential impacts on bird species from offshore wind development, it is recommended to develop a comprehensive evidence base on bird migration and protected bird species to understand impacts on these from offshore development in remote offshore locations, in order to fully understand cumulative effects of these developments and to inform project mitigation.
- Energy efficiency measures and renewable energy development could result in cumulative effects on cultural heritage and the historic environment. It is recommended to develop specific design guidance which reflects future technologies and scale of development to mitigate impacts on cultural heritage and the historic environment.
- Renewable energy development and associated infrastructure could impact on areas of high landscape value, in particular, in relation to cumulative effects. It is recommended to develop specific design guidance for energy efficiency and renewable energy development in relation to areas of high landscape value, ensuring it reflects future technologies and scale of development.
- Reflecting potential impacts on soil sealing from development, there should be the development of a strategic framework to support the best use of existing energy infrastructure, and of previously developed land to reduce/minimise potential effects on soil from renewables development.
- In order to reduce the greenhouse gas emissions associated with the materials required for renewable energy development, infrastructure and energy efficiency further guidance should be provided on standards required to inform material choices, and supply chain development.

Enhancement

7.7 The identified areas for enhancement relate primarily to research and innovation to address knowledge gaps, and development of the regulatory, planning and consent framework to consider effects from the draft Energy Strategy and Just Transition Plan. Opportunities for enhancement are outlined below.

7.8 Delivering a just transition for communities:

- The final Energy Strategy and Just Transition Plan should provide further clarity on support for energy consumers who are keen to explore net zero or low carbon alternatives to reduce energy bills.
- The final Energy Strategy and Just Transition Plan should provide further guidance to encourage reduced energy use or switching to renewable/green energy.
- The final Energy Strategy and Just Transition Plan should make clearer links to the Tackling Fuel Poverty Strategy.

7.9 Delivering a just transition for Scotland:

- The final Energy Strategy and Just Transition Plan should ensure that the structures required for offshore wind turbines are designed to provide co-benefits in terms of habitat for biodiversity[277].
- The final Energy Strategy and Just Transition Plan should include increased reference to remanufacturing as it could reduce pressure on resources compared to manufacturing from new.
- The final Energy Strategy and Just Transition Plan should include increased reference to advanced manufacturing as it would enable shorter and more localised supply chains.
- The final Energy Strategy and Just Transition Plan should prioritise the reuse of materials in construction and use of low carbon construction materials.
- The final Energy Strategy and Just Transition Plan should ensure that where hydrogen or carbon dioxide are exported or imported that, where possible, transport is decarbonised to reduce overall emissions associated with trade.

7.10 Offshore wind:

- The final Energy Strategy and Just Transition Plan should develop a clear framework to support circular economy principles in onshore and offshore wind.

[277] The Dutch, for example, are formulating a Catalogue of National Inclusive Design Options, which includes actions such as European native oyster restoration, for offshore developments. https://www.nature.scot/doc/information-note-marine-habitat-enhancement-recovery-restoration-and-creation-scotland-terminology

7.11 Solar:

- The final Energy Strategy and Just Transition Plan should support the installation of energy storage in tandem with solar energy development.

7.12 Heating and cooling our buildings:

- The final Energy Strategy and Just Transition Plan should link fuel poverty payments to prioritising energy efficiency actions in these properties.
- The final Energy Strategy and Just Transition Plan should accelerate or increase the targets to decarbonise homes and non-domestic buildings.
- The final Energy Strategy and Just Transition Plan should reference battery storage in relation to development of domestic renewables within the programme of delivery, not just in the surrounding text in the Heat in buildings policy action.

7.13 Energy for Transport:

- The final Energy Strategy and Just Transition Plan should support increased infrastructure to facilitate decarbonising transport in the short term to align with the phase out the need for new petrol and diesel cars by 2030
- The final Energy Strategy and Just Transition Plan should support active travel routes which are accessible to a wide range of users, and should be well linked with other routes and public transport modes to further reduce potential emissions from transport.

7.14 Energy in agriculture:

- The final Energy Strategy and Just Transition Plan should support research to improve the knowledge base on the climate impact of different land uses and farming methods.
- The final Energy Strategy and Just Transition Plan should support research to identify sector specific barriers to reducing energy in agriculture.

Chapter 8
Monitoring

8.1 Monitoring significant environmental effects is a statutory requirement within the 2005 Act. Monitoring seeks to ensure that plans avoid generating unforeseen adverse environmental effects and enables the responsible authority to undertake appropriate remedial action.

8.2 The main monitoring and reporting mechanism will be the Scottish Energy Statistics Hub, maintained by the Scottish Government, which sets out key energy statistics and trends.

8.3 Established monitoring regimes for related national and local policies, plans, programmes and strategies will supplement the monitoring of environmental impacts. This will assist in monitoring policies, policy development milestones and proposals.

8.4 Annual monitoring and reporting of Scotland's overall greenhouse gas emissions reductions is undertaken by the Scottish Government[278], along with annual statutory reporting of all the indicators set out in the Climate Change (Emissions Reduction Targets)(Scotland) Act 2019[279]. As new policies and proposals are brought forward and developed in more detail, further specific monitoring proposals will be considered.

[278] Latest report available at https://www.gov.scot/news/scottish-greenhouse-gas-statistics-2020/

[279] Latest report available at https://www.gov.scot/publications/climate-change-plan-monitoring-reports-2022/

Chapter 9
Conclusions and Next Steps

9.1 The consultation on the draft Energy Strategy and Just Transition Plan will run for a minimum of 12 weeks from January 2023. Comments on the draft Energy Strategy and Just Transition Plan and the Environmental Report can be submitted via the Scottish Government Citizen Space website[280]. Requests for hard copies of the Environmental Report can be made to energystrategy@gov.scot.

9.2 Consultation questions on the SEA Environmental Report are as follows:

a. Do you have any comments on the environmental baseline information referred to in the Environmental Report?

b. Are you aware of further information that could be used to inform the assessment findings?

c. What are your views on the assessment findings?

d. Are there other environmental effects arising from the draft Energy Strategy and Just Transition Plan?

e. Do you agree with the justification for the approach to the alternatives?

f. What are the most significant environmental effects which should be taken into account as the draft Energy Strategy and Just Transition Plan is finalised?

g. How can the draft Energy Strategy and Just Transition Plan be enhanced to maximise positive environmental effects?

h. What do you think of the proposed approach to mitigation and monitoring?

9.3 Following the consultation period, the consultation responses will be analysed and the Scottish Government will finalise and publish the Energy Strategy and Just Transition Plan. After the Energy Strategy and Just Transition Plan is adopted, a Post Adoption Statement will be produced. This Statement will set out how the SEA and the views received in the consultation processes have been taken into account.

[280] https://consult.gov.scot/energy-and-climate-change-directorate/energy-strategy-and-just-transition-plan/

Appendix A

Plans, Policies and Strategies

Note: The Scottish Government has committed to alignment between Scots and EU law as a result of EU exit. Although the statutory governance arrangements are not yet in place, European legislation is included in the tables below.

General

Source	Key objectives	Implications/ Comments
International		
Aarhus Convention (1998)	To develop a number of rights of the public with regard to the environment. Local authorities should provide for: ■ The right of everyone to receive environmental information ■ The right to participate from an early stage in environmental decision making ■ The right to challenge in a court of law public decisions that have been made without respecting the two rights above or environmental law in general	Ensure that the public are involved and consulted at all relevant stages of SEA production.
Johannesburg Declaration on Sustainable Development (2002)	Commitment to building a humane, equitable and caring global society aware of the need for human dignity for all. Areas of focus include: ■ Sustainable consumption and production patterns. ■ Accelerate shift towards sustainable consumption and production – 10-year framework of programmed of action. ■ Reverse trend in loss of natural resources. ■ Renewable energy and energy efficiency. ■ Urgently and substantially increase Global share of renewable energy. ■ Significantly reduce the rate of biodiversity loss by 2010.	The SEA should reflect objectives to support reduction in emissions of greenhouse gases, promote renewable energy and energy efficiency.
European		
EU Public Participation Directive	Provides a legal framework for community involvement by requiring public participation in decision-making and regulation, including through access to information and consultation.	Ensure that the public are involved and consulted at all relevant stages of drawing up certain plans and programmes relating to the environment.

Source	Key objectives	Implications/ Comments
Directive 2003/35/EC on providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC		
SEA Directive 2001 Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment	The key objective of the SEA Directive is to provide for a high level of protection of the environment and contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development.	Requirements of the SEA Directive must be met in Strategic Environmental Assessments.
National (Legislation)		
Town and Country Planning (Scotland) Act 1997 (as amended)	The Town and Country Planning (Scotland) Act governs the use and development of land within Scotland. The 1997 Act forms the basis of the Scottish planning system. It sets out the roles of Scottish Ministers and designates local authorities as 'planning authorities' with a responsibility for producing local development plans and handling most aspects of development management and enforcement. All planning applications in Scotland are required to be determined against the Town and Country Planning (Scotland) Ac 1997.	The SEA should be mindful of the requirements set out in the 1997 Act.
Planning etc. (Scotland) Act 2006	The Planning etc. (Scotland) Act 2006 formed a central part of the reform of the Scottish planning system. One of its key effects was the creation of Strategic Development Planning Authorities, which comprise several local planning authorities and are charged with producing long-term development plans.	The SEA should be mindful of the requirements set out in the Planning etc. (Scotland) Act 2006
Town and Country Planning (Development Management Procedure) (Scotland)	Sets out provisions for granting planning permission in accordance with the Town and Country Planning (Scotland) Act 1997.	The SEA should be mindful of the requirements of the Town and Country Planning (Development Management Procedure) Scotland Regulations

Source	Key objectives	Implications/ Comments
Regulations 2008 (as amended)		
Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011	Sets out criteria for determining whether an Environmental Impact Assessment would be required for developments.	The SEA should reflect the objectives to minimise the potential environmental impacts of development
Planning (Scotland) Bill	An Act of the Scottish Parliament to make provision about how land is developed and used. The Bill is part of a wider planning system reform responding to an independent review of planning, which includes changes to secondary legislation made under existing powers as well as non-legislative changes. Some of the key aspects of the Bill are its provisions in relation to the system of development plans; the opportunities for community engagement in planning; the effective performance of planning authorities' functions; and a new way to fund infrastructure development.	The SEA should be mindful of the requirements proposed by the Planning (Scotland) Bill.
Electricity Act 1989	Establishes a licensing regime for generation, transmission, distribution and supply, and sets out the statutory duties of the regulator. The Act gives powers to Scottish Ministers for the determination of applications for electricity infrastructure including applications to construct, extend and operate onshore electricity generating stations exceeding 50 megawatts capacity; applications to vary existing consents which were granted under section 36; and applications for overhead lines.	The SEA should be mindful of the requirements of the Act.
National (policies, Plans, Programmes and Strategies)		
National Planning Framework 4 Revised Draft[281] (the Scottish Government)	The Fourth National Planning Framework (Revised Draft, details the long-term plan for what Scotland could be in 2045, was approved by Parliament on 11th January 2023. NPF4 comprises: ■ Part 1 – A National Spatial Strategy for Scotland 2045	The SEA should be mindful of the policy framework of National Planning Framework 4.

[281] At the time of publication of the Environmental Report NPF4 had been approved by the Scottish Parliament, with the expected adoption in February 2023.

Source	Key objectives	Implications/ Comments
	■ Part 2 - National Planning Policy; covering sustainable places, liveable places, and productive places	
National Planning Framework 3 (the Scottish Government, 2014)	The National Planning Framework 3 set out the Scottish Government's spatial development/investment priorities over the next 20-30 years. It is a long-term strategy to promote environmental sustainability, equality in opportunity, technological progress and human well-being and health. Key outcomes of the framework are as follows: ■ Creating sustainable places ■ Reducing carbon emissions and adapting to climate change ■ Protecting and enhancing Scotland's natural cultural assets as well as facilitating their sustainable use ■ Supporting better transport and digital connectivity	The SEA should reflect the objectives to make Scotland a successful, sustainable place; a low carbon place; a natural, resilient place; and a connected place.
Scottish Planning Policy (The Scottish Government, 2014)	The purpose of the Scottish Planning Policy is to set out national planning policies on how to address land use matters across the country. It is non-statutory, however, it is in line with the Town and Country Planning (Scotland) ■ Creating sustainable places ■ Reducing carbon emissions and adapting to climate change ■ Protecting and enhancing Scotland's natural cultural assets as well as facilitating their sustainable use ■ Supporting better transport and digital connectivity	The SEA should reflect the objectives to make Scotland a successful, sustainable place; a low carbon place; a natural, resilient place; and a connected place.

Climatic Factors

Source	Key objectives	Implications/ Comments
International		

Source	Key objectives	Implications/ Comments
IPCC's Fifth Assessment Report on Climate Change (2014)	To limit and/or reduce all greenhouse gas emissions which contribute to climate change	The SEA should reflect objectives to support reduction in emissions of greenhouse gases.
The Cancun Agreement-UNFCC (2011)	Shared vision to keep global temperature rise to below two degrees Celsius, with objectives to be reviewed as to whether it needs to be strengthened in future on the basis of the best scientific knowledge available.	Include sustainability objectives to support the reduction in greenhouse gas emissions and mitigation to climate change.
Paris Agreement (United Nations 2015)	The main aim of the Paris Agreement centres on keeping global temperature rise this century below 2°C above preindustrial levels. Frameworks are to be put in place to help achieve these goals.	The SEA should reflect objectives to adapt and mitigate climate change.
The Kyoto Protocol to the UNFCCC (1997)	The Kyoto Protocol to the UNFCCC established the first policy that actively aims to reduce greenhouse gas emissions by industrialised countries.	The SEA Framework should include objectives to reduce greenhouse gas emissions and promote sustainable development.
European		
Emissions Trading System Directive 2009 Directive 2009/29/EC to improve and extend the greenhouse gas emission allowance trading scheme of the Community	The main aim of the Directive is to improve and extend the greenhouse gas emission allowance trading scheme of the Community	The SEA should reflect objectives to promote energy efficiency and reduce the emission of greenhouse gases.
Renewable Energy Directive 2009 Directive 2009/28/EC on the use of energy from renewable sources	The Directive sets targets for renewable energy use within the EU, which requires that 20% of the energy consumed within the EU is renewable.	The SEA should reflect objectives to promote renewable energy.
Energy Efficiency Directive 2012	The purpose of the Directive is to promote energy efficiency by establishing a set of binding measures to help the EU reach its 20% energy efficiency target by 2020.	The SEA should reflect objectives to promote energy efficiency and prudent use of resources.

Source	Key objectives	Implications/ Comments
Directive 2012/30/EU on energy efficiency		
National (Legislation)		
The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019	The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 ("The Fuel Poverty Act") was introduced in 2019. Alongside the increased funding, work to decarbonise our homes and buildings will be led and co-ordinated by a new-dedicated National Public Energy Agency, to be established by 2025. A virtual agency will be in place and will act first to coordinate and then accelerate existing- and new-delivery programmes as part of the transition process.	The SEA should reflect the objective to support the decarbonising of homes and buildings
Climate Change (Scotland) Act 2009 Including amendments made by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019	The 2009 Act sets statutory targets for the reduction of greenhouse gas emissions and makes further provision about energy efficiency and about the reduction and recycling of waste. The Act set an interim 42 percent reduction target by 2020 and an 80 percent reduction target for 2050. In 2019, the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 amended these reduction targets to a 56% reduction by 2020, 75% reduction by 2030, 90% reduction by 2040 and achieving net-zero emissions by 2045. Secondary legislation has been made under the Climate Change (Scotland) Act 2009, including: ■ The Climate Change (Annual Targets) (Scotland) Order 2010: sets emission reduction targets for 2010-2022 ■ The Climate Change (Limit on Carbon Units) (Scotland) Order 2010: places a limit on the amount of carbon units that may be credited to net Scottish Emissions for the period 2010-2012 ■ The Carbon Accounting Scheme (Scotland) Regulations 2010: establish a scheme for monitoring compliance with annual reduction targets for 2010-22 (as amended in 2015 and 2016) ■ The Climate Change (International Aviation and Shipping) (Scotland) Order 2010: establish a method by which emissions of greenhouse gases from international aviation and international shipping that are attributable to Scotland are calculated. ■ The Climate Change (Annual Targets) (Scotland) Order 2011: sets emission reduction targets for 2023-2027	The SEA should reflect the objective to reduce the emission of greenhouse gases and mitigate climate change

Source	Key objectives	Implications/ Comments
	■ The Climate Change (Limit on Carbon Units) (Scotland) Order 2011: places a limit on the amount of carbon units that may be credited to net Scottish Emissions for the period 2023-2027 ■ The Climate Change (Limit on Carbon Units) (Scotland) Order 2010: places a limit on the amount of carbon units that may be credited to net Scottish Emissions for the period 2013-2017 ■ The Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland) Order 2015: requires bodies to prepare reports on compliance with climate change duties ■ The Climate Change (Additional Greenhouse Gas) (Scotland) Order 2015: adds nitrogen trifluoride as an additional greenhouse gas listed in the Climate Change (Scotland) Act 2009 ■ The Climate Change (Annual Targets) (Scotland) Order 2016: sets annual reduction targets for 2028-2032 ■ The Climate Change (Limit on Carbon Units) (Scotland) Order 2016: places a limit on the amount of carbon units that may be credited to net Scottish Emissions for the period 2018-2022 ■ Part 5 of the Climate Change (Scotland) Act 2009 also includes secondary legislation in relation to the energy performance of buildings and the functions of forestry commissioners.	
Heat Networks (Scotland) Act 2021	The Heat Networks (Scotland) Act 2021 (the Act) received Royal Assent in February 2021. The Act aims to accelerate the deployment of heat networks in Scotland through the introduction of a regulatory system aimed at boosting consumer confidence in the sector and providing greater certainty for investors. The Act sets statutory targets for heat network deployment in 2027 and 2030, which are equivalent to an estimated 120,000 and 650,000 additional homes being connected to heat networks. This helps it to contribute to the achievement of the targets and ambition set out in Scotland's 2018 to 2032 climate change plan.	The SEA should reflect objectives to support the development of heat networks.
National (policies, Plans, Programmes and Strategies)		

Source	Key objectives	Implications/ Comments
Climate Change Plan 2018 Including the Update to the Climate Change Plan 2020	The Climate Change (Scotland) Act 2009 requires that Ministers publish a report setting out policies and proposals to meet annual targets. With the publication of the Climate Change Plan (2018), the Scottish Government aims to meet its emission reduction targets over the period 2018-2032. The Climate Change Plan sits alongside the Scottish Government's Energy Strategy, and provides the strategic framework for our transition to a low carbon Scotland. Building on previous reports on policies and proposals, the Plan sets out the path to a low carbon economy while helping to deliver sustainable economic growth and secure the wider benefits to a greener, fairer and healthier Scotland in 2032. The third Climate Change Plan provides policies and proposals to reduce GHG emissions from seven key sectors, including: electricity; buildings; transport; industry; waste and the circular economy; land use, land use change and forestry; and agriculture. The update to the Climate Change Plan, published in 2020, committed to lay out a coordinated vision for the whole energy system within Scotland's refreshed energy strategy as well as ensuring the targets within the 2017 Energy Strategy remain on track. This update also provided a detailed, clear and credible pathway to meeting emissions targets over the period to 2032. Following the amendments to emissions reduction targets by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, the Scottish Government committed to updating the climate change plan (2020). The new plan continues to drive progress towards the current emissions reduction target of net-zero b 2045. The plan includes an additional sector, negative emissions technologies.	The SEA should reflect objectives to adapt and mitigate climate change, and support the reduction of greenhouse gas emissions.
Reducing emissions in Scotland Progress Report to Parliament 2020	This report documents Scotland's progress towards reducing greenhouse gas emissions. The report sets out strategic policies, objectives and milestones for the coming years, including: ■ Delivering an update to the Climate Change Plan which takes into account recent progress, seeks to deliver meaningful reductions outside of the power sector, and considers the implications of COVID-19. ■ Delivering a strategy for low-carbon heat and energy efficiency in Scotland's buildings. ■ Decarbonising transport by encouraging behavioural change, uptake of active and sustainable means of travel, and promoting '20 minute' neighbourhoods.	The SEA should reflect objectives to adapt and mitigate climate change, and support the reduction of greenhouse gas emissions.

Source	Key objectives	Implications/ Comments
	■ Accelerating investments in low-carbon technologies (e.g. carbon capture and storage, renewables and hydrogen) and climate adaptation infrastructure ■ Maximise carbon sequestration by increasing tree planting to 18,000 ha per year, and peatland restoration to 20,000 ha per year. ■ Strengthen policies in local plans relating to climate change and adaptation.	
Climate Ready Scotland: Second Scottish Climate Change Adaptation Programme 2019	The Adaptation Programme provides an overarching framework for adaptation to climate change, setting out Scottish Ministers' objectives as required by the 2009 Act. Building on the work of Climate Change Ready Scotland: Scottish Climate Change Adaptation Programme (2014) this second Programme sets out to address the impacts identified for Scotland by the 2017 UK Climate Change Risk Assessment.	The SEA should reflect objectives to mitigate the effects of climate change.
Climate Ready Scotland: Scottish Climate Change Adaptation Programme 2014	Addresses the impacts identified for Scotland in the UK Climate Change Risk Assessment (CCRA) published under section 56 of the UK Climate Change Act 2008. It aims to increase the resilience of Scotland's people, environment and economy to the impacts of a changing climate.	The SEA should reflect objectives to mitigate the effects of climate change.
Climate Emergency Skills Action Plan (CESAP) (2020)	Published in December 2020, the Climate Emergency Skills Action Plan sets out the government's plan to maximise the transition to net-zero for Scotland ensuring that Scotland's workforce has the skills required to make the transition to net-zero a just transition, fair and inclusive to all. It will act as a driver towards Scotland's ambition to be a world leader in decarbonisation, aiming to reduce reach zero greenhouse gases by 2045, with an interim reduction of 45 per cent by 2030. It sets out a clear direction for the changes needed in the skills system, and signals the role that industry, communities and individuals across Scotland will play in achieving this.	The SEA should reflect objectives to support the transition to net zero.
Hydrogen Action Plan 2022	Scottish Government's Hydrogen Action Plan articulates the actions that will be taken over the next five years to support the development of a hydrogen economy to further our efforts to reduce greenhouse gas emissions from Scotland's energy system while ensuring a just transition.	The SEA should reflect the objectives to support the development of a hydrogen economy.
Hydrogen Policy Statement 2020	The Statement sets out a vision for Scotland to become a leading hydrogen nation in the production of reliable, competitive, and sustainable hydrogen. It recognises the importance of hydrogen in the transition to renewable energy. The policy statement	The SEA should reflect objectives to support the reduction of greenhouse gas emissions.

Source	Key objectives	Implications/ Comments
	outlines the commitments of the Scottish Government to help achieve hydrogen production.	
Energy Strategy Position Statement 2021	The Scottish Government's Energy Strategy position statement, published in March 2021, provided an overview of the Scottish Government's key short-to-medium-term priorities, set out a comprehensive programme of work across the energy sector as well as an overview of the Scottish Government's commitment to ensuring a green economic recovery in respect to energy. It also summarised policy publications and consultations. The UK Government published their energy security strategy in April 2022, which will need to be taken into consideration for Scotland's Energy Strategy	The SEA should reflect objectives to support the transition to net zero through changes to the energy sector.
Scotland's electricity and gas networks: vision to 2030 (2019)	In 2019, the Scottish Government published Scotland's electricity and gas networks: vision to 2030, supporting an inclusive transition to a decarbonised energy system; a whole system approach across heat, transport and electricity; and smarter local energy models. It recognises that new transmission infrastructure will be required, including links to meet the needs of the islands, within Scotland and with the rest of the UK	The SEA should reflect objectives to support the transition to a decarbonised energy system.
Heat in Buildings Strategy 2021	The Heat in Buildings Strategy, published October 2021, sets out our vision for the future of heat in buildings, and the actions we are taking in the buildings sector to deliver our climate change commitments, maximise economic opportunities, and ensure a just transition, including helping address fuel poverty. This Strategy outlines the steps we will take to reduce greenhouse gas emissions from Scotland's homes, workplaces and community buildings and to ensure that we remove poor energy performance as a driver of fuel poverty. The focus of this Strategy is on energy demand for space and water heating in homes, workplaces and community buildings. This Strategy sets out a pathway to zero emissions buildings by 2045 and details a series of near-term actions to put us on a clear path towards this, as well as a range of further, longer-term commitments to accelerate the transformation of the nation's building stock. It sets out the principles we will apply to ensure our zero emissions heat delivery programmes support the fuel poverty objectives.	The SEA should reflect objectives to support the transition to zero emissions buildings.
A Low Carbon Economic Strategy for Scotland – Scotland A Low Carbon Society 2010	The main purpose of the Low Carbon Economic Strategy is to achieve the targets as set out in the Climate Change (Scotland) Act 2009, as amended. The document provides a comprehensive framework for developing a low carbon economy across Scotland. The strategy sets out measures that could be undertaken by	The SEA should reflect objectives to support the reduction of greenhouse gas emissions

Source	Key objectives	Implications/ Comments
	Parties to cut their greenhouse gas emissions. This vision relates to the energy sector, the built environment, Scotland's resources and businesses.	
Towards a Low Carbon Scotland – Smart Cities 2012	The purpose of the document is to highlight the ways in which Scotland can become a low carbon society by presenting a number of case studies about sustainable urban development in Scottish cities such as district heating development and a hydrogen bus project in Aberdeen, renewable energy projects in Edinburgh and the 'Energy from Waste' project in Glasgow.	The SEA should support the reduction of greenhouse gas emissions.
Delivering for Today, Investing for Tomorrow: The Government's Programme for Scotland 2018-19	One of the key objectives of the Programme is to promote further investments in renewable and low carbon energies in order to tackle climate change.	The SEA should reflect objectives to support renewable and low carbon technologies.
The Scottish Energy Strategy 2017	Scotland's Energy Strategy sits alongside the aforementioned Climate Change Delivery Plan. Three key themes underpin the Strategy; ■ A whole-system view in which energy supply and consumption are seen as equal priorities ■ A stable energy transition towards renewable energies and sustainable transport ■ A smarter model of local energy provision which promotes local energy, community involvement and community ownership of energy generation	The SEA should reflect objectives to adapt to and mitigate climate change.
Scottish Emissions Targets 2028-2032 – The high ambition pathway towards a low-carbon economy 2016	Sets out recommendations by the Committee on Climate Change which involves the following; ■ Significant rollout of low-carbon heat pumps and heat networks ■ Promoting sales of electric cars ■ Stimulating afforestation in Scotland ■ Expanding renewable power and shutdown of coal-fired power	The SEA should reflect objectives to reduce greenhouse gas emissions.

Source	Key objectives	Implications/ Comments
2020 Routemap for Renewable Energy in Scotland (2011), updated 2013	Reflects the new target to meet an equivalent of 100% demand for electricity from renewable energy by 2020, as well as our target of 11% renewable heat.	The SEA should reflect objectives to reduce greenhouse gas emissions.
Offshore Wind Policy Statement 2020	The Offshore Wind Policy Statement was published October 2020. Scottish offshore wind generation will play a vital part in helping us meet this challenge, while taking into account wider environmental factors and the interests of other users of the sea. This needs to happen within timeframes that keep us on course for Scotland's 2045 and interim emissions reduction targets and securing our 2030 target of meeting at least 50% of Scotland's total energy needs from renewable sources.	The SEA should reflect objectives to support continued use of offshore wind.
Onshore Wind Policy Statement 2022	The Onshore Wind Policy Statement was published in December 2022. The transition to net zero means that our demand for green electricity will increase substantially over the course of the next decade. This means that a consistently higher rate of onshore wind and other renewables capacity will be required year on year. The onshore wind policy statement, confirms the Scottish Government ambition to deploy 20 GW of installed onshore wind capacity by 2030. This will be enabled in part by a strong, supportive policy environment from the Scottish Government, particularly one that mitigates preventable barriers. The Climate Change Plan Update noted the need to develop 11-16GW of renewable capacity through to 2032.	The SEA should reflect objectives to support continued use of onshore wind.
Sectoral Marine Plan for Offshore Wind Energy 2020	Sets out the spatial framework for the development of commercial-scale offshore wind energy in Scotland.	The SEA should reflect objectives to reduce greenhouse gas emissions, minimise negative impacts to population and human health; biodiversity; soils; water quality; landscape and coastal environment; and, historic environment.
Delivering Scotland's circular economy: A Route Map to 2025 and beyond' 2022	Through this consultation we set out our proposals for a Route Map to 2025, our strategic plan to deliver Scotland's zero waste and circular economy ambitions. This consultation invites views on the proposed priorities and actions to reach our waste, recycling and emissions reduction targets.	The SEA should reflect objectives to support the circular economy.
Big Climate Conversation	The Big Climate Conversation engaged over 2,500 people in Scotland over a six-month period up to November 2019, in a discussion about Scotland's response to tackling the global climate emergency. Cross cutting issues which emerged included:	The SEA should reflect objectives to reduce greenhouse gas emissions.

Source	Key objectives	Implications/ Comments
	■ A holistic and system-wide approach requiring an integrated plan. ■ Government leadership ensuring that low carbon behaviours become the most convenient or only option. ■ A just transition to ensure that action to address climate change should not exacerbate inequalities and where possible, should reduce them.	
Bute House Agreement 2021	The Scottish Government and the Scottish Green Party Parliamentary Group have agreed to work together over the next five years to build a green economic recovery from COVID, respond to the climate emergency and create a fairer country. A shared draft policy programme has been agreed. It details collaboration on the climate emergency, economic recovery, child poverty, the natural environment, energy and the constitution. It includes commitments to: ■ hold a referendum on Scottish independence after the COVID pandemic has passed, within the current parliamentary session ■ increase investment in active travel and public transport ■ a strengthened framework of support for the marine renewables and offshore wind ■ take forward a ten-year £500 million Just Transition Fund for the North East and Moray ■ significantly increase the level of the Scottish Child Payment, in order to maximise the impact on child poverty ■ designate at least one new National Park by the end of this parliamentary session ■ enhance marine environmental protection ■ implement an effective national system of rent controls, enhance tenants' rights and deliver 110,000 affordable homes by 2032 ■ invest at least £1.8 billion over this parliamentary session in energy efficiency and renewable heating	The SEA should reflect the agreement to build a green economic recovery.

Source	Key objectives	Implications/ Comments
	■ establish two new Scottish Government overseas offices in Warsaw and Copenhagen	
Zero Emission Energy for Transport Report 2022	The Zero Emission Energy for Transport Report was published on 26 May 2022. Transport Scotland is committed to removing greenhouse gas emissions from the transport system. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 requires Scotland to reduce greenhouse gas emissions to net-zero by 2045, with an interim reduction target of 75% against 1990 levels by 2030. Transport is one of the biggest 'demand sectors' of energy, and neither the energy nor transport sectors can decarbonise without the other in sync.	The SEA should reflect objectives to reduce greenhouse gas emissions from transport.
Scotland's Economic Strategy 2015	The strategy sets out an overarching framework for a more productive, cohesive and fairer Scotland. The Economic Strategy forms the strategic plan for existing and all future Scottish Government policy. In addition to setting goals for sustainable economic growth, the Economic Strategy also sets out our ambitions for investing in Scotland's infrastructure, and prioritises investment to ensure that Scotland protects and nurtures its natural resources and captures the opportunities offered by the transition to a more resource efficient, lower carbon economy.	The SEA should reflect objectives to adapt and mitigate climate change, and support the reduction of greenhouse gas emissions.
Protecting Scotland Renewing Scotland: The Government's Programme for Scotland 2020-2021	The programme sets out Scottish Governments plans to make Scotland a more successful country, with opportunities and increased well-being for all. Within the context of the global climate emergency it sets out that the Scottish Government is committed to achieving net zero by 2045. The importance of adaption to prepare and manage the impacts of climate change is also set out. The programme sets out the next Infrastructure Investment Plan which will reflect Scotland's commitment to achieving net zero.	The SEA should reflect objectives to reduce greenhouse gas emissions.
Clyde Mission: energy masterplan 2021	This masterplan will support the strategic development of low carbon heat and energy infrastructure projects that align to the goals of the Clyde Mission. It aims to support the identification and development of a portfolio of heat and energy related investment opportunities in within the Clyde Mission area.	The SEA should reflect objectives to support low carbon heat and energy infrastructure.
Energy Consumer Action Plan: Putting Consumers at the heart of Scotland's Energy Transition 2019	Energy Consumer Action Plan sets out our commitment to ensure consumers are at the heart of Scotland's energy transition.	The SEA should reflect objectives to support the energy transition.

Source	Key objectives	Implications/ Comments
Heat networks delivery plan 2022	The delivery plan sets out how provisions of the Heat Networks Scotland Act 2021 and wider policy will contribute to increasing heat networks in Scotland.	The SEA should reflect objectives to support heat networks.
Potential heat network zones: first national assessment 2022	Analysis to identify and characterise potential zones for heat networks in Scotland. It provides further detail on the analysis criteria, assessment methodology, limitations, definitions and the interpretation of the outputs.	The SEA should reflect objectives to support heat networks.
Heat Network Fund: application guidance 2022	Information on Scotland's Heat Network Fund, including eligibility and how to apply.	The SEA should reflect objectives to support heat networks.
Bioenergy: update - March 2021	The update considers the potential role for bioenergy to support our net zero greenhouse emissions targets and outlines how we intend to move forward over the next 18 to 24 months to understand the most appropriate and sustainable use of bioenergy resources in Scotland.	The SEA should reflect objectives to support bioenergy.

Biodiversity, Flora and Fauna

Source	Key objectives	Implications/ Comments
International		
Bern Convention (1979)	To ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of those species) listed in Appendix III. To this end the Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1,000 wild animal species.	The SEA should consider the preservation and protection of the environment.
Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979)	To ensure that contracting parties work together to conserve terrestrial, marine and avian migratory species and their habitats (on a global scale) by providing strict protection for endangered migratory species. The overarching objectives set for the Parties are: ■ Promote, co-operate in and support research relating to migratory species	The SEA should reflect the objectives protecting biodiversity and the natural environment.

Source	Key objectives	Implications/ Comments
	■ Endeavour to provide immediate protection for migratory species included in Appendix I ■ Endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II	
Ramsar Convention (1971)	To promote the wise use of wetlands and their resources. The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".	The SEA should take into account the conservation of wetlands and their resources.
The Convention on Biological Diversity (2010)	The Convention on Biological Diversity (CBD) is a multilateral treaty which served three main goals, including: ■ Conservation of biological diversity ■ Sustainable use of its components ■ Fair and equitable sharing of benefits arising from genetic	The SEA should reflect objectives protecting biodiversity and sustainable use of its components.
European		
The Habitats Directive 1992 Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora	To promote the maintenance of biodiversity taking account of economic, social, cultural and regional requirements. Conservation of natural habitats and maintain landscape features of importance to wildlife and fauna.	The SEA should reflect objectives to protect and maintain the natural environment and important landscape features.
The Birds Directive 2009 Directive 2009/147/EC is a codified version of Directive 79/409/EEC as amended	The preservation, maintenance, and re-establishment of biotopes and habitats shall include the following measures: Creation of protected areas. Upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones. Re-establishment of destroyed biotopes.	The SEA should reflect objectives for the protection of birds.

Source	Key objectives	Implications/ Comments
	Creation of biotopes.	
EU Biodiversity Strategy to 2020 (European Commission, 2011)	The European Commission has adopted an ambitious new strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020. The six targets cover: ■ Full implementation of EU nature legislation to protect biodiversity ■ Better protection for ecosystems, and more use of renewable infrastructure ■ More sustainable agriculture and forestry ■ Better management of fish stocks ■ Tighter controls on invasive alien species ■ A bigger EU contribution to averting global biodiversity loss	The SEA should reflect objectives to value, protect and enhance biodiversity.
EU Seventh Environmental Action Plan to 2020 (European Commission, 2013)	The EU's objectives in implementing the programme are: (a) to protect, conserve and enhance the Union's natural capital; (b) to turn the Union into a resource-efficient, renewable and competitive low-carbon economy; (c) to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing; (d) to maximise the benefits of the Union's environment legislation; (e) to improve the evidence base for environment policy; (f) to secure investment for environment and climate policy and get the prices right; (g) to improve environmental integration and policy coherence; (h) to enhance the sustainability of the Union's cities; (i) to increase the Union's effectiveness in confronting regional and global environmental challenges.	The SEA should reflect objectives to protect and enhance the natural environment.
National (Legislation)		

Source	Key objectives	Implications/ Comments
Wildlife and Countryside Act 1981 (as amended)	The Act implements the principles of the Bern Convention and the EU Birds Directive in the UK. Since it came into force, the Act has been amended several times. The act applies to the terrestrial environment and inland waters. According to the Act, Scottish Natural Heritage (SNH) is a regulator of the Wild and Countryside Act and is legally responsible for Sites of Special Scientific Interest (SSSIs) and to enforce law when necessary. It is important to note that specific amendments, which only apply in Scotland due to devolution, have been made to the Act.	The SEA should reflect objectives to value, protect and enhance biodiversity.
The Conservation (Natural Habitats, &c.) Regulations 1994	The Act amends the Wildlife and Countryside Act 1981 for Scotland. The Act, together with the Nature Conservation (Scotland) Act 2004, implements the EU Birds and Habitats Directives.	The SEA should reflect objectives to value, protect and enhance biodiversity.
Nature Conservation (Scotland) Act 2004	The Act amends the Wildlife and Countryside Act 1981 for Scotland and makes provision for the further conservation of biodiversity. The Act requires the Scottish Government to report on progress in relation to the Scottish Biodiversity Strategy	The SEA should reflect objectives to protect biodiversity and the natural environment.
Wildlife and Natural Environment (Scotland) Act 2011 (as amended)	The Act amends the Wildlife and Countryside Act 1981 for Scotland. The Act mainly changed the way land and the environment is managed in Scotland e.g., it made operational changes to how SSSIs are managed.	The SEA should reflect objectives to protect and enhance designated biodiversity areas.
The Conservation of Offshore Marine Habitats and Species Regulations 2017	The Regulations form the legal basis for the implementation of the Habitats Directive and the Bird Directive in terrestrial areas and territorial waters.	The SEA should reflect objectives to value, protect and enhance marine habitats and species.
National (policies, Plans, Programmes and Strategies)		
UK Post-2010 Biodiversity Framework (JNCC, 2012)	The Framework shows how the work of the four UK countries joins up with work at a UK level to achieve the 'Aichi Biodiversity Targets' and the aims of the EU biodiversity strategy. The Framework identifies the following strategic goals: ■ Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society. ■ Reduce the direct pressures on biodiversity and promote sustainable use.	The SEA should reflect objectives to value, protect and enhance biodiversity.

Source	Key objectives	Implications/ Comments
	■ Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity. ■ Enhance the benefits to all from biodiversity and ecosystems. ■ Enhance implementation through participatory planning, knowledge management and capacity building.	
Scotland's Biodiversity: It's in Your Hands (Scottish Executive, 2004)	Scotland's Biodiversity: It's in Your Hands presents a 25 year strategy (until 2030) for the conservation and enhancement of Scotland's biodiversity. It sets out a number of outcomes in relation to; ■ Species and habitats ■ People ■ Landscapes and Ecosystems ■ Integration and Co-ordination ■ Knowledge	The SEA should reflect objectives to value, protect and enhance biodiversity.
2020 Challenge for Scotland's Biodiversity – A Strategy for the conservation and enhancement of biodiversity in Scotland (The Scottish Government, 2013)	The aims of the 2020 Challenge are in line with the targets set by the aforementioned United Nations Convention on Biological Diversity (20100 and the European Union's Biodiversity Strategy for 2020, and include: ■ Protect and restore biodiversity on land and in Scotland's SAs ■ Involve and engage people in decisions about the environment ■ Promote sustainable economic growth ■ The 2020 Challenge and the 'Scotland's Biodiversity: It's in Your Hands' together make up the Scottish Biodiversity Strategy.	The SEA should reflect objectives to value, protect and enhance biodiversity.
Scotland's Biodiversity: A Route Map to 2020 (The Scottish Government, 2015)	The 'Six Big Steps for Nature' identified in the Route Map are: ■ Ecosystem restoration ■ Investment in natural capital ■ Quality greenspace for health and education benefits	The SEA should reflect objectives to value, protect and enhance biodiversity.

Source	Key objectives	Implications/ Comments
	■ Conserving wildlife in Scotland ■ Sustainable management of land and freshwater ■ Sustainable management of marine and coastal ecosystems	
Scottish Biodiversity Strategy; Report to the Scottish Parliament 2014-2016	Report to the Scottish Parliament which sets out progress with delivery of the Scottish Biodiversity Strategy. It records progress from 2014-2016 and highlights the remaining challenges that must be overcome to meet the aims of the 2020 Challenge for Scotland's Biodiversity	The SEA should reflect objectives to value, protect and enhance biodiversity.

Population and Human Health

Source	Key objectives	Implications/ Comments
International		
International Health Regulations, 2007	The International Health Regulations provide a legal instrument for upholding global public health security by preventing and responding to acute public health risks. The Regulations require countries to report certain disease outbreaks and public health risks to the World Health Organisation.	The SEA should reflect the objective that acknowledges the potential health hazards that could be caused by the different development types.
European		
The Bathing Water Quality Directive 2006 Directive 2006/7/EC on the quality of water intended for human consumption	The overall objective of the revised Directive remains the protection of public health whilst bathing.	The SEA should reflect the Directive requirements and protect the quality of bathing waters.
The Drinking Water Directive 1998 Directive 98/83/EC on the quality of water intended for human consumption	Protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean.	The SEA should reflect objectives to protect and enhance drinking water quality.

Source	Key objectives	Implications/ Comments
The Noise Directive 2000/14/EC	■ Monitor the environmental problem by drawing up strategic noise maps. ■ Informing and consulting the public about noise exposure, its effects and the measures considered to address noise. ■ Addressing local noise issues by requiring authorities to draw up action Plans to reduce noise where necessary and maintain environmental noise where it is good.	The SEA should reflect objectives to reduce noise pollution.
National (Legislation)		
Public Health etc. (Scotland) Act 2008	The Act updates the law on public health, enabling Scottish Ministers to protect public health. It also makes provision for law on statutory nuisances.	The SEA should reflect objectives to protect public health.
National (policies, Plans, Programmes and Strategies)		
National Performance Framework (The Scottish Government, 2016)	The main purpose of the National Performance Framework is to promote sustainable economic growth by setting out a measurement set that can be used to determine the extent to which key targets are being fulfilled. It sets seven broad targets in relation to: ■ Growth – stimulating economic growth ■ Productivity – improving productivity ■ Participation – improving economic participation ■ Population – increase population growth ■ Solidarity – reduce income equality ■ Cohesion – reduce inequalities in economic participation ■ Sustainability – reduce greenhouse gas emissions	The SEA should reflect objective to promote the principles of sustainable economic growth.
Scotland's Third Land Use Strategy 2021-2026	Scotland's Third Land Use Strategy 2021-2026 sets out our vision, objectives and policies to achieve sustainable land use. The strategy covers the next five years and aims to provide a more holistic understanding of our land the demands we place upon it and the benefits we get from our land.	The SEA should reflect objective to support sustainable land use.

Source	Key objectives	Implications/ Comments
Scotland's Public Health Priorities (Scottish Government, 2018)	Sets out the six public health priorities for Scotland and how they are to be developed. The 6 priorities are: ■ A Scotland where we live in vibrant, healthy and safe places and communities ■ A Scotland where we flourish in our early years ■ A Scotland where we have good mental wellbeing ■ A Scotland where we reduce the use of and harm from alcohol, tobacco and other drugs ■ A Scotland where we have a sustainable, inclusive economy with equality of outcomes for all ■ A Scotland where we eat well, have a healthy weight and are physically active	The SEA should reflect objectives which support Scotland's public health priorities.
Tackling Fuel Poverty in Scotland: A Strategic Approach 2021	The fuel poverty strategy sets out policies and proposals for national government, local authorities and third sector partners to help meet the targets set out in the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019.	The SEA should reflect objectives which support tackling fuel poverty.
A National Mission with Local Impact: Infrastructure Investment Plan for Scotland 2021-22 to 2025-26 (2021)	The Infrastructure Investment Plan outlines a coherent, and strategic approach to delivering our National Infrastructure Mission. The Plan demonstrates the vital role infrastructure has to play in helping businesses and communities to adapt and recover from the COVID-19 pandemic.	The SEA should reflect objectives which supports delivering the National Infrastructure Mission.
Social Housing Net Zero Heat Fund - development funding invitation 2022	Information and guidance notes for the Social Housing Net Zero - Development Funding Invitation.	The SEA should reflect objectives which supports net zero housing.

Soil

Source	Key objectives	Implications/ Comments
European		

Source	Key objectives	Implications/ Comments
EU Management of Waste from Extractive Industries (2006/21/EC)	The purpose of the Directive is to prevent water and soil pollution from the deposition of waste into heaps or ponds and puts emphasis on the long-term stability of waste facilities to help avoid major accidents. The main elements of the Directive are: ■ Conditions for operating permits. ■ General obligations concerning waste management. ■ The obligation to characterise waste before disposing of it or treating it. ■ Measures to ensure the safety of waste management facilities. ■ A requirement to draw up closure plans. ■ An obligation to provide for an appropriate level of financial security.	The SEA should reflect objectives to protect soil quality and minimise soil pollution.
The Industrial Emissions Directive 2010 Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)	This Directive lays down rules on integrated prevention and control of pollution arising from industrial activities. It also lays down rules designed to prevent or, where that is not practicable, to reduce emissions into land and to prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole.	The SEA should reflect objectives to protect soil quality and minimise soil pollution.
Thematic Strategy for Soil Protection (European Commission, 2006)	Includes a thematic strategy which aims to: ■ Establish common principles for the protection and sustainable use of soils ■ Mitigate potential threats to soils ■ Preserve soil functions ■ Restore degraded and contaminated soils	The SEA should reflect objectives to protect soils and minimise soil pollution.
National (Legislation)		
Environmental Protection Act 1990 (as amended)	Sets out legislation for the management and remediation of contaminated land that in its current states, is causing or has the potential to cause significant pollution of the environment.	The SEA should reflect objectives to protect soil quality.

Source	Key objectives	Implications/ Comments
Contaminated Land (Scotland) Regulations 2000	Provides a detailed framework for the definition, identification and remediation of contaminated land.	The SEA should reflect objectives to protect soil quality.
National (policies, Plans, Programmes and Strategies)		
The Scottish Soil Framework (The Scottish Government, 2009)	The Soil Framework sets out a vision for the enhancement and protection of soil consistent with the economic, social and environmental needs of Scotland. The Framework identifies 13 key outcomes, as follows: ■ Protecting and enhancing soil organic matter ■ Reducing soil erosion ■ Maintaining soil structure ■ Reduce greenhouse gas emissions from soils ■ Protecting soil biodiversity ■ Ensuring that soils contribute to sustainable flood management ■ Enhancing water quality through sustainable soil management ■ Enhancing soil's productive capacity ■ Reducing soil contamination ■ Reducing pressure on greenfield land and redirect development to brownfield sites where appropriate ■ Protecting soils with significant historical and cultural features ■ Enhancing knowledge base ■ Promoting effective coordination between stakeholders	The SEA should reflect objectives to protect soils and minimise soil pollution.
Scotland's National Peatland Plan	This plan sets out proposals for the sustainable use, protection, management and restoration of Scotland's peatlands. It identifies the following outcomes:	The SEA should reflect objectives to protect and promote sustainable use and management of peatlands.

Source	Key objectives	Implications/ Comments
Working for our future (Scottish Natural Heritage, 2015)	■ Protect those areas of peatland currently in good condition and supporting their potential range of ecosystem functions; ■ Enhance ecosystem resilience to climate change through appropriate management; ■ Restore peatland ecosystem functions and biodiversity, evaluating and understanding the benefits to help inform future decisions; ■ Secure greater peatland restoration capabilities and understanding of these amongst land managers, developers, advisers and the public; ■ Ensure peatland values are reflected in the support given to those who manage and restore them; and ■ Demonstrate and communicate the wider public benefits of healthy peatland landscapes and peatland restoration.	

Water

Source	Key objectives	Implications/ Comments
International		
Convention on the Law of the Sea (1982)	Defines the rights and responsibilities of national in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of natural resources.	The SEA should reflect objectives to protect and enhance the water environment.
European		
The Water Framework Directive 2000 Directive 2000/60/EC establishing a framework for community action in the field of water policy	The main aim of the Directive is to protect of inland surface waters, transitional waters, coastal waters and ground waters.	The SEA should reflect objectives to protect and minimise the impact on water quality.

Source	Key objectives	Implications/ Comments
The Bathing Water Quality Directive 2006 Directive 2006/7/EC on the quality of water intended for human consumption	The overall objective of the revised Directive remains the protection of public health whilst bathing.	The SEA should reflect the Directive requirements and protect the quality of bathing waters.
The Floods Directive 2007 Directive 2007/60/EC on the assessment and management of flood risks	Establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods.	The SEA should reflect objectives that relate to flood management and reduction of risk.
Marine Strategy Framework Directive 2007	The MSFD extends the requirements of the Water Framework Directive (WFD) into seas beyond 1nm. The MSFD requires Member States to "take necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest".	The SEA should reflect objectives to protect and enhance the water environment.
National (legislation)		
Marine (Scotland) Act 2010	The Act provides a framework which will help balance the competing demands of Scotland's seas. It introduces a duty to protect and enhance the marine environment and includes measure to help boost economic investment and growth in areas such as marine renewables. The main measures include: ■ Marine Planning - a new statutory marine planning system to sustainably manage the increasing, and often conflicting, demands on Scotland's seas ■ Marine Licencing - a simpler licensing system, minimising the number of licences required for development in the marine environment to cut bureaucracy and encourage economic investment ■ Marine Conservation - improved marine nature and historic conservation with new powers to protect and manage areas of importance for marine wildlife, habitats and historic monuments ■ Conservation - much improved protection for seals and a new comprehensive licence system to ensure appropriate management when necessary	The SEA should reflect objectives to protect and enhance the marine environment.

Source	Key objectives	Implications/ Comments
	■ Enforcement – a range of enhanced powers of marine conservation and licensing	
Bathing Waters (Scotland) Regulations 2008	The Act implements the EU Bathing Water Quality Directive.	The SEA should reflect objectives that relate to flood management and reduction of risk.
Flood Risk Management (Scotland) Act 2009	The Act requires local authorities to assess bodies of water to determine potential flood risk and carry out measures if required. The Act implements the EU Floods Directive.	The SEA should reflect objectives that relate to flood management and reduction of risk.
Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)	Provides a regulatory framework for controlling activities which could have an adverse effect on Scotland's water environment including abstraction, impoundments, dredging, impoundments, surface water drainage and pollution. The primary objective of the Regulations is to protect and restore Scotland's water environment.	The SEA should reflect objectives to protect and restore the water environment.
Water Environment and Water Services (Scotland) Act 2003	The Water Environment and Water Services (Scotland) Act 2003 is the enabling legislation for the Water Framework Directive and makes major changes to the administration of water and sewerage provision in Scotland. It identifies the Scottish Environmental Protection Agency (SEPA) as the competent authority. Part 1 makes provision for protection of the water environment, whilst Part 2 deals with water and sewerage services.	The SEA should reflect objectives to protect the water environment.
Water Environment (Miscellaneous) (Scotland) Regulations 2017	The Regulations amend existing general binding rules and introduces requirements for particular projects to have a construction license in place before works can commence.	The SEA should reflect sustainability objectives to protect the natural environment.
The Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Amendment Regulations 2017	Provides a regulatory framework for flood risk management amending the previous regulations made in 2009.	The SEA should reflect sustainability objectives to relate to flood management and reduction of risk.

Source	Key objectives	Implications/ Comments
National (Policies, Plans, Programmes and Strategies)		
National Marine Plan 2015	The plan covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). It also applies to the exercise of both reserved and devolved functions. It provides guidance to decision-makers and users within Scotland's marine environment.	The SEA should reflect sustainability objectives to protect the sustainable use of the marine environment.
SEPA Draft River Basin Management Plans Scotland River Basin District / Solway Tweed River Basin District 2008	Identifies key pressures and environmental impacts on Scottish water bodies, which may be exacerbated by climate change.	The SEA should reflect objectives that relate to flood management and reduction of risk.
Scotland's Bathing Waters: A Strategy For Improvement (Scottish Executive Environment Group, 2002)	The main purpose of this strategic document is to reduce water pollution in bathing waters by implementing changes to agricultural practices, ensuring compliance with controls on industrial discharges and making use of SUDs.	The SEA should reflect the Directive requirements and protect the quality of bathing waters.
Scottish Water Net Zero Emissions Routemap	We are responsible for providing water and waste water services that are essential to everyday life for households and businesses across Scotland; making a critical contribution to the country's health, wellbeing, economic prosperity and natural environment. But the changing climate will increasingly threaten our ability to deliver these services. We must therefore adapt our approaches, deal with the climate challenges, and secure the future reliability and sustainability of the country's water and waste water services. While we must adapt our services to deal with climate change, we must also eliminate the greenhouse gas emissions that are contributing to the climate emergency.	The SEA should reflect the Scottish Water Routemap to ensure future reliability and sustainability of water and waste water services.

Air

Source	Key objectives	Implications/ Comments
International		
UNECE Convention on Long Range Transboundary Air Pollution (1979)	The purpose of the UNECE Convention was to address the environmental consequences of air pollution. The main aim of the Convention was to reduce and prevent air pollution in order to improve air quality on the local, regional and national levels. To achieve this, the Convention sets out measures to be taken by parties to cut their emissions of air pollutions. The UNECE Convention has been extended by eight other protocols that identify measures to be undertaken by Parties to cut their emissions of air pollutants. These eight protocols include the following: ■ EMEP Protocol on Long-Term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutions in Europe (1984) ■ Helsinki Protocol on the Reduction of Sulphur Emissions (1985) ■ Nitrogen Oxide Protocol (1988) ■ Volatile Organic Compounds Protocol (1991) ■ Oslo Protocol on Further Reduction of Sulphur Emissions (1994) ■ Protocol on Heavy Metals (1998) ■ Aarhus Protocol on Persistent Organic Pollutants (1998) ■ Gothenburg Protocol on Abate Acidification, Eutrophication and Ground-level Ozone (1999)	The SEA should reflect the objectives to protect and enhance air quality from factors such as eutrophication and acidification
European		
The National Emissions Ceiling Directive 2001	The Directives sets limits for the main causal factors of acidification, eutrophication and ground-level ozone.	The SEA should reflect the objectives to protect and enhance air quality from factors such as eutrophication and acidification.

Source	Key objectives	Implications/ Comments
Directive 2001/81 EC on national emission ceilings for certain atmospheric pollutants		
The Air Quality Directive 2008 Directive 2008/50/EC on ambient air quality and cleaner air for Europe	Avoid, prevent and reduce harmful effects of air pollution on human health and the environment. The Directive Brings together existing legislation (at the time) on air quality, including objectives for key pollutants such as SO_2, NO_x, particulates, lead, benzene and ozone. The Directive sets out statutory limits for the concentration of different pollutants (Annex XI) and thresholds for human and environmental health (Annex II).	The SEA should reflect the objectives to reduce harmful effects of air pollution.
The Industrial Emissions Directive 2010 Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)	This Directive lays down rules on integrated prevention and control of pollution arising from industrial activities. It also lays down rules designed to prevent or, where that is not practicable, to reduce emissions into air in order to achieve a high level of protection of the environment taken as a whole.	The SEA should reflect the objective for reducing air pollution caused by industrial emissions.
The Clean Air Policy Package and Clean Air Programme for Europe 2013	The Clean Air Policy Package and Clean Air Programme for Europe set targets up to 2030, and also introduces measures and proposals to reduce emissions and improve air quality across the EU.	The SEA should reflect the objectives to protect and enhance air quality.
National (Legislation)		
The Environment Act 1995	The Act requires the UK government and devolved administrations to produce a national air quality strategy. The most recent version of this national air quality strategy is The Air Quality Strategy for England Scotland Wales and Northern Ireland which defines the roles of the local and central government, as well as the Scottish Environment Protection Agency (SEPA), industry, business, transport, individuals and other groups. In addition, the Act sets objectives for specific emissions and measures for monitoring. Where limits are not met, the local authority must declare it an Air Quality Management Area (AQMA)	The SEA should reflect the objective for reducing air pollution.

Source	Key objectives	Implications/ Comments
The Air Quality (Scotland) Regulations 2000 As amended by the Air Quality (Scotland) Amendment Regulations 2002 and the Air Quality (Scotland) Amendment Regulations 2016	Sets out air quality objectives for several substances in line with the Environment Act 1995. In contrast to EU requirement, Scotland has set stricter levels for specific pollutants including PM_{10} and $PM_{2.5}$.	The SEA should reflect the objective for reducing air pollution.
The Air Quality Standards (Scotland) Regulations (2010)	Sets statutory targets for concentrations of pollutants in ambient air in accordance with EU Directives. The Act allows for Air Quality Management Zones to be identified and makes provision for the sharing of this information with the public. The Regulations were amended through The Air Quality Standards (Scotland) Amendment Regulations 2016.	The SEA should reflect the objective for reducing air pollution.
Pollution Prevention and Control (Scotland) Regulations 2012	Implements the requirements of the EU Industrial Emissions Directive in Scotland. The Act states that emissions to air, water and land must be considered together, and permits are considered based on the nature of the activity. The Act has been amended several times since 2012.	The SEA should reflect the objective for reducing air pollution.
National (policies, Plans, Programmes and Strategies)		
The Air Quality Strategy for England Scotland Wales and Northern Ireland (2011)	The key objective of the strategy is to improve and protect ambient air quality in the UK, with the overall aim of health protection. The strategy sets out key objectives and monitoring recommendations for specific emissions.	The SEA should reflect the objective for reducing air pollution, particularly in relation to health protection.
Cleaner Air for Scotland – The Road to a Healthier Future (the Scottish Government, 2015)	Presents a single framework which sets out further proposals for delivering improvements to air quality in Scotland. It summarises six broad types of key actions that could help to reduce air pollution and improve air quality; ■ **Transport** – reducing transport emissions by promoting active travel and/or low and zero emission fuels ■ **Legislation and Policy** – comply with European and Scottish legal requirements	The SEA should reflect the objective for reducing air pollution and promote active/sustainable travel.

Source	Key objectives	Implications/ Comments
	■ **Communication** – inform and engage citizens ■ **Health** – protecting citizens from air pollution ■ **Placemaking** – minimise air pollution through appropriate design ■ **Climate Change** – achieve Scotland's renewable targets	

Cultural Heritage and the Historic Environment

Source	Key objectives	Implications/ Comments
International		
European Convention on the Protection of the Archaeological Heritage (Valletta, 1992) Revision of the 1985 Granada Convention	Protection of the archaeological heritage, including any physical evidence of the human past that can be investigated archaeologically both on land and underwater. Creation of archaeological reserves and conservation of excavated sites.	The SEA should reflect objectives to protect the archaeological heritage.
UNESCO World Heritage Convention (1972)	The 1972 World Heritage Convention links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognises the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List. It also sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledged to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage.	The SEA Framework should include objectives relating to the conservation and enhancement of cultural heritage and natural heritage.
European		

Source	Key objectives	Implications/ Comments
European Spatial Development Perspective (1999)	Economic and social cohesion across the community. Conservation of natural resources and cultural heritage. Balanced competitiveness between different tiers of government.	The SEA should reflect objectives to conserve natural resources and cultural heritage.
National (Legislation)		
Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997	Provides main legislation to: ■ list buildings of special architectural or historic interest ■ providing requirements in relation to changes affecting listed buildings and conservation areas ■ setting out a framework for designating and managing Conservation Areas	The SEA should reflect objectives to conserve cultural heritage, particularly in relation to Listed Buildings, Conservation Areas and buildings of special architectural or historic interest.
National Parks (Scotland) Act 2000	Sets out for main aims for the National Parks of Scotland: ■ Conserving and enhancing the natural and cultural heritage of the area ■ Promoting sustainable use of the natural resources of the area ■ Promoting understanding and enjoyment of the area by the public ■ Promoting sustainable economic and social development of the area's communities	The SEA should reflect objectives to conserve cultural heritage in National Parks.
Historic Environment Scotland Act 2014	The Act established Historic Environment Scotland (HES) as a Non-Departmental Public Body (NDPB). Under the Act, HES will be a statutory consultee in relation to listed buildings and conservation area consents, as well as in relation to EIA. The Act also amended statutory processes in relation to the historic environment by changing the processes for the designation of sites and buildings (by scheduling and listing) and for consents relating to scheduled monuments, listed buildings and conservation areas.	The SEA should reflect objectives to conserve cultural heritage and the wider historic environment. In addition, the role of Historic Environment Scotland should be taken into account.
The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013	Both Acts state that Historic Environment Scotland must be consulted on any development affecting a UNESCO World Heritage Site in Scotland.	The SEA should reflect objectives to conserve cultural heritage and the wider historic environment.

Source	Key objectives	Implications/ Comments
The Town and Country Planning (Neighbouring Planning Authorities and Historic Environment) (Scotland) Direction 2015		
National (policies, Plans, Programmes and Strategies)		
Our Place in Time – The Historic Environment Strategy for Scotland (The Scottish Government, 2014)	The Strategy provides a high-level framework which sets out a 10-year vision for safeguarding the cultural, social, environmental and economic value of Scotland's heritage assets. The Strategy sets out three main aims: ■ Investigating and recording the assets that make up Scotland's historic environment ■ Protecting Scotland's historic environment ■ Sharing information on the significance of Scotland's historic environment ■ Each ambition is underpinned by a number of strategic priorities e.g. application of new technologies.	The SEA should reflect objectives to conserve the historic environment.
Historic Environment Policy for Scotland (HEPS)	This policy replaces the 2016 Policy Statement and supports the protection and enhancement of the historic environment, and sets out the principles for designation.	The SEA should reflect the principles of the protection and enhancement of the historic environment.

Landscape and Geodiversity

Source	Key objectives	Implications/ Comments
European		
European Landscape Convention (Florence, 2002)	The convention promotes landscape protection, management and planning.	The SEA should reflect objectives to protect, manage and plan for landscape provision.
National (Policies, Plans, Programmes and Strategies)		

Source	Key objectives	Implications/ Comments
Getting the best from our land A Land Use Strategy for Scotland 2016-2021	The Strategy supports sustainable land use, and recognises the interactions between different interests and land use. The objectives of the strategy include: ■ Land-based businesses working with nature to contribute more to Scotland's prosperity. ■ Responsible stewardship of Scotland's natural resources delivering more benefits to Scotland's people. ■ Urban and rural communities better connected to the land with more people enjoying the land and positively influencing land use.	The SEA should reflect the need to support sustainable land use.
Scottish Land Rights and Responsibilities Statement 2017	This statement sets out 6 principles relating to land rights and responsibilities. It aims to work towards a Scotland with a strong and dynamic relationship between its land and people, where all land contributes to a modern and successful country, and where rights and responsibilities in relation to land are fully recognised and fulfilled. The 6 principles outlined are: ■ The overall framework of land rights, responsibilities and public policies should promote, fulfil and respect relevant human rights in relation to land contribute to public interest and wellbeing, and balance public and private interests. The framework should support sustainable economic development, protect and enhance the environment, help achieve social justice and build a fairer society ■ There should be a more diverse pattern of land ownership and tenure, with more opportunities for citizens to own, lease and have access to land. ■ More local communities should have the opportunity to own, lease or use buildings and land which can contribute to their community's wellbeing and future development. ■ The holders of land rights should exercise these rights in ways that take account of their responsibilities to meet high standards of land ownership, management and use. Acting as the stewards of Scotland's land resource for future generations they contribute to sustainable growth and a modern, successful country ■ There should be improved transparency of information about the ownership, use and management of land and this should be publicly available, clear and contain relevant detail.	The SEA should reflect objectives to promote a strong relationship between Scotland's land and people.

Source	Key objectives	Implications/ Comments
	■ There should be greater collaboration and community engagement in decisions about land	
Scotland's Forestry Strategy 2019-2029	The strategy supports an increase in Scotland's forests and woodlands that will be sustainably managed and better integrated with other land uses. It has 3 main objectives: ■ Increase the contribution of forests and woodlands to Scotland's sustainable and inclusive economic growth ■ Improve the resilience of Scotland's forests and woodlands and increase their contribution to a healthy and high-quality environment ■ Increase the use of Scotland's forest and woodland resources to enable more people to improve their health, well-being and life chances	The SEA should reflect objectives to promote an increase in the number and use of forests and woodlands.
Natural Heritage Futures 2002	This programme aims to guide the sustainable management and use of Scotland's nature and landscapes up until 2025. The programme's six national prospectuses cover: ■ farmland ■ coasts and seas ■ hills and moors ■ settlements ■ freshwater ■ forests and woodlands And each prospectus describes: ■ what is distinctive to each region in Scotland ■ a vision for the natural heritage for 2025 ■ objectives and actions required to pursue that vision.	The SEA should reflect objectives to conserve and enhance the landscape and natural environment.
Landscape Policy Framework 2017	The policy aims to 'safeguard and enhance the distinct identity, the diverse character and the special qualities of Scotland's landscapes as a whole, so as to ensure tomorrow's landscapes contribute positively to people's environment and are at least as attractive and valued as they are today'. The principles of approach are based on four propositions:	The SEA should reflect objectives to conserve and enhance the landscape and natural environment.

Source	Key objectives	Implications/ Comments
	■ Scotland's landscapes are a shared responsibility. ■ All of Scotland's landscapes deserve attention. ■ Scotland's landscapes will continue to change. ■ Scotland's landscapes deserve greater care.	

Material Assets

Source	Key objectives	Implications/ Comments
European		
The Landfill Directive 1999 Directive 99/31/EC on the landfill of waste	Prevent or reduce negative effects on the environment from the landfilling of waste by introducing stringent technical requirements for waste and landfills.	The SEA should reflect objectives to increase recycling and reduce the amount of waste.
The Waste Framework Directive 2008 Directive 2008/98/EC on waste	Prevention or reduction of waste production and its harmfulness. The recovery of waste by means of recycling, re-use or reclamation. Recovery or disposal of waste without endangering human health and without using processes that could harm the environment.	The SEA should reflect objectives that minimise waste production as well as promote recycling.
The Urban Waste Water Directive 1991 Directive 91/271/EEC concerning urban waste water treatment	Protect the environment from the adverse effects of urban waste water collection, treatment and discharge, and discharge from certain industrial sectors.	The SEA should reflect objectives to reduce water pollution.
EU Management of Waste from Extractive Industries (2006/21/EC)	The purpose of the Directive is to prevent water and soil pollution from the deposition of waste into heaps or ponds and puts emphasis on the long-term stability of waste facilities to help avoid major accidents. The main elements of the Directive are: ■ Conditions for operating permits.	Include sustainability objectives that encourage recycling and the prudent use of natural resources and the protection of the environment. Also promote a reduction in water and soil pollution.

Source	Key objectives	Implications/ Comments
	■ General obligations concerning waste management. ■ The obligation to characterise waste before disposing of it or treating it. ■ Measures to ensure the safety of waste management facilities. ■ A requirement to draw up closure plans. ■ An obligation to provide for an appropriate level of financial security.	
National (Legislation)		
Environmental Protection Act 1990	The Act implements the EU Waste Framework Directive (2008) and includes provisions for improved control of pollution and waste generation arising from certain industrial processes Moreover, the Act places a duty on local authorities, as the primary regulators, to identify and secure the remediation of contaminated land in their respective areas. The Environmental Protection Act comprises the following parts: Part I: Integrated Pollution and Control Part II: Waste Management Licencing Part III: Statutory Nuisances Part IV: Criminal Offences Concerning Litter Part VI: Statutory Notification and Risk Assessment for Genetically Modified Organisms (GMOs) Part VII: Creation of Nature Conservancy Council for England the Nature Conservancy Council for Scotland and the Countryside Council for Wales.	The SEA should reflect objectives to reduce pollution.
The Management of Extractive Waste (Scotland) 2010 Regulations	EU directive 2006/21/EC was transposed in the form of the Management of Extractive Waste (Scotland) 2010 Regulations, also known as 'MEW'. It sets out conditions for granting planning permission for extractive waste areas and waste facilities, along with additional requirements for category A (high risk) waste facilities.	The SEA should reflect objectives to minimise the environmental impact of waste.

Source	Key objectives	Implications/ Comments
Waste Management Licencing (Scotland) Regulations 2011 (as amended)	Sets out requirements for the management of waste and related activities with regard to granting site licences and consolidating existing licences.	The SEA should reflect objectives to minimise the environmental impact of waste.
Pollution Prevention and Control (Scotland) Regulations 2012 (as amended)	Implements the requirements of the EU Industrial Emissions Directive in Scotland. The Act states that emissions to air, water and land must be considered together, and permits are considered based on the nature of the activity. The Act has been amended several times since 2012.	The SEA should reflect objectives for reducing air/water/soil pollution.
Scotland Rural Development Programme (SRDP) 2021-2024	The key purpose of the SRDP 2014 - 2020 is to help achieve sustainable economic growth in Scotland's rural areas and the priorities remains broadly the same as the previous programme: The main priorities are: ■ Enhancing the rural economy ■ Supporting agricultural and forestry businesses ■ Protecting and improving the natural environment ■ Addressing the impact of climate change ■ Supporting rural communities	The SEA should reflect objectives for protecting the environment.
National (policies, Plans, Programmes and Strategies)		
Scotland's circular economy: A Route Map to 2025 and beyond (The Scottish Government, 2022)	Scotland's circular economy: A Route Map to 2025 and beyond has been through consultation which sets out the Scottish Government's proposals for a Route Map to 2025, our strategic plan to deliver Scotland's zero waste and circular economy ambitions. This consultation invites views on the proposed priorities and actions to reach our waste, recycling and emissions reduction targets.	The SEA should reflect objectives to support a circular economy.
Scotland's Zero Waste Plan (2010)	The Zero Waste Plan presents a vision to minimise waste transport to landfills, promote recycling and enhancing collection methods. The key objective of the Plan is to maximise the economic and environmental opportunities of waste reduction and reuse.	The SEA should reflect objectives to minimise the environmental impact of waste and promote recycling.
Planning Advice Note 63: energy from waste (2013)	Sets out guidance for planning authorities on proactively planning for waste management	The SEA should reflect objectives to minimise the environmental impact of waste and promote recycling.

Source	Key objectives	Implications/ Comments
A strategy for improving waste data in Scotland (2017)	Sets out a strategy to improve the relevance, quality and availability of data on waste from all sources (e.g. households, commerce and industry). The primary objective of the strategy is to improve waste data strategies in order to enhance Scotland's waste and resources sector.	The SEA should reflect objectives to minimise the environmental impact of waste and promote recycling.

Appendix B

Assessment tables

Note: The policies set out in this section have been taken directly from the policy action tables in the draft Energy Strategy and Just Transition Plan.

Delivering a Just Transition for communities and regions across Scotland

People have access to affordable clean energy

- We have doubled our Fuel Insecurity Fund this year to £20 million, helping households who are at risk of severely rationing their energy use or self-disconnecting entirely.
- We will boost the Home Energy Scotland (HES) advice service and have widened the eligibility criteria of the Warmer Homes Scotland fuel poverty programme.
- We continue to call on the UK Government to take stronger and more targeted action:
  - A windfall tax should apply fairly to all companies benefiting from significantly higher profits.
  - Additional support needs to be delivered to support vulnerable energy consumers who are already struggling to pay their bills and heat their homes.
  - More needs to be done to support households across Scotland who rely on alternative fuels to heat their homes.
  - Accelerate the review on identifying 'vulnerable non-domestic customers' and offer all vulnerable SME's guaranteed support past March 2023.
- We also continue to call on the UK Government to ensure continued incentives to support investment in renewable generation as well as enabling consumers, communities and businesses in Scotland to share the benefits of low cost renewable power.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	-	**Minor negative direct effects** are identified in relation to climatic factors as supporting affordable energy reduces price as a driver of reduced GHG emissions, however this is partly balanced by investment in insulation. The negative effects on climatic factors from support for affordable energy costs, are expected in the short term, and the balance of positive effects from and energy efficiency are in the medium to long term.	The action could drive the use of renewable energy sources to help reduce energy costs.
Population and human health	++	Actions on energy costs have **significant positive direct effects** in relation to population and human health. Assisting with winter heating costs, and investment in insulation will result in reduced energy bills and lower running costs of buildings. This will therefore, support Scotland's plan to tackle fuel poverty and reduce the cost of living for the people of Scotland and in particular those who need it the most. These effects are expected to be immediate and in the short term..	Support to energy consumers who are keen to explore net zero or low carbon alternatives to reduce energy bills. The action should relate to the Tackling Fuel Poverty in Scotland Strategy. Encouraging reduced energy use or switching to renewable/green energy.

Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	0	No significant effects are identified in relation to material assets.	
Lifecycle assessment of GHG emissions	These actions reduce the role of price as a driver of lower energy use, although support for energy efficiency measures will help to reduce overall energy demand. The lifecycle assessment determined that overall these actions will have a net negative effect on achieving national greenhouse gas emissions targets, as there is a greater emphasis on financial support for those facing fuel insecurity.		

Communities and places can participate and benefit from the net zero energy transition

- We will work with the renewables industry to explore ways of increasing the amount of shared ownership projects in Scotland.
- We will encourage developers to offer community benefits and shared ownership opportunities as standard on all new renewable energy projects – including repowering and extensions to existing projects.
- We're also working with the Scottish National Investment Bank to assess the pipeline of shared ownership opportunities and the ways in which they could be financed.
- We are providing a tailored package of support to remote and rural off grid communities through CARES (Community and Renewable Energy Scheme), helping them to upgrade their energy systems.
- We will commission a review to assess the current approach, identify examples of best practice for community benefits, and consider how we might further strengthen our approach and maximise the benefits flowing to communities.
- We are currently updating our Good Practice Principles for Community Benefit from Offshore Renewable Energy Developments, and will consult on new draft guidance in early 2023.

- We will engage with UK Government to consider mechanisms for maximising opportunities for community benefit and shared ownership for renewable energy developments.
- We welcome UK Government proposals to consider how local communities can benefit from electricity infrastructure. We will work closely with the UK Government to ensure this policy reflects the diverse needs of industry and community stakeholders across Scotland.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	Supporting communities to upgrade their energy systems and shared ownership of renewables will encourage local engagement and enable communities to benefit from renewable energy generation. Providing support to decarbonise community buildings will help to reduce greenhouse gas emissions by installing renewable technologies, such as heat pumps, and should help reduce energy costs. This will indirectly support a reduction in GHG emissions through a move away from fossil fuels and encourage more consideration and understanding of carbon footprints Therefore, **minor positive direct effects** are identified in relation to climatic factors. These effects are expected to begin in the medium term and continue into the long term.	
Population and human health	++	Supporting communities to upgrade their energy systems and enabling shared ownership will encourage local climate action and public engagement in energy supply. Shared ownership of renewables brings the opportunity for local communities to engage with and benefit from renewable energy generation in their local area. This will allow local communities to better engage in the development process. Additionally, revenues from the renewable energy development will be able to be invested back into the community and support locally important issues. Therefore, **significant positive direct effects** are identified in relation to population and human health. Indirect positive effects are expected in relation to providing support for decarbonising community buildings. This should help lower running costs as communities will have access to reliable renewable energy. These effects are expected to be immediate and in the short term but will continue in the long term as new renewable energy developments come forward.	There should be early education opportunities to understand the renewable energy sector and planning process.
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	

Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+	**Minor positive indirect effects** are identified in relation to material assets as supporting communities and offering opportunities for shared ownership of renewables may allow renewable energy developments to grow faster and make the planning and development process smoother. Additionally, supporting the decarbonisation of community buildings will increase the energy efficiency of a property making it more eco-friendly affecting its value. This will indirectly help grow the renewable energy sector. These effects are expected in the medium term and to continue into the long term.	There is mainly mention of wind energy. Could this be expanded to other types of renewable energy.
Lifecycle assessment of GHG emissions	Indirect reduction in GHG emissions are expected as community engagement in renewable energy will help push forward the continued move over to renewable energy and achieving net zero. This is expected to be slow but gradual in the short term at the early stages of community engagement with decreasing levels of GHG emissions expected to continue into the long term. Additionally, the shared ownership of renewables and providing support for decarbonising community buildings will help Scotland meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Regional and local opportunities

- We will work with Enterprise agencies to help facilitate support to realise the vast regional socio-economic opportunities of the transition.
- We will support six communities through the Carbon Neutral Islands programme to take net zero action locally.
- We will carry out carry out research on the net zero skills gap on islands across Scotland.
- Through our Climate Action Hubs and Climate Action Towns we will provide a vehicle for communities to come together to identify local solutions and build a pipeline of investible projects and opportunities at a regional level.
- We will support local authorities to produce their Local Heat and Energy Efficiency Strategies and Delivery Plans by providing capacity support training in partnership with Zero Waste Scotland.
- We are taking forward research into how to accrue maximum economic benefits to Scotland's households, communities and our economy at regional/local and national levels from Scotland's anticipated surplus low carbon energy.

SEA topic	Score	Justification	Mitigation and enhancement

Climatic factors	+	Regional climate action hubs will provide an opportunity for communities to come together and engage in collective climate action. Two pathfinder Climate Action Hubs, designed and led by community organisations, are delivering support to communities in their area with a wider network of hubs in development. The Carbon Neutral Islands project is a programme for government commitment aimed at supporting islands to become carbon neutral by 2040. The islands included as part of the project are Hoy, Islay, Great Cumbrae, Raasay, Barra and Yell. Overall, publishing a report setting out the steps to help six islands reach carbon neutral will indirectly result in minor reductions in GHG emissions. Increased diversification of the energy mix and energy storage could offer greater system flexibility and efficiencies. Partnership working, raising awareness and encouraging climate action, improving heat and energy efficiency and the carbon neutral island programme, will provide the information and tools for communities to take action against climate change. This can ensure that people and communities consider their carbon footprint. This will indirectly support a reduction in GHG emissions through encouraging more consideration and understanding of carbon footprints and supporting climate resilience and adaptation. Therefore, **minor positive indirect effects** are identified in relation to climatic factors. These effects are expected to begin in the short term and continue into the long term.	
Population and human health	+	**Minor positive direct effects** are identified in relation to population and human health as supporting climate action will allow people to get more involved in local community initiatives, and the carbon neutral islands project will support these communities, who are vulnerable to energy prices and fossil fuel reliance. Additionally, regional climate action hubs will act as an education tool to help understand the impacts of climate change and how to reduce carbon footprints. There will also be opportunities to help people and businesses in their transition to net zero, making it an easier process. Building links between relevant groups will help develop partnerships allowing for better sharing of information. These effects are expected to begin in the short term and continue into the long term.	There should be early education opportunities.
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	

Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+	Supporting climate action and partnership working could help support community projects. Regional climate hubs and the carbon neutral islands project may also offer the opportunity for local communities to access renewable energy and get more involved in renewable energy projects. Therefore, **minor positive indirect effects** are identified in relation to material assets. These effects are expected to begin in the short term and continue into the long term. There is the potential for secondary benefits as supporting community projects may help the growth of local and regional economy.	
Lifecycle assessment of GHG emissions	Indirect reduction in GHG emissions are expected as regional climate action hubs and the carbon neutral islands project will help support continued climate change action and encouraging climate resilience. Climate change action will help support Scotland achieving net zero as people and communities better understand their carbon footprint and impact on the environment and climate change. This is expected to be slow but immediate in the short term at the early stages of climate action with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Delivering a Just Transition for Scotland's energy economy

Creating a supportive policy environment and maximising the impact of government expenditure

- We are investing almost £5 billion in the net zero energy economy in Scotland over this parliamentary term.
- Our £75m Energy Transition Fund supports five key transition projects in the North East and our £100m Green Jobs Fund, provides capital across Scotland to support green industries and the green jobs associated with them. Our £500m Just Transition Fund will support the northeast and Moray to become one of Scotland's centres of excellence for the transition to a net zero economy.
- The 2021-22 to 2025-26 Infrastructure Investment Plan (IIP) includes details of around £26 billion of major projects and prioritises enabling the transition to net zero as the first of its three core priorities. It provides a robust pipeline of public sector infrastructure work, with almost £9 billion for environmental sustainability and the net zero transition.

SEA topic	Score	Justification	Mitigation and enhancement

Climatic factors	++	**Significant positive direct effects** are identified as infrastructure investment and diversification of the oil, gas and energy sectors and investing in decommissioning will help lower GHG emissions and support the growth of the renewable energy sector. These effects are expected to begin in the medium term and continue into the long term.	
Population and human health	+	Infrastructure investment and diversification of the oil, gas and energy sectors and investing in decommissioning will directly support the renewable energy sector offering a variety of green energy to consumers and offer new employment opportunities and potentially options to reskill. Therefore, **minor positive direct effects** are identified in relation to population and human health. These effects are expected to begin in the medium term and continue into the long term.	
Air	+	**Minor positive indirect effects** are identified in relation to air as investing in the renewable energy sector will result in lower GHG emissions improving air quality. These effects are expected to begin in the medium term and continue into the long term.	
Soils and geology	-	**Minor negative direct effects** are expected in relation to soils and geology as coastal infrastructure projects have the potential to disturb sea beds. These effects are expected to begin in the medium term and continue into the long term.	
Water	-	Coastal infrastructure projects have the potential to affect aquatic environments through changes in water quality, costal hydrology and contamination. Therefore, **minor negative direct effects** are identified in relation to water. These effects are expected to begin in the medium term and continue into the long term.	
Biodiversity, flora and fauna	-	Coastal infrastructure projects have the potential to negatively affect aquatic species and habitats through changes in water quality, coastal hydrology and contamination. Therefore, **minor negative direct effects** are identified in relation to biodiversity, flora and fauna. These effects are expected to begin in the medium term and continue into the long term.	
Cultural heritage and historic environment	-	Coastal infrastructure projects have the potential to affect marine cultural heritage, through dredging and construction works. Therefore **minor negative direct effects** are identified in relation to cultural heritage and the historic environment and are expected in the medium to long term.	
Landscape	-	**Minor negative direct effects** are identified in relation to landscape as coastal infrastructure projects have the potential to negatively impact the visual aspect of the landscape and result in loss or	

		degradation to the environment. These effects are expected to begin in the medium term and continue into the long term.	
Material assets	+	Investing in infrastructure and offering funding for net zero transition will support and help grow the renewable energy and low carbon sector. Growing the renewable energy sector could indirectly support growth in the local or regional economy, and decommissioning undertaken in line with the principles of the circular economy reduces resource use. Therefore, **minor positive direct effects** are identified in relation to material assets. These effects are expected in the medium term and to continue into the long term.	Opportunities to prioritise use of existing infrastructure on and offshore which can be refurbished. The reuse of materials in construction and use of low carbon construction materials should be prioritised. Upon decommissioning, waste materials should be reused or recycled. Potential to align decarbonizing with placemaking.
Lifecycle assessment of GHG emissions	Indirect reduction in GHG emissions are expected as investment in the renewable energy sector, diversification of the oil, gas and energy sectors and investment in infrastructure will help push forward the continued move to renewable energy and achieving net zero. This investment will help Scotland meet the national GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Attracting private investment

- As part of our route map to a net zero energy system, we will develop an investment prospectus to support critical milestones. We will develop this in consultation with key stakeholders, including financial institutions, trade bodies and business, ahead of the finalised Strategy and Plan
- We will work with our enterprise agencies, business and investors to attract the required capital and inward investment to deliver Scotland's net zero ambition and export potential.
- We have established the Green Heat Finance Task Force, working with partners to develop the additional financial products and services needed to unlock the heat in buildings transformation.
- We will expand our Green Investment Portfolio to bring together market-ready projects worth £3 billion in 2022.
- We will work with stakeholders including the Scottish National Investment Bank to ensure infrastructure investment is aligned to Scottish Government energy policy priorities and leverages private capital to help tackle climate change and support local economic growth.

- In line with our National Strategy for Economic Transformation, an Investor Panel chaired by the First Minister has been established to bring market intelligence to Scotland's capital investment opportunities and will attract a pipeline of projects in Scotland that support our transition to net zero. The Panel met for the first time in Dec 2022.
- We will publish an updated Climate Emergency Skills Action Plan (CESAP) in 2023.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	Attracting private investment in energy infrastructure and the Scottish supply chain will indirectly support a reduction in GHG emissions through a move away from fossil fuels. **Minor positive indirect effects** are identified in relation to climatic factors. These effects are expected to begin in the short term and continue into the long term.	
Population and human health	+	Attracting private investment to support green infrastructure will directly support the renewable energy sector and enhancing green infrastructure. Additionally attracting private investment could indirectly lead to the creation of employment opportunities within renewable energy sector. Therefore, **minor positive direct and indirect effects** are identified in relation to population and human health. These effects are expected to be in the short term to long term as investment continues.	
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	++	Attracting private investment will help boost the renewable energy sector and offer opportunities for enhancement in green infrastructure. This will add a valuable asset to Scotland. Therefore, **significant positive direct effects** are identified in relation to material assets. These effects are expected in the medium term and to continue into the long term.	Opportunities to prioritise use of existing infrastructure on and offshore which can be refurbished. Potential to align decarbonising with placemaking.

Lifecycle assessment of GHG emissions	Indirect reductions in GHG emissions are expected as attracting private investment to support green investment will help push forward the continued move to renewable energy and achieving net zero. This is expected to be slow but immediate in the short term at the early stages of investment with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.

Developing a multi-skilled green workforce, boosting jobs, our domestic supply chain and manufacturing capabilities

- We are supporting reskilling of oil and gas workers through funding an offshore skills passport through our Just Transition Fund.
- To inform the updated CESAP, we are undertaking research on skills needs for hydrogen, heat in buildings and on Scotland's islands.
- We have committed £100,000 in grant funding to support just transition capacity within the trade union movement.
- We are making a £75 million investment in the National Manufacturing Institute Scotland (NMIS).
- We are expanding our Supply Chain Development Programme to improve the capacity, capability and development of Scottish supply chains.
- We are developing our understanding of Scotland's existing strengths in net zero goods and services and the renewables sectors, looking at opportunities for internationalisation.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Funding for skills within the renewable energy sector and investing in more efficient manufacturing will support Scotland's transition to net zero leading to a reduction in greenhouse gas emissions. Investing in Scotland's supply chain and increasing manufacturing ability for renewable energy will support increased uptake of renewable energy. The increased uptake of renewables will decrease reliance on fossil fuels reducing GHG emissions. There is the potential for long-term increases in domestic transport emissions associated with material and components and energy use for manufacturing processes and generation of waste which could lead to overall increases in GHG emissions. However, these activities are supporting future renewable energy development. The balance of GHG emissions from domestic manufacturing compared to importing fully fabricated products is unknown. Overall, **significant positive indirect effects** are identified in relation to climatic factors. These effects are expected to be within the medium term.	There could be emphasis on jobs and skills development within the renewable energy sector.
Population and human health	++	Boosting Scottish supply chains and increasing manufacturing ability offers the opportunity to potentially drive further investment, innovation, productivity and inclusive growth. Offering funding for skills development will offer new employment opportunities within the energy sector for the people of	Primarily energy jobs have been concentrated in Aberdeenshire. New opportunities for energy related jobs

		Scotland. This could include the regeneration of areas and offer wider social and health benefits by providing opportunities for people to change career, get back into work or receive promotion. There will also be opportunities for reskilling from traditional oil and gas jobs to green job opportunities supporting people who will be affected by the downturn in the oil and gas industry. The growth of the hydrogen sector offers significant opportunities for regional and local economic growth, creating new high-quality green jobs in rural communities, islands and cities, and new opportunities for reskilling. The transition to low and zero-emission vehicles also has the potential to create green jobs and economic opportunities in Scotland. Employment supports health and wellbeing and quality of life; therefore, **significant positive direct effects** are identified in relation to population and human health. These effects are expected to be within the short term.	will be available in many locations across Scotland to improve accessibility of energy jobs.
Air	+	**Minor positive indirect effects** are identified in relation to air as reductions in GHG emissions associated with investing in Scottish supply chain for renewable energy and renewable energy manufacturing processes will improve air quality through the increase in renewable energy provision. However, local manufacturing could have minor negative impacts on local air quality, although these impacts would be controlled by the existing regulatory regime. Improvements in air quality are expected overall in the longer term as the supply chain supporting renewable energy is developed.	
Soils and geology	?	There are **uncertain effects** on soils and geology. It is unclear if boosting supply chain development will lead to new development, or if it will take place on existing manufacturing or brownfield sites.	
Water	-	Investing in Scottish supply chain and manufacturing processes for renewable energy could increase the demand for water potentially having a negative impact on the water environment. Therefore, **minor negative indirect effects** are identified in relation to water. These effects are likely to occur in the short term, and continue into the longer term, as further renewable energy generation takes place.	
Biodiversity, flora and fauna	?	There are **uncertain effects** in relation to biodiversity, flora and fauna. It is unclear if boosting supply chain development will lead to new development, or if it will take place on existing manufacturing or brownfield sites.	
Cultural heritage and historic environment	?	**Uncertain effects** are identified in relation to cultural heritage and historic environment. It is unclear if boosting supply chain development will lead to new development, or if it will take place on existing manufacturing or brownfield sites.	
Landscape	?	**Uncertain effects** are identified in relation to landscape as increasing the manufacturing ability and boosting supply chains could in principle give rise to localised negative effects on landscape and	

		seascape from development, both of manufacturing facilities and the resulting renewables. More significant effects could occur in more sensitive landscapes. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Material assets	+/-	Mixed minor direct and indirect effects are identified in relation to material assets. **Minor positive direct effects** are expected as boosting supply chains and increasing our manufacturing ability will help increase production and installation of renewable energy developments, increasing renewables infrastructure overall. Additionally, supporting more efficient manufacturing reduces resource use, and offering funding for skills development may help boost the renewable energy sector. However, **minor negative direct effects** are expected due to the use of raw materials in infrastructure construction and the creation of storage facilities, and the generation of waste. These effects are expected in the medium term. There are potential minor positive secondary effects as increasing the manufacturing process may offer opportunities to innovate the manufacturing process making it more efficient and reducing resource and energy use.	There could be reference to remanufacturing as it could reduce pressure on resources. Remanufacturing can also reduce pressure on resources compared to manufacturing from new. Advanced manufacturing could be considered as it would enable shorter and more localised supply chains. Opportunities to prioritise use of existing infrastructure on and offshore which can be refurbished. The reuse of materials in construction and use of low carbon construction materials should be prioritised and waste materials reused or recycled.
Lifecycle assessment of GHG emissions	The use of raw materials will be required in infrastructure works and development. However, the resulting infrastructure will reduce reliance on fossil fuels through encouraging the use of renewable energy and lower greenhouse gas emissions in the long term following construction. Indirect GHG emissions reduction as increasing the number of green jobs will help expand the renewable energy sector and encourage the move away from fossil fuels. Depending on the rate at which these changes are implemented and the carbon footprint of materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. In the long term, it is likely that renewable energy could be used to power any manufacturing facilities. There is significant uncertainty over the carbon footprint of the materials involved, the scale of development enabled and the payback period from implementing the changes.		

The net zero energy system is continuously innovative and competitive in domestic and international markets

- We will continue to improve our understanding of Scotland's renewable sectors' trade and investment needs and opportunities in order to set those out in the final Strategy and Plan, and are seeking views through this consultation.
- We will publish our Renewables Export Plan in early 2023, to grow exports of renewable energy goods and services. .
- We will implement our Hydrogen Action Plan which was published in December 2022.
- We will continue to urge the UK Government to create a frictionless trading environment for renewable energy, goods and services by using trade agreements and policies to address tariff and non-tariff barriers to trade.
- We are calling on the UK Government to take the action necessary at a UK-level to facilitate the smooth international trade of hydrogen, in line with Scottish export ambitions.
- We have funded an industry led study into the regulatory, infrastructure and economic requirements and benefits to establishing a CO_2 shipping industry centred on Peterhead port.
- We urge the UK Government to seek the development of a common international standard on CO_2 storage that focuses on storing emissions from essential industries.
- We will publish our Innovation Strategy which highlights energy and low carbon as a key priority, in early 2023.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	**Minor positive direct effects** are identified in relation to climatic factors as supporting trade and investment needs and opportunities will support the development of renewable energy within Scotland and overseas. The publication of the Renewables Export Plan and Hydrogen Action Plan and the enhancement to the trading environment will support the transition to a low carbon economy through supporting development of renewables and the use of hydrogen energy. Considering the potential regulatory, infrastructure and economic requirements of a CO2 emissions industry centred on Peterhead port will indirectly support future carbon capture and storage. The Innovation Strategy will support research and development and the roll out of technologies at scale where models are not yet commercial. This will indirectly help to improve roll out of low carbon options, reducing GHG emissions. The impacts of climate change on coastal assets due to sea level rise and coastal erosion is also a consideration. These effects are expected to start in the medium term with long term reductions in GHG emissions.	Ensure that where possible transport is decarbonised to reduce overall emissions associated with trade
Population and human health	+	**Minor positive indirect effects** for population and human health may arise from employment opportunities, with associated benefits for physical and mental health. The package of innovative	

		measures is likely to enhance Scotland's energy system which will have benefits for homes and businesses in terms of improved energy efficiency and a more reliable energy network. These effects are expected to start in the medium term with continued long-term effects.	
Air	+	**Minor positive direct effects** are identified in relation to air as these actions support a reduction in GHG emissions which will improve air quality.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+/-	**Mixed effects** are identified in relation to material assets. Minor positive indirect effects are identified through the investment and growth in the renewable energy sector which will support growth in Scotland's national and local economies. However, infrastructure may be required to support a growth in Scotland renewable energy sector, in particular to allow the export of renewable energy. This may require the use of raw materials and the production of waste to develop the needed infrastructure. Therefore, minor negative direct effects are identified. These effects are expected to start in the medium term with continued long term effects.	
Lifecycle assessment of GHG emissions	Depending on the infrastructure required and the nature of the trade and inward investment and considering both direct and indirect effects, there will likely be an overall net positive impact on achieving national greenhouse gas emissions reduction targets.		

Energy supply

Scale up renewable energy

Offshore wind[282] [283]

- We have set out an ambition to have 8-11GW of installed offshore wind capacity by 2030 and are consulting on setting a further offshore deployment ambition.
- We will continue to call on the UK Government to devolve the powers necessary to enable us to deliver our ambitions on offshore wind.
- We are currently updating our Good Practice Principles for Community Benefit from Offshore Renewable Energy Developments, and will consult on new draft guidance in 2023.
- We will revise Scotland's National Marine Plan (2015) following the outcome of the earlier (2021) review. This new NMP this will update our planning framework and help to facilitate sustainable delivery of offshore renewable energy.
- We will use the Sectoral Marine Plan (SMP) Iterative Plan Review to consider and assess new information relating to ScotWind and Innovation and Targeted Oil and Gas Decarbonisation (INTOG), providing an up-to-date evidence base to assist consenting and future planning.
- We will deliver up-to-date critical research through the Scottish Marine Energy Research (ScotMER) program to address key consenting and planning risks with increased funding for projects over the next five years.

Score	Justification	Mitigation and enhancement
++	Significant additional offshore wind energy capacity by 2030 will make a significant contribution to reducing GHG emissions. The SMP Iterative Plan review and the Scottish Marine Energy Research programme will support future consenting and planning, enabling the future development of renewable energy and reducing emissions. Potential negative effects include impacts on blue carbon sources and emissions from construction vessels and vehicles. The impacts of climate change on coastal infrastructure, including sea level rise and coastal erosion are also a consideration. However further research will be delivered to address key	Resilience against climate change effects to be considered at project level. Project level consideration to avoid areas of sensitive marine carbon.[284]

[282] Assessment informed by the SEA of Sectoral Marine Plan for Offshore Wind Energy SEA Environmental Report (2019) https://mst.dk/media/188824/sea-sectoral-marine-plan-offshore-wind-energy-strategic-environmental-assessment-environmental-report.pdf. The SEA identifies mitigation for potential significant effects identified. Project level mitigations include consultation with local stakeholders, spatial planning, use of Statutory National Conservation Body (SNCB) piling/construction protocols, noise abatement measures, radar and survey studies to identify areas of risk, adherence to pollution, marine archaeology and biosecurity management plans, hydrodynamic and sediment studies. Plan level mitigation measures include limiting the scale of development under the plan, placing requirements on developments for spatial planning and EIA, implementation of temporal delay to development where sufficient data is currently unavailable, collaboration between organisations to improve baseline and impact assessment knowledge and to implement national environmental enhancement schemes and management of project sequencing.

[283] Assessment informed by environmental effects identified in the Sectoral Marine Plan for Offshore Wind for Innovation and Targeted Oil and Gas Decarbonisation (INTOG) SEA Screening and Scoping Report September 2022

[284] Mitigation and enhancement informed by the Sectoral Marine Plan for Offshore Wind Post Adoption Statement (October 2020) https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

	consenting and planning risks. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to be in the short to long term depending on the speed of offshore wind development.	To be considered throughout the project EIA and HRA development process.[285]
+/-	The delivery of more wind energy could reduce customer exposure to volatile energy markets. This could help relieve fuel poverty levels. Updating the Good Practice Principles will allow communities to benefit from offshore wind developments, whether through shared ownership or financial incentives. Energy development in near shore areas could have adverse impacts on population and human health as a result of underwater noise, shadow flicker (if near shore), visual effects and impacts on navigational safety during the lifecycle of the project from surveys to decommissioning. However further research will be delivered to address key consenting and planning risks. Therefore, mixed **minor positive and minor negative direct effects** are identified in relation to population and human health. These effects are expected to be in the short to long term depending on the speed of offshore wind development.	Avoiding areas of key effect, planning of cable routes to avoid key areas through project level assessment and consultation processes. Planning to avoid impacts on navigational safety to be taken into account in array design. Pollution management plans should be considered during project planning and assessment for all stages of project development.[286]
+	**Minor positive direct effects** are expected in relation to air as reducing GHG emissions and reliance on fossil fuels will improve air quality. These effects are expected to be in the short to long term depending on the speed of offshore wind development.	
-	There is the potential for changes in sediment dynamics, tidal flows and fluxes and waves and impacts on deposition and abrasion during installation and operation of wind turbines and offshore transmission network which could result in **minor direct negative effects in relation to soil and geology.** These effects are likely to be temporary related to the construction phase of development. However further research will be delivered to address key consenting and planning risks.	Project level hydrodynamic and sediment modelling where required. Planning of cable routes to avoid geodiversity sites.[287]
-	The installation of wind turbines and transmission network offshore has the potential to negatively impact the coastal and marine environment including marine species. This includes increased turbidity, seabed disturbance and contamination from installation, maintenance and decommissioning equipment and vessels and dredging. Therefore, **minor negative direct effects** are	Project level pollution management plans.

[285] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf
[286] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf
[287] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

	identified in relation to water. These effects are expected to be in the short to long term depending on the speed of offshore wind development.	Spatial planning to avoid areas of high effect.[288]
--	**Significant negative direct effects** are identified in relation to biodiversity, flora and fauna as the installation and operation of wind turbines and offshore transmission network could cause the following effects: • habitat loss, both temporary and permanent, but also introduce new structures which may create habitat • Introduction of invasive non-native species • noise impacts during surveys, clearance of unexploded ordnance, installation and decommissioning • impacts from induced electromagnetic fields from operational cables • indirect positive effects from a reduction in commercial fishing in the vicinity of wind turbines • collision risk with structures from mammals and birds, and displacement of seabirds • cause collision and displacement impacts on seabirds. These effects are expected to be in the short to long term depending on the speed of wind developments and installation of wind turbines. However further research will be delivered to address key consenting and planning risks.	Mitigation includes careful site and route selection and implementation of appropriate mitigation. Project level assessment and mitigation as proposed by the SMP for OWE should be considered through the project EIA and HRA development process. Biosecurity management plans should be considered during project planning and assessment for all stages of project development.[289]
-	There is potential for installation, operation and decommissioning to affect known historic sites and their exclusion zones, including protected sites (e.g. World Heritage (WHS) sites), coastal listed buildings such as lighthouses, scheduled monuments and other unknown, submerged or non-designated archaeological assets features or paleo-landscapes and the potential for the offshore transmission infrastructure to cause loss of or damage to known or unknown buried heritage from construction and maintenance/repair activities. Therefore, **minor negative direct effects** are identified in relation to cultural heritage and historic environment. However further research will be delivered to address key consenting and planning risks.	Surveys to identify areas of potential significance, application of a Marine Archaeology Reporting Plan. Avoidance of any sensitive heritage assets through appropriate cable route selection. To be considered through the project EIA development process.[290]

[288] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

[289] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

[290] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

--	There is the potential for turbines and their supporting infrastructure (i.e., additional platforms, construction, maintenance or decommissioning vessels and equipment) associated with any of the offshore wind technologies, to adversely affect sensitive landscape and visual receptors such as designated or valued landscapes/seascapes, depending on the location of new developments. Therefore, **significant negative direct effects** are identified. These effects are expected to be in the short to long term depending on the speed of offshore wind development.	Spatial planning to avoid areas closest to land, or selection of smaller turbines closer to land. Mitigation to be considered through the project EIA.
++/-	**Mixed effects** are identified in relation to material assets as materials are required to create wind turbines and transmission network. **Significant positive direct effects** on material assets are identified as a result of installation of wind turbines which will allow for the further generation of renewable energy reducing reliance on fossil fuels. Additionally, offshore wind energy will support the enhancement of existing ports and harbors. Enhancing the supply chains and legislating on electricity generating consents will help boost investment within the offshore wind energy and the wider renewable energy sector. **Minor negative direct effects** will arise from the resources required to implement wind energy. Additionally, materials will be required in the long term maintenance of wind turbines and potential increase in waste when the wind turbine is no longer useable. These effects are expected to be in the short to long term depending on the speed of wind developments and installation of wind turbines.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.[291]
Direct GHG emissions will arise from the production, transport and installation of materials required for wind turbines and transmission networks. These infrastructure changes will result in increased production and use of renewable energy, contributing to reduced emissions overall in the following years. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes. However, overall offshore wind is likely to have a significant positive effect in reducing Scotland's GHG emissions.		

Onshore wind

- We will take action to deliver an additional 12 GW of installed onshore wind by 2030, as set out in our Onshore Wind Policy Statement, published in December 2022. This will take us to a total of 20GW.
- We will work with industry to deliver an Onshore Wind Sector Deal in 2023 to ensure we maximise deployment and the economic opportunities that flow from it.
- We will ensure that the community energy sector is represented on the forthcoming onshore wind strategic leadership group.

[291] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Post Adoption Statement [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-post-adoption-statement/documents/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy-2020-post-adoption-statement.pdf

■ We will convene an expert group, including representatives from industry, agencies and academia. This will provide advice to the Scottish Government on how guidance could be developed to support both our peatland and onshore wind aims		
Score	**Justification**	**Mitigation and enhancement**
++	Scotland currently has 8.78 GW of installed onshore wind, with 11.2 GW of onshore wind currently in the pipeline, spread over 217 different projects. Scotland has an ambition for an additional 8-12 GW of onshore wind to be installed. Supporting the development of onshore wind turbines will encourage the use of renewable energy and reduce the reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale. Development on carbon rich soils can impact on carbon emissions and the draft ESJTP recognises the need to review the use of the carbon calculator and improve tools and guidance on the impact of development proposals on peatlands and carbon rich soils. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to be in the short to long term depending on the rate of onshore wind development.	Valued soils should be protected and disturbance to soils from development should be minimised.
+	The installation of wind turbines and generation of wind energy could reduce customer exposure to volatile energy markets. This could help relieve fuel poverty levels within domestic homes. Additionally, shared ownership can help to promote stronger relationships between local communities and the wind energy sector while benefiting financially from the energy generated. Additionally, representing the community energy sector at the wind strategic leadership group will give communities a voice when it comes to onshore wind. Therefore, **minor positive direct effects** are identified in relation to population and human health. These effects are expected to be in the short to long term depending on the speed of onshore wind development.	
+	**Minor positive direct effects** are expected in relation to air as reducing GHG emissions and reliance on fossil fuels will improve air quality. These effects are expected to be in the short to long term depending on the speed of installation of wind turbines.	
-	**Minor negative direct effects** are identified in relation to soils and geology as soil disturbance is expected during the development of wind farms. These effects are permanent and expected to be in the short to long term depending on the speed of wind energy developments and installation of wind turbines.	Wind turbine development on protected soils and important geological features should be avoided.
0	No significant effects are identified in relation to water.	
-	**Minor negative direct effects** are identified in relation to biodiversity, flora and fauna as the installation of wind turbines could impact on species and their habitats in particular birds. These effects are expected to be in the short to long term depending on the rate of wind developments and installation of wind turbines.	Incorporate actions for biodiversity. Ensure that the installation of wind turbines does not negatively impact

		bird migration areas or protected bird species.
-	**Minor negative direct effects** are identified in relation to cultural heritage and the historic environment both in terms of direct effects from construction and in terms of impacts on setting. These effects are expected in the short term and are permanent.	
--	Policies seeking to encourage the uptake of wind energy may have adverse effects on the wider landscape and countryside, particularly from cumulative effects. In particular, the installation of wind turbines may alter the visual aspect of the wider landscape although the impact will depend on the local context. However cumulative effects from the scale and extent of development means that. **significant negative direct effects** are identified in relation to landscape. These effects are expected to be in the short to long term depending on the rate of wind developments and installation of wind turbines.	Develop or refer to specific design guidance for renewable energy development in relation to areas of high landscape value.
+/-	**Mixed effects** are identified in relation to material assets as materials are required to create wind turbines. Minor positive direct effects on material assets are identified as a result of installation of wind turbines which will allow for the further generation of renewable energy reducing reliance on fossil fuels. Minor negative indirect effects will arise from the resources required to implement wind energy. Additionally, materials will be required in the long term maintenance of wind turbines and potential increase in waste when the wind turbine is no longer useable. These effects are expected to be in the short to long term depending on the speed of wind developments and installation of wind turbines.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.
Direct GHG emissions will arise from the production, transport and installation of materials required for wind turbines. The wind turbines will result in increased production and use of renewable energy, contributing to reduced emissions over the following years. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Wave and tidal

- A draft vision for Marine is set out below, and we are seeking views on this as part of the consultation
  - *Wave and tidal energy has the potential to support the delivery of a secure and low carbon energy system while providing a new industrial opportunity and being part of Scotland's response to the global climate emergency. The predictability and availability of the marine energy resource off Scotland's coastline, together with Scotland's early lead in the technology, provides an opportunity to build on Scotland's maritime heritage and to secure a substantial share of the emerging global market for marine energy.*
- We will support the delivery of the 2021-2025 business plan for Wave Energy Scotland with £18.25 million of investment and work with stakeholders to explore the longer-term needs of the wave energy sector.

Score	Justification	Mitigation and enhancement
++	Marine energy (wave and tidal) is located along the coastline of Orkney and off the coastline of parts of Argyll and Bute. Supporting the development of wave and tidal energy will encourage the use of renewable energy and reduce the reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to be in the short to long term depending on the speed of marine energy developments and installation of infrastructure to support wave and tidal energy generation.	
+	Supporting the development of wave and tidal energy could reduce energy bills by reducing reliance on fossil fuels and volatile energy markets. This could help relieve fuel poverty levels within domestic homes. Therefore, **minor positive indirect effects** are identified in relation to population and human health. These effects are expected to be in the short to long term depending on the speed of marine energy developments and installation of infrastructure to support wave and tidal energy generation.	
+	Supporting the development of wave and tidal energy will lead to **minor positive indirect effects** for air as reducing GHG emissions and reliance on fossil fuels will improve air quality. These effects are expected to be in the short to long term depending on the speed of marine energy developments and installation of infrastructure to support wave and tidal energy generation.	
-	There is the potential for loss and disturbance to the seabed during installation which could result in **minor indirect negative effects**, from development enabled by the actions. These effects are likely to be temporary related to the construction phase of development and to occur in the longer term, due to the need for further research and development.	
-	Supporting the development of wave and tidal energy will potentially negatively impact the coastal and marine environment including water. Therefore, **minor negative indirect effect** are identified in relation to water. These effects are expected to be in the short to long term depending on the rate of marine energy developments and installation of infrastructure to support wave and tidal energy generation.	Project sites in locations around St Fergus, Peterhead and the Firth of Forth have the potential to result in impacts such as loss of functionally-linked habitat and disturbance of qualifying species on European Sites. Offshore works in the Firth of Forth also have the potential to effectively act as a barrier (due to disturbance) to migratory Atlantic salmon and/or lamprey species of the upstream River Teith SAC.

-	Supporting the development of wave and tidal energy will result in **minor negative indirect effects** as the installation and running of wave and tidal energy generation infrastructure could impact on species and their habitats in particular seabirds and marine species. These effects are expected to be in the short to long term depending on the rate of wind developments and installation of wind turbines.	Incorporate actions for biodiversity. Ensure that the installation of wind turbines does not negatively impact bird migration areas or protected bird species. Protected and important marine environments should be avoided for wind turbines.
-	Supporting the development of wave and tidal energy has potential for long term negative impacts on both known and unknown, as well as designated and undesignated offshore archaeology and protections sites, including historic wrecks. Therefore, **minor negative indirect effects** are identified in relation to cultural heritage and historic environment.	Possible adverse impacts should be explored as individual projects and the detail of proposed works, becomes clearer. Adverse effects can be avoided through appropriate sitting of infrastructure.
-	Supporting the development of wave and tidal energy has potential for impacts on seascape and coastal landscapes, depending on the location of new developments, and **minor negative indirect effects** are identified.	
+/-	Supporting the development of wave and tidal energy will have **mixed effects** as materials are required to create wave and tidal infrastructure. **Minor positive indirect effects** on material assets are identified as a result of installation of wave and tidal energy infrastructure which will allow for the further generation of renewable energy reducing reliance on fossil fuels. Minor negative indirect effects will arise from the resources required to implement wave and tidal energy. Additionally, materials will be required in the maintenance of marine and wave tidal equipment and there will be a potential increase in waste from wave and tidal equipment. These effects are expected to be in the short to long term depending on the speed of marine energy developments and installation of infrastructure to support wave and tidal energy generation.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.
Direct GHG emissions will arise from the production, transport and installation of materials required for wave and tidal energy generation. These infrastructure changes will result in increased production and use of renewable energy, contributing to reduced emissions overall in the following years. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Solar

- We are setting out a draft vision for Solar and are seeking views on this, and options for setting a solar deployment ambition, as part of the Strategy and Plan consultation process:

  Solar has an important role to play, as part of a diverse energy mix, in Scotland's decarbonisation journey. Our aim is to maximise the contribution solar can make to a just, inclusive, transition to net zero. We will support the sector to minimise barriers to deployment wherever possible and continue to provide support through our schemes such as Community and Renewable Energy Scheme and Home Energy Scotland.

- Through the solar vision we are setting out action to reduce barriers to enable and encourage greater solar deployment.
- We are keen to see the number of solar installations offering community benefits increase and continue to encourage the sector to consider what packages of community benefit it can offer communities local to developments, in line with our Good Practice Principles.

Score	Justification	Mitigation and enhancement
++	Solar capacity has increased rapidly in the first half of this decade. Solar energy generation ranges largely in scale across Scotland. The intention is to increase current capacity. Supporting the development of solar panels will encourage the use of renewable energy and reduce the reliance on fossil fuels. This will reduce GHG emissions from energy use. However, the extent of benefits will be dependent on factors such as scale. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to be in the short to long term depending on the extent to which the actions enable solar developments and rate of installation of PV panels.	The installation of storage will allow any unused solar energy to be stored and used in times of low light.
+	The installation of solar panels on domestic and commercial properties could reduce energy bills by reducing reliance on fossil fuels and volatile energy prices. This could help relieve fuel poverty levels within domestic homes. Therefore, **minor positive direct effects** are identified in relation to population and human health. These effects are expected to be in the short to long term depending on the rate of solar developments and installation of PV panels.	
+	**Minor positive direct effects** are expected in relation to air as reducing GHG emissions and reliance on fossil fuels will improve air quality. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	
-	**Minor negative direct effects** are identified in relation to soils and geology as land take up is expected when there is development of a solar farm. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	Solar farms on protected soils and important geological features should be resisted. Valued soils should be protected and disturbance to soils

		from development should be minimised.
0	No significant effects are identified in relation to water.	
-	**Minor negative direct effects** are identified in relation to biodiversity, flora and fauna as building and roofing works for the installation of solar panels could impact on certain species, such as bats. Although bats are a European protected species and cannot be disturbed at certain times within the year, a loss of suitable nesting sites would have a detrimental effect. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	Incorporate actions for biodiversity such as nest space provision.
-	**Minor negative direct effects** are identified in relation to cultural heritage and the historic environment as the retrofitting of buildings to include solar panels may alter the setting of heritage assets or change the appearance or fabric of a historic asset. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to cultural heritage and the historic environment.
-	Policies seeking to encourage the uptake of solar energy may have adverse effects on landscape character. In particular, the retrofitting of buildings to include new technologies such as solar panels and siting of new development may alter the character of the landscape. Therefore, **minor negative direct effects** are identified in relation to landscape. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to areas of high landscape value.
+/-	**Mixed effects** are identified in relation to material assets as raw materials are required to create solar panels. **Minor positive direct effects** on material assets are identified as a result of installation of solar panels which will add value to the property and make it more sustainable and eco-friendly. The development of solar renewable energy generation also increases the resilience of the energy system. **Minor negative indirect effects** will arise from the resources required to implement solar panels. Additionally, materials will be required in the maintenance of solar equipment and there will be a potential increase in waste generated from this equipment. These effects are expected to be in the short to long term depending on the speed of solar developments and installation of PV panels.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.
Direct GHG emissions will arise from the production, transport and installation of materials required for solar panels. These infrastructure changes will result in increased production and use of renewable energy, contributing to reduced emissions overall in the following years. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Hydro[292]

▪ We will continue to urge the UK Government to provide appropriate market mechanisms for hydro power to ensure the full potential of this sector is realised.			
SEA topic	**Score**	**Justification**	**Mitigation and enhancement**
Climatic factors	++	**Significant positive direct effects** are identified as the development of further pumped hydro storage will have significant positive effects on greenhouse gas emissions, facilitating reduced reliance on fossil fuels and increased energy storage capacity. Energy storage can also offer greater system flexibility and efficiencies, helping to manage fluctuations in energy demand, including managing the intermittency of energy generation from other renewable technologies, supporting adaptation to the impacts of climate change.	
Population and human health	-	Potential **minor negative direct effects** that could arise from pumped hydro storage from construction and operation in the short term, such as noise and vibration, are likely to require consideration at project level with the scale of effects likely to depend on factors such as proximately of nearby populations. Negative implications may also arise for recreational users. Possible long term benefits could arise from reduced risk of disruption and increased diversity and resilience as pumped hydro can offer greater energy system flexibility and efficiencies, helping to manage fluctuations in energy demand, including managing the intermittency of energy generation from other renewable technologies. Greater storage of energy can also allow consumers to use energy differently and where this leads to energy efficiency, support reducing fuel poverty and wider poverty. Further possible benefits could arise from employment opportunities for local communities.	
Air	+	Construction and operation of pumped hydro storage can lead to short term negative impacts, including noise, vibration and dust, including from increased transports movements, which can in turn effect human health and biodiversity. **Minor indirect positive effects** could arise for air quality through support for the decarbonisation of the energy sector in the long term.	
Soils and geology	-	**Minor negative direct effects** are identified from permanent loss of soil during reservoir construction and site development, including associated infrastructure requirements. Extensive areas of land could be required where new reservoirs are created. The significance of this would be dependent on the	Where development includes areas of peatland and carbon-rich soils,

[292] Informed by Scottish Government (2021) Appendix D - Proposed National Developments [PDF] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/impact-assessment/2021/11/scotland-2045-scotlands-fourth-national-planning-framework-draft-integrated-impact-assessment-environmental-report/documents/appendix-d-proposed-national-developments/appendix-d-proposed-national-developments/govscot%3Adocument/appendix-d-proposed-national-developments.pdf

		scale of works proposed. There is the potential for further negative impacts to arise through sediment transportation. Construction of new underground caverns to accommodate plant tunnels and pipes could have significant impacts on geology.	mitigation will be required to ensure reuse and restoration where possible.
Water	-	**Minor negative direct effects** are identified from construction of large storage or pumped storage hydropower which can lead to blocking, diverting and changes to the natural course of river systems. Negative impacts could include effects on water quality and quantity, morphological changes to standing and running waters. Potential adverse impacts could also arise due to sediment transportation, including potential for increased turbidity. Significance of potential effects will be influenced by factors such as location and the scale of works proposed in combination with existing activity, and are likely to require further consideration.	
Biodiversity, flora and fauna	--	Pumped hydro storage projects have potential for **significant negative direct effects** on biodiversity from loss of habitat and disturbance to species. Indirect effects can arise through to changes in lighting or noise. Both terrestrial and freshwater habitats and species can be affected by pumped hydro schemes. There is also the potential for pollution impacts on habitats and species.	Further consideration at project level will be required, including through HRA and EIA where relevant.
Cultural heritage and historic environment	-	Pumped hydro storage has potential for **direct and indirect minor negative effects** on the historic environment, including designated and undesignated, features and their settings. Future projects brought forward, where locations are currently unknown are likely to require consideration at project level.	
Landscape	-?	Pumped hydro storage infrastructure has the potential to give rise to significant negative local landscape impacts. Access tracks, pipelines, grid connections and other components could have significant impacts requiring mitigation through appropriate siting and post-construction restoration where possible. Effects during construction could be extensive, but temporary in nature. Operational effects include changes to landscape at a broad scale. The significance of these effects will depend on the character and sensitivity of the landscape within which developments are located, therefore **minor negative but uncertain direct effects** are identified. Projects at existing hydroelectric power plants have the potential to have less significant effects on landscapes.	
Material assets	+	Potential **minor positive direct effects** should arise from pumped hydro storage through supporting diversification and increased resilience within the energy network. Consideration will need to be given at project level to mitigate the potential generation of waste materials that could arise, for example, the	

		excavation of rock, depending on scale of work. Where possible, this should include consideration of re-use.	
Lifecycle assessment of GHG emissions	Depending on the nature of the project taken forward, and considering both direct and indirect effects, it is likely that this development will have a net positive effect due to the facilitation and enabling of renewable energy development across Scotland from the provision of energy storage and rapid capacity during demand peaks. The scale of this effect could range from medium to very high depending on the project details, the location and frequency of use. If the development enables significantly more renewable electricity to be generated, whilst minimising energy associated with construction and decommissioning, and effects on soil carbon, a very high positive effect will be expected. However, if renewable electricity generation provided by the development is lower, and there are more significant amounts of energy and carbon intensive materials used during construction, this positive effect might reduce to medium.		

Bioenergy

- We are reviewing the potential to scale up domestic biomass supply chains, with the support of a Bioenergy Policy Working Group.
- We will develop a strategic framework for the most appropriate use of finite bio-resources, which will be published in a Bioenergy Action Plan.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	The development of a bioenergy action plan will potentially lead to increased use of bioenergy which will reduce reliance on fossil fuels. It should be noted that that GHG emissions per unit of electricity generated from biomass can be lower or higher than those from fossil fuels depending on the type of biomass burnt and where it comes from. If bioenergy is combined with Carbon Capture and Storage (CCS), there is the potential to reduce emissions as this can be considered a negative emission technology due to the carbon sequestration associated with growing energy crops. Furthermore, if biomass is imported from overseas, as indicated in the strategy, there will be emissions associated with the transport of this material and there will be less control over the production methods employed. Assuming that the bioenergy action plan will develop the most efficient use of bioenergy resources, including CCS, secondary **significant positive indirect effects** are predicted despite uncertainties surrounding biomass sources and types. These effects are expected in the short to medium term following the strategy being published.	
Population and human health	-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and there is a risk that biofuel production can cause competition for land use between food production and fuel production, with potential secondary minor negative effects on food. Therefore, **minor negative**	

		indirect effects are identified in relation to population and human health. These effects are expected in the short to medium term following the strategy being published.	
Air	+	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and, if bioenergy with Carbon Capture and Storage is utilized, instead of fossil fuel for energy generation, as will be explored in the action plan, there will be a **minor positive indirect effect** due to the associated increase in air quality from a reduction in fossil fuel combustion. These effects are expected in the short to medium term following the strategy being published.	
Soils and geology	+/-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Depending on the type of crop grown and where, there could be potential **mixed minor positive and minor negative indirect effects** on soil. If bioenergy crops replace annual crops on farmland there may be reduced soil disturbance following establishment of the bioenergy crop. If annual bioenergy crops are produced there may be no change or greater soil disturbance. These effects are expected in the short to medium term following the strategy being published.	
Water	+/-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Depending on the type of crop grown and where, there could be potential **mixed minor positive and minor negative indirect effects** on water, depending on the water demands of the crop grown. These effects are expected in the short to medium term following the strategy being published.	
Biodiversity, flora and fauna	+/-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Depending on the type of crop grown and where, there could be potential **mixed minor positive or and minor negative indirect effects** on biodiversity, flora and fauna as a result of competition with woodland creation and other habitats that may benefit BFF. These effects are expected in the short to medium term following the strategy being published.	
Cultural heritage and historic environment	+/-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Depending on the type of crop grown and where, there could be potential **mixed minor positive or and minor negative indirect effects** on cultural heritage and the historic environment as a result of impacts on the setting of cultural heritage and	

		historic environment features. These effects are expected in the short to medium term following the strategy being published.	
Landscape	+/-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. There is the potential for **mixed minor positive or and minor negative indirect effects** on landscape if they enhance or detract from the landscape qualities. These effects are expected in the short to medium term following the strategy being published.	
Material assets	-	The development of a bioenergy action plan will potentially lead to increased use of bioenergy and increased domestic production of bioenergy crops. Previous SEA work recognises that an increased uptake of biomass could cumulatively raise some challenges regarding material assets (Land Use) such as forestry expansion and agriculture. If expanded considerably, biomass would have a **minor negative indirect effect** on material assets. These effects are expected in the short to medium term following the strategy being published.	
Lifecycle assessment of GHG emissions	Direct GHG emissions reductions are expected as the Bioenergy Action Plan will help reduce reliance on fossil fuels through the increased use of bioenergy. If bioenergy is combined with CCS, this will help the transition to net zero through the use of negative emission technology. The transport and production of bioenergy will have associated emissions. However, the Bioenergy Action Plan will develop the most efficient use of bioenergy resources mitigating any production and transport related emissions. Developing a Bioenergy Action Plan is expected to make a significant contribution to reducing Scotland's GHG emissions and help reach net zero by 2045. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Hydrogen

- We will take forward the actions in our Hydrogen Action Plan[293], including:
  - set out an ambition of 5 GW of renewable and low-carbon hydrogen production by 2030 and 25 GW by 2045.
  - £100 million funding towards the development of our hydrogen economy
- We are taking forward a collaborative project with key stakeholders to streamline consenting procedures and reduce consenting timescales.

[293] The Hydrogen Action Plan (2022) was subject to SEA, which informs this assessment Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/11/draft-hydrogen-action-plan/documents/sea-draft-hydrogen-action-plan-scotland-environmental-report/sea-draft-hydrogen-action-plan-scotland-environmental-report/govscot%3Adocument/sea-draft-hydrogen-action-plan-scotland-environmental-report.pdf

- We will work with key partners to provide targeted support to develop skills programmes and to help people, companies and communities to connect to the opportunities created by the growing hydrogen economy.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Hydrogen is a clean alternative to methane, also known as natural gas. Hydrogen can be produced from a variety of resources, such as natural gas, nuclear power, biogas and renewable power like solar and wind. Scottish Power is developing Scotland's largest renewable hydrogen project at Whitelee Windfarm. The 20 MW green hydrogen production facility will be available in early 2023 with up to 8 tonnes of green hydrogen. Scotland's first Hydrogen Energy Hub will become Operational in Aberdeen in 2023. The creation of regional hydrogen energy hubs by 2030 will be spread across the following areas: Shetland Orkney, Western Isles, Cromarty Firth, Aberdeen & North east, Dundee, Fife, Grangemouth, Ayrshire, Glasgow and Argyll/Islands. The rollout of hydrogen infrastructure and using renewable and low carbon hydrogen would reduce GHG emissions in comparison to the current fossil fuel-based energy sources. Streamlining the consenting procedures will help ensure that the rollout of hydrogen use is faster allowing Scotland to meet climate change targets more quickly. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to occur within the short term to long term as hydrogen production occurs.	
Population and human health	+	**Minor positive indirect effects** are identified in relation to population and human health as a result of increased skills development which supports health and wellbeing.	
Air	-	Current research indicates that burning hydrogen may lead to NOx emissions having negative effects on the overall air quality. Burning hydrogen has similar or lower NOx emissions to those emitted when using methane fuel. However, there is a degree of uncertainty due to the scale of hydrogen production proposed and due to the hydrogen being blended. Therefore, **minor negative direct effects** are identified in relation to air. These effects are expected to occur within the short term to long term as hydrogen production occurs.	

Soils and geology	-	**Minor negative direct effects** are identified in relation to soil as any additional development of facilities for hydrogen production may lead to land take up and soil compaction. These effects are expected to occur within the short term to long term as hydrogen production occurs.	There is the potential to mitigate for the negative effects by selecting brownfield land for necessary developments
Water	--	**Significant negative direct effects** are identified in relation to water as hydrogen production needs substantial quantities of water. In offshore locations, or coastal locations with limited freshwater supply, the desalination process is required, which results in a by-product, a very concentrated brine, which normally is released to the sea having negative effects on the marine ecosystems. It is somewhat saltier than sea water and therefore can cut levels of oxygen in the sea near desalination, having adverse effects on shellfish and other creatures living on the seabed. Additional **significant negative indirect effects** on other species up the food chain are identified. These effects are expected to occur within the short term to long term as hydrogen production occurs. There is a significant amount of uncertainty in relation to water requirements for the low-carbon hydrogen production. Water is required for the reaction but also for cooling purposes. Some literature sources suggest that the water use from either low carbon or renewable hydrogen production may be similar, but slightly higher for renewable hydrogen.	Further research to understand future water availability under climate change, and detailed analysis of the impacts of water abstraction or desalinisation in locations for hydrogen production, including cumulative effects.
Biodiversity, flora and fauna	-	In order to ensure that hydrogen is available in strategic locations, it will be necessary to construct storage facilities across the country making hydrogen available for different uses. This may result in additional land take having permanent negative effects on biodiversity limiting space for habitats and species. Therefore, **minor negative direct effects** are identified in relation to biodiversity, flora and fauna. These effects are expected to occur within the short term to long term as hydrogen production occurs.	Incorporate actions for biodiversity to ensure hydrogen infrastructure has minimal impact.
Cultural heritage and historic environment	-	Hydrogen production plants will require construction new infrastructure which could have negative impacts on heritage assets. This will include impacts on setting and direct impacts on land and marine historic environment features. Therefore, **minor negative direct effects** are identified in relation to cultural heritage and historic environment. These effects are expected to occur within the short term to long term as hydrogen production occurs.	Pre-development planning mechanisms will offer viable mitigation.
Landscape	-	Hydrogen storage as part of infrastructure requirements may negatively impact on landscape setting especially in more remote areas and less developed locations. Therefore, **minor negative direct effects** are identified in relation to landscape. These effects are expected to occur within the short term to long term as hydrogen production occurs.	Pre-development planning mechanisms will offer viable mitigation

Material assets	+/-	**Mixed effects** are identified in relation to material assets. To enable the large-scale production of hydrogen, there is a requirement to develop hydrogen processing infrastructure, hydrogen storage facilities, and facilities for producing fuel cells. This may require the use of raw materials throughout the life of the infrastructure to support hydrogen use and generation of waste as a result of maintaining and disposing of old infrastructure. Therefore, **minor negative direct effects** are identified. Where hydrogen production makes use of existing oil and gas infrastructure, this represents an efficient use of existing resources. The development of hydrogen technologies will have **minor positive direct effects** on material assets by improving the reliability and security of energy supply, as well as the resilience of the energy sector to the predicted pressures from climate change. These effects are expected to occur within the short term to long term as hydrogen production occurs.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.
Lifecycle assessment of GHG emissions	The use of raw materials will be required in the construction and maintenance of hydrogen infrastructure. However, this infrastructure will reduce reliance on fossil fuels and lower greenhouse gas emissions in the long term following construction. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Planning and consenting

- We will place climate and nature at the centre of our planning system in line with the Revised National Planning Framework 4, making clear our support for all forms of renewable, low-carbon and zero emission technologies, including transmission and distribution infrastructure.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	A planning system with climate and nature at the core, which supports all forms of renewable, low carbon and zero emissions technologies will ensure that renewable energy development is approved at a faster rate encouraging the move away from fossil fuels through the generation of increased levels of renewable energy. This will indirectly result in reduced GHG emissions. Therefore, **minor positive indirect effects** are identified in relation to climatic factors. The effects are expected within the short to the long term.	Consideration should be given for the time it takes for renewable energy developments to receive consent.
Population and human health	+	Delivering more renewable energy through a clearer consenting system could improve access to renewable energy. It will also allow local communities to be able to access green energy. Therefore,	

		minor positive indirect effects are identified in relation to population and human health. The effects are expected within the short to the long term.	
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+	**Minor positive indirect effects** are identified in relation to material assets as increasing renewable energy development through improving the consenting system will help grow the renewable energy sector in Scotland. The effects are expected within the short to the long term.	The consenting system should align with planning policy and address waste and the circular economy.
Lifecycle assessment of GHG emissions	Indirect GHG emissions reductions are expected due to an increase in renewable energy generation associated with changes to the consenting system, which provide greater support for renewable, low carbon and zero emissions technologies. Increasing renewable energy generation will help Scotland meet national emissions reduction targets and move towards net zero. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Economic benefits

- In 2023, we will establish a Green Datacentres cluster builder to increase renewable energy adoption by datacentres.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	Datacentres powered by renewable energy and international fibre connections are key parts of the digital and data economy. The Green Datacentres Cluster Builder will support the continued use of renewable energy while ensuring reliable energy from a variety of sources. Additionally, improving energy resilience and reliability can have a secondary benefit of reducing energy demand. Overall, this will reduce GHG	

		emissions associated with energy. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected within the short to medium term.	
Population and human health	+	Green Datacentres cluster builder will support datacentres with access to renewable energy sources. The aim is to improve economic growth from data storage, management and innovation. The development of green datacentres in Scotland will support digital connectivity and employment which support health and wellbeing with **minor positive indirect effects** in relation to population and human health.	
Air	+	**Minor positive indirect effects** are identified in relation to air as reducing GHG emissions from datacentres will result in improvements in air quality. These effects are expected within the short to medium term.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+	**Minor positive indirect effects** are identified in relation material assets as development of Green Datacentres will increase the sustainability of this infrastructure. These effects are expected within the short to medium term.	
Lifecycle assessment of GHG emissions	The development of green Scottish datacentres and renewable energy infrastructure will require materials for construction but the operation will support direct GHG emissions reductions. The Green Data-Centre Cluster Builder will ensure that datacentres make use of a variety of renewable energy sources. This will result in a further move away from fossil fuels and lower energy usage. The Green Datacentres is expected to help Scotland meet its national emissions reduction targets. Depending on the rate at which these changes are implemented, the scale of development and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Economic benefits from exporting energy

■ In 2023, we will establish a Green Datacentres cluster builder to increase renewable energy adoption by datacentres.			
SEA topic	**Score**	**Justification**	**Mitigation and enhancement**
Climatic factors	+	Datacentres powered by renewable energy and international fibre connections are key parts of the digital and data economy. The Green Datacentres Cluster Builder will support the continued use of renewable energy while ensuring reliable energy from a variety of sources. Additionally, improving energy resilience and reliability can have a secondary benefit of reducing energy demand. Overall, this will reduce GHG emissions associated with energy. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected within the short to medium term.	
Population and human health	+	Green Datacentres cluster builder will support datacentres with access to renewable energy sources. The aim is to improve economic growth from data storage, management and innovation. The development of green datacentres in Scotland will support digital connectivity and employment which support health and wellbeing with **minor positive indirect effects** in relation to population and human health.	
Air	+	**Minor positive indirect effects** are identified in relation to air as reducing GHG emissions from datacentres will result in improvements in air quality. These effects are expected within the short to medium term.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	

Material assets	+	**Minor positive indirect effects** are identified in relation material assets as development of Green Datacentres will increase the sustainability of this infrastructure. These effects are expected within the short to medium term.	
Lifecycle assessment of GHG emissions	The development of green Scottish datacentres and renewable energy infrastructure will require materials for construction but the operation will support direct GHG emissions reductions. The Green Data-Centre Cluster Builder will ensure that datacentres make use of a variety of renewable energy sources. This will result in a further move away from fossil fuels and lower energy usage. The Green Datacentres is expected to help Scotland meet its national emissions reduction targets. Depending on the rate at which these changes are implemented, the scale of development and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Reduce our reliance on other energy sources

North sea oil and gas

- We are calling on the UK Government to support the fastest possible just transition for the oil and gas sector.
- We are calling on the UK Government to take forward a more rigorous package of tests than those recently introduced by the UK Government for the 33rd licensing round to align with global climate goals.
- Whilst licensing is reserved to the UK Government, the Scottish Government is consulting on whether, in order to support the fastest possible and most effective just transition, there should be a presumption against new exploration for oil and gas.
- To take action to build a skilled, resilient energy workforce of the future, we are supporting reskilling of oil and gas workers through an offshore skills passport as part of our Just Transition Fund.
- Our £75m Energy Transition Fund supports five key transition projects in the North East and our £100m Green Jobs Fund provides capital across Scotland to support green industries and the green jobs associated with them.
- Our £500m Just Transition Fund will support the North East and Moray to become one of Scotland's centres of excellence for the transition to a net zero economy.
- We will support Scotland to become a decommissioning centre of excellence. We have announced our intention to invest £9 million in the development of an ultra-deep-water port at Dales Voe, Shetland through the Islands Growth Deal to increase the competitiveness of the decommissioning sector in Scotland.
- We urge the UK Government to provide more support directly to the decommissioning sector to ensure as much of this growing area of work as possible is carried out in Scotland, creating and protecting jobs and economic opportunities.

Score	Justification	Mitigation and enhancement

++	Most oil and gas activity in Scottish Waters takes place offshore, beyond 12 nautical miles from the coastline. Most oil and gas fields are located in the North Sea. Oil and gas production is responsible for about 4 per cent of the UK's annual greenhouse gas emissions, the equivalent of 20 million tonnes of carbon dioxide. Scotland produced 1% of global production in 2019, and the resource is declining. The Scottish Government supports investment in renewables and a just transition for the energy sector and for Scottish households and businesses over further fossil fuel extraction. INTOG is a new offshore wind leasing round specifically designed for offshore wind farms that support the decarbonisation of the oil and gas sector, as well as small scale innovation projects of less than 100 MW. INTOG will form an important role in delivering the North Sea Transition Deal's Supply Decarbonisation policy. The oil and gas industry could reduce GHG emissions (11-16% of the 2018 total GHG emissions from upstream oil and gas operations) by sourcing power either from the shore or from offshore renewables. On 17 January 2022, Crown Estate Scotland awarded 17 sites around Scotland for the development of almost 25GW of offshore wind projects (subject to planning and consenting decisions and finding a route to market). In August 2022, three additional projects were awarded lease options through the ScotWind clearing process. This now brings the total current reported potential pipeline of ScotWind projects to 27.6 GW (subject to change), with potential for floating offshore wind at 14 of the 20 sites. A Just Transition for the oil and gas sector will support the move away from using fossil fuels and towards greater reliance on renewable sources. This will result in a decrease in GHG emissions and help Scotland to transition to net zero. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to be in the short to medium term depending on the speed of decommissioning.	Locating INTOG leasing sites relatively close to areas of oil and gas operation makes offshore wind more attractive to oil and gas operators.
++	This policy position will support the re-skilling of oil and gas workers while offering new job opportunities. This will ensure there are minimal job losses from the transition away from oil and gas. It will also help retain the viability of communities that are reliant on oil and gas jobs. Employment brings direct positive effects on physical and mental health and wellbeing. Therefore, **significant positive direct effects** are identified in relation to population and human health. These effects are expected to be in the short to medium term depending on the rate of decommissioning.	
+	**Minor positive direct effects** are expected in relation to air as reducing GHG emissions and reliance on fossil fuels will improve air quality. These effects are expected to be in the short to long term.	
-	**Minor negative direct effects** are expected in relation to soils and geology as development of deep-water ports has the potential to disturb sea beds. Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects. These effects are expected to begin in the medium term and continue into the long term.	

-	Deep water ports have the potential to affect aquatic environments through changes in water quality, costal hydrology and contamination. Therefore, **minor negative direct effects** are identified in relation to water. Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects. These effects are expected to begin in the medium term and continue into the long term.	
-	Deep water ports have the potential to negatively affect aquatic species and habitats through changes in water quality, coastal hydrology and contamination. Therefore, **minor negative direct effects** are identified in relation to biodiversity, flora and fauna. Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects. These effects are expected to begin in the medium term and continue into the long term.	Incorporate actions for biodiversity.
-	Deep water ports have the potential to affect marine cultural heritage, through dredging and construction works. Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects. Therefore **minor negative direct effects** are identified in relation to cultural heritage and the historic environment and are expected in the medium to long term.	Possible adverse impacts should be explored as individual projects and the detail of proposed works, becomes clearer.
-	**Minor negative direct effects** are identified in relation to landscape as deep-water ports have the potential to negatively impact the visual aspect of the landscape and result in loss or degradation to the environment. Additionally, infrastructure may be required as part of a Just Transition resulting in negative effects. These effects are expected to begin in the medium term and continue into the long term.	
+/-	**Mixed effects** are identified in relation to material assets. Investing in infrastructure and a net zero transition will support and help grow the renewable energy and low carbon sector. Growing the renewable energy sector could indirectly support growth in the local or regional economy. Therefore, minor positive direct effects are identified in relation to material assets. However, infrastructure may be required for a Just Transition resulting in the use of raw materials and production of waste. Therefore, minor negative direct effects are identified. These effects are expected in the medium term and to continue into the long term.	Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy and support the use of materials with a low carbon footprint and a faster payback period.
A Just Transition for the oil and gas sector will result in a significant reduction in GHG emissions. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Onshore conventional oil and gas

▪ Ministers confirm a preferred policy position of no support for the exploration or development of onshore conventional oil and gas in Scotland. The relevant statutory and other impact assessments will now be undertaken, and the finalised policy position will be confirmed on conclusion of this process.

Score	Justification	Mitigation and enhancement
0	Conventional oil and gas refers to petroleum, or crude oil, and raw natural gas extracted from the ground by conventional means and methods. The oil and gas industry use a range of techniques to extract oil and gas from underground reserves. Conventional oil and gas reserves can be exploited by drilling a well, with oil or gas then flowing out under its own pressure. There is currently no onshore oil and gas production in Scotland however onshore oil and gas hydrocarbon licenses cover an area south of Wick, and one location in the central belt. No new onshore conventional oil and gas extraction avoids the release of GHG emissions from onshore sources, however the continued extraction of oil and gas forms part of the transition to alternative fuels. This policy position reduces the availability of oil and gas overall, however onshore sources are unlikely to be significant in comparison to the existing licences for offshore oil and gas production. Therefore, a **negligible effect** is identified in relation to climatic factors. These effects are likely to be permanent.	
+	No new onshore conventional oil and gas extraction avoids the population and human health impacts from extraction in areas close to where people live. This includes avoidance of air quality impacts on human health and other adverse impacts in terms of traffic, noise and impacts from development. Therefore, a **minor positive effect** is identified in relation to population and human health. These effects are likely to occur in the short term, and be permanent.	
+	No new onshore conventional oil and gas extraction avoids the air quality impacts on communities close to areas where onshore oil and gas extraction take place, of ozone, VOC emissions and toxins such as benzene, ethylbenzene, and n-hexane. However air quality impacts from offshore oil and gas production will continue. Therefore, a **minor positive effect** is identified in relation to air, due to avoidance of impacts on communities. These effects are likely to occur in the short term and be permanent.	
0	No new onshore conventional oil and gas extraction avoids the negative effects on soils and geology from onshore exploration and extraction of oil and gas. However offshore marine impacts on sediments and geology will continue. Therefore, a **negligible effect** in relation to the baseline is identified in relation to soils and geology. These effects are likely to occur in the short term and be permanent.	
0	Conventional oil and gas operations can place pressures on watercourses through all stages of operation. There is potential for adverse effects due to the risk of release of oil or chemicals to the water environment. No new onshore conventional oil and gas extraction avoids the negative effects on the land-based water environment. However, offshore impacts on the water environment will continue. Therefore, a **negligible** effect is identified in relation to the baseline. These effects are likely to occur in the short term, and be permanent.	

0	Conventional oil and gas operations can place pressures on local biodiversity through all stages of operation. There is the potential for disturbance and damage to species and habitats, and the risk of release of oil or chemicals to the environment. No new onshore conventional oil and gas extraction avoids the negative effects on land-based biodiversity, flora and fauna. However, offshore impacts on biodiversity, flora and fauna will continue. Therefore a **negligible effect** is identified in relation to the baseline These effects are likely to occur in the short term, and be permanent.	
0	Conventional oil and gas operations could place pressure on land based cultural heritage resources. No new onshore conventional oil and gas extraction avoids potential negative effects on these resources. Offshore oil and gas production may also impact on the historic environment as a result of pipelines and associated infrastructure, particularly where it comes onshore. Therefore, a **negligible effect** is identified in relation to the baseline. These effects are likely to occur in the short term, and be permanent.	
0	Conventional oil and gas operations can place pressures on local landscape through all stages of operation from exploration to production. No new onshore oil and gas production avoids potential negative effects on onshore landscape resources. Offshore oil and gas production has lower landscape and seascape impacts due to the typical distances that these are located offshore. Therefore, **negligible effects** are identified from the avoidance of adverse landscape impacts. These effects are likely to occur in the short term, and be permanent	
0	No new onshore conventional oil and gas extraction avoids the extraction and use of oil and gas and required infrastructure. Therefore, **negligible effects** are identified.	The use of sustainable or low carbon materials should be encouraged.
No new onshore conventional oil and gas production is not expected to make significant contributions to reducing GHG emissions and Scotland's national emissions targets, due to the scale of continued production from the offshore industry, and minor contribution that onshore production could make overall.		

Unconventional oil and gas

- Ministers have announced their finalised position of no support for unconventional oil and gas.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	In October 2019, Scottish Ministers announced their finalised position of no support for unconventional oil and gas. The term “unconventional” refers to crude oil and gas that is obtained through methods other than traditional vertical well extraction.	

		Significant positive direct effects from the avoidance of uncontrolled and controlled release of produced gas to the atmosphere, the release of greenhouse gases as a result of site development and the release of greenhouse gases from the processing and use of Scottish unconventional oil and gas. The combined effects of these greenhouse gas emissions could be significant. The development of an unconventional oil and gas industry in Scotland would make achieving the Scottish Government's energy and climate change commitments even more challenging and would not promote its objectives in relation to decarbonising the economy.	
Population and human health	++	**Significant positive direct effects** as a result of the avoidance of potential risks to physical health and safety. The combined effect of this with a range of other impacts (noise, light pollution, odours, recreation and amenity and road safety), could also be significant	
Air	++	**Significant positive direct effects** from the avoidance of direct gas emissions, and of exhaust emissions from construction activities and traffic serving the developments.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	++	**Significant positive direct effects** from the avoidance of pollution of ground and surface water due to the release of contaminated water, hazardous materials or saltwater intrusion, and the avoidance of the combined effects of pollution and the abstraction of water.	
Biodiversity, flora and fauna	++	**Significant positive direct effects** from the avoidance of the loss and fragmentation of habitats and risks associated with accidental spills of hazardous materials, the spread of invasive species and impacts on wetland systems upon which particular species depend, and the significant combined impact of these effects, together with disturbance and the effects of accelerated climate change.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	++	**Significant positive direct effects** from the avoidance of the impact of unconventional oil and gas development on the character and quality of landscapes, and the associated visual impacts of oil and gas extraction sites.	
Material assets	0	No significant effects are identified in relation to material assets.	
Lifecycle assessment of GHG emissions	Direct positive effects are expected as not supporting unconventional oil and gas will result in lower future GHG emissions. An avoidance of future GHG emissions will support Scotland's move to net zero and meeting national emissions targets. The absence of unconventional oil and gas as an energy source		

	will support the push to renewable energy also helping Scotland meeting its national targets. It is anticipated that this position could have a net positive impact on achieving national greenhouse gas emissions targets.

Coal

- Ministers confirm a preferred policy position of no support for coal extraction in Scotland. Impact assessments for this policy will follow a similar approach as outlined above for conventional oil and gas; the finalised policy position will be confirmed on conclusion of this process.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	Scotland has no coal fired power stations. There are currently no operational coal mines in Scotland. There are 18 licenses that are recorded as having an expiry date beyond May 2022; however, 15 relate to the Scottish Coal Company, which has been in liquidation for some time and where the authorisation to mine is no longer in place. The remaining three sites are where restoration is underway or is complete. Therefore, no future coal mining can or will take place at any of these 18 sites. The only future coal extraction would be under new licenses, which is not in line with the UK Government position on coal for power generation. However coal is also used for other processes such as coking for steel making and domestic use for heating. In 2021, the largest provider of coal imports to the UK were from the USA (54%) and Russia (19%). In June 2021, the UK Government confirmed plans to bring forward the date to remove unabated coal from the UK's energy mix to October 2024; this will mean coal will no longer be used to generate electricity. They have also confirmed plans to decarbonize industries that still rely on coal. No Scottish coal extraction will still result in coal imports for industrial processes and heating, importing coal internationally incurs additional GHG emissions associated with transport. However as there is no current coal extraction in Scotland and Scotland is currently reliant on imports, the policy position does not change the existing baseline in relation to GHG emissions. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to climatic factors. These effects are expected to occur within the short term.	
Population and human health	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future health impacts on the people of Scotland but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to population and	

		human health. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to population and human health.	
Air	+	Coal is known to cause air pollution and the burning of coal releases a number of airborne toxins and pollutants. However as there is no current coal extraction in Scotland and Scotland is currently reliant on imports, the policy position does not change the existing baseline in relation to air quality impacts from coal. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to air.	
Soils and geology	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future removal of topsoil but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to soils and geology. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to soils and geology.	
Water	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future impacts on water quality of acid mine drainage, which leads to heavy metals dissolving and seeping into ground and surface water, but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to water. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to water.	
Biodiversity, flora and fauna	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future impacts on biodiversity including habitat loss and pollution, but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to biodiversity. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to biodiversity, flora and fauna.	Opportunities for rewilding.
Cultural heritage and historic environment	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future impacts on cultural heritage and the historic environment including direct effects and effects on setting, but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to cultural heritage and the historic environment. It avoids	

		future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to cultural heritage and historic environment.	
Landscape	+	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future impacts on landscape from mining, but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to landscape. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **minor positive indirect effects** are identified in relation to landscape.	
Material assets	0	As there is no coal extraction in Scotland continuing no extraction of coal avoids the future extraction of this resource, but does not alter the current baseline. Scotland is currently reliant on imports, and the policy position does not change the existing baseline in relation to the use of coal. It avoids future coal extraction in Scotland which would increase availability of this fuel source, potentially increasing use. Therefore, **negligible effects** are identified in relation to material assets.	
Lifecycle assessment of GHG emissions	As Scotland does not currently extract coal, emissions reductions are not expected as a result of this action. However, the importing of coal from out with the UK has associated oversea emissions that Scotland contributes too. Continuing to import coal will result in continued GHG transport related emissions.		

Nuclear

- The Scottish Government's position on traditional nuclear energy has not changed. We do not support the building of new nuclear power plants under current technologies.

Score	Justification	Mitigation and enhancement
0	Scotland has two EDF-owned nuclear stations, of which only Torness is currently generating electricity, and Hunterston B stopped generating in January 2022. There are three Nuclear Decommissioning Authority (NDA)-owned civil nuclear sites at advanced stages of decommissioning: Dounreay, Chapelcross and Hunterston A. The Scottish Government does not support the continued use of nuclear for energy generation. There are no plans to build new nuclear plants in Scotland and therefore, Scotland will be without nuclear energy by 2028. The use of nuclear is considered a low carbon energy source. However, Scotland is a key driver in the generation of renewable energy sources that can be used to replace the use of nuclear power. The majority of Scotland's renewable electricity generation comes from wind. The construction of a nuclear power plant can generate significant amounts of GHG emissions which would be avoided by not generating nuclear power. Additionally, mining of uranium is a carbon intensive process,	Ensure that renewable energy sources are used to replace the use of nuclear energy.

	leading to significant embedded carbon emissions for nuclear power. However the lifecycle emissions from nuclear power are identified as lower than coal and gas, and it is considered a low carbon energy source. Therefore, a **negligible effect** is identified in relation to climatic factors. These effects are expected in the short to the long term.	
+	Nuclear energy produces radioactive waste. Nuclear power plants pose a significant risk to human health from the potential risk of a nuclear accident. As such, not constructing nuclear power plants will remove the risk of a nuclear spill or accident. Additionally, nuclear energy produces radioactive waste which can contaminate the local environment posing a threat to human health. Therefore, a **minor positive direct effect** is identified in relation to population and human health. These effects are expected in the short to the long term.	
+	One of the biggest concerns with nuclear power is the radioactive waste produced while generating nuclear power. There are a few types of radioactive material produced throughout the lifecycle of a nuclear power plant, most notably uranium mill tailings and used reactor fuel. This radioactive material that is produced has the potential to pollute air. Therefore, **minor positive direct effects** are identified in relation to air as by not generating nuclear power will prevent radioactive waste material from entering the atmosphere and causing air pollution. These effects are expected in the short to the long term.	
+	One of the biggest concerns with nuclear power is the radioactive waste produced while generating nuclear power. There are a few types of radioactive material produced throughout the lifecycle of a nuclear power plant, most notably uranium mill tailings and used reactor fuel. This radioactive material that is produced has the potential to contaminate soils and ground level surfaces. Therefore, **minor positive direct effects** are identified in relation to soils and geology as by not generating nuclear power will prevent radioactive waste material from contaminating soils. These effects are expected in the short to the long term.	
+	The generation of nuclear power also requires large volumes of water. During the cooling process, the water becomes contaminated with radionuclides (unstable atoms with excess energy) and must be filtered to remove as many radionuclides as possible. Heavy metals and salts also build up in the water used by nuclear plants, which, when released back into the water environment, could potentially harm the aquatic ecosystem. Therefore, **minor positive direct effects** are identified in relation to water as by not generating nuclear power will prevent radioactive waste material from polluting the water environment and the excessive use of water in the process of generating nuclear energy. These effects are expected in the short to the long term.	
+	One of the biggest concerns with nuclear power is the radioactive waste produced while generating nuclear power. There are a few types of radioactive material produced throughout the lifecycle of a nuclear power plant, most notably uranium mill tailings and used reactor fuel. This radioactive material that is produced has the potential to cause genetic damage or mutation to animals and plants through contamination. Therefore, **minor positive direct effects** are identified in relation to biodiversity, flora and fauna. These effects are expected in the short to the long term.	

0	No significant effects are identified in relation to cultural heritage and historic environment.	
+	**Minor positive direct effects** are identified in relation to landscape from the avoidance of the impact of nuclear energy development on the character and quality of landscapes, and the associated visual impacts of nuclear power plants. However, a nuclear power plant produces significant power generation from a single location. These effects are expected in the short to the long term.	
+	**Minor positive direct effects** are identified in relation to material assets as no generating nuclear power will result in less raw materials being using in energy generation. These effects are expected to occur within the short term to long term.	
Nuclear power plants have lifecycle emissions of between 4 and 110 gCO2e/kWh which is approximately 90% less than coal and 80% less than gas. Nuclear power is considered a low carbon energy source. However, Scotland generates a large amount of its electricity from renewable energy sources. No longer generating nuclear power is not likely to reduce GHG emissions.		

Reducing demand and decarbonising energy use across heat and transport sectors

Heating and cooling our buildings

- We have set an ambition to decarbonise 1 million homes by 2030 and to reduce emissions from our non-domestic buildings.
- We will consult during 2023 on a Heat in Buildings Bill and outline proposals for regulating energy efficiency and zero direct emission heat in Scotland's homes and buildings.
- We will deliver support for the transformational change needed for heat in buildings through our National Energy Agency – Heat and Energy Efficiency Scotland.
- We are investing over £1.8bn in decarbonising homes and buildings, through Heat and Energy Efficiency Scotland, over the course of this parliament.
- We have introduced a Home Energy Scotland Grant scheme in 2022/2023 including enhanced support for rural off gas households.
- We will publish a Public Engagement Strategy for Heat in Buildings and the report from the Green Heat Finance Task Force in 2023.
- We have set an ambition for 2.6 TWh of thermal energy to be supplied by heat networks by 2027 and 6 TWh by 2030, and will set a new target for 2035.
- We will establish a new regulatory regime for heat networks in Scotland and appropriate financial mechanisms.
- We will publish an updated target for renewable heat in 2023.

■ We will support local authorities to produce their Local Heat and Energy Efficiency Strategies and Delivery Plans by providing capacity support training in partnership with Zero Waste Scotland.			
SEA topic	**Score**	**Justification**	**Mitigation and enhancement**
Climatic factors	++	Funding for emissions reductions, improved energy efficiency and increased renewables for homes and businesses has a **significant positive direct effect** on reducing greenhouse gas emissions. Renewable heat also offers opportunities to increase energy efficiency of buildings reducing heat demand. These effects will begin in the medium term, and continue over the longer term as further energy efficiency measures are implemented and as more renewables are developed. Heat networks also deliver improved energy efficiency and the use of thermal energy will reduce reliance on fossil fuels. These effects will begin in the short term, and continue over the longer term as further energy efficiency measures are implemented and as more renewables are developed.	Provide clarity on the proportion of the heat network provision to be met from renewables. Link fuel poverty payments to energy efficiency actions, or prioritizing energy efficiency actions. Accelerate or increase the targets to decarbonise homes and non-domestic buildings
Population and human health	++	**Significant positive direct effects** are identified for population and human health from improved energy efficiency of homes, reducing associated issues of condensation and damp which impact on health. Improvements to energy efficiency, the provision of renewable energy and energy storage will take effect in the short term, with increasing take up bringing benefits in the medium to long term. Indirect minor positive effects arise from the improved viability of businesses from greater energy efficiency, indirectly supporting employment and the associated mental health benefits associated with this. In terms of renewable heat generation, these projects and interlinked displaced emissions from fossil fuels have the potential to benefit population and human health by providing access to green energy is likely to offer **minor positive indirect effects** in relation to population and human health through the creation of employment opportunities to support the renewable sector supply chains. Additionally, publishing a Public Engagement Strategy will support increased community engagement and education surrounding Scotland's energy system. It is also anticipated that there will be minor positive secondary effects from increased action on energy efficiency and renewable energy leading to greater awareness and action at a household and business level.	
Air	+	**Minor positive direct effects** are identified in relation to air as improved energy efficiency, increased use of renewables and zero emissions heat from homes and businesses will improve air quality due to	As for climatic factors

		the reduction in emissions for heating. These effects will occur in the short term, and continue and increase into the longer term.	
Soils and geology	-	There could be **minor negative direct effects** on soils and geology as a result of development of ground source heat pumps or heat networks, however these would form part of a range of renewable technologies being developed, and the footprint of these varies depending on the approach used, and is localised in extent. Development of other renewable energy technologies could also negatively impact on soil depending on the proportion of ground based or building mounted technologies. These impacts would occur in the short term, reflecting the development stage of any works undertaken.	There is no reference to deep geothermal as a heat source. Clarity should be provided on heat network energy sources.
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	-	Improved energy efficiency of buildings could have **minor negative indirect effects** on biodiversity, flora and fauna. This could occur as a result of improved energy efficiency measures impacting on the availability of nesting space for bird and bat species which use buildings and roof space. These effects will occur in the short term, and continue into the longer term as further work takes place.	Incorporate actions for biodiversity within energy efficiency measures such as green walls and nest space provision.
Cultural heritage and historic environment	-	There are likely to be **minor negative direct effects** on cultural heritage and the historic environment as a result of external changes to improve energy efficiency or retrofit renewable energy as these changes may impact on the character of the built environment. Locally more significant effects could occur particularly in areas designated for their cultural heritage value. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to cultural heritage and the historic environment.
Landscape	-	There are likely to be **minor negative direct effects** on the landscape as a result of external changes to improve energy efficiency or retrofit renewable energy as these changes may impact on the character of urban areas. However, this is within the context of varied urban landscapes, which already include a mixture of building styles, designs and external building features. Locally more significant effects could occur in more sensitive landscapes.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to areas of high landscape value.
Material assets	+/-	There are likely to be **mixed effects** on material assets. **Minor positive direct effects** on material assets are identified as a result of improved energy efficiency and through the support for heat networks which not only improves the quality of individual buildings, but also reduces energy demand indirectly improving the resilience of the energy network. The development of local heat networks and renewable energy generation also increases the resilience of the energy system. **Minor negative indirect effects** will arise from the resources required to implement the new development.	Battery storage should be referenced in relation to development of domestic renewables within the programme of delivery, not just in the surrounding text. Complete a lifecycle assessment of typical materials used in improving energy efficiency and renewable energy

			and support the use of materials with a low carbon footprint and a faster payback period.
Lifecycle assessment of GHG emissions	Direct GHG emissions will arise from the production, transport and installation of materials required for improved energy efficiency measures or renewable energy development. These infrastructure changes will result in more efficient use of energy and increased production and use of renewable energy, contributing to reduced emissions overall in the following years. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

- We have committed to reduce car kilometres by 20% by 2030, and investing £500m in active travel.
- We are investing £500 million in bus priority measures and investing over £5 billion in maintaining, improving and decarbonising Scotland's rail network.
- We are helping more people on lower incomes and remote/island communities to switch to zero emission vehicles with a further £30 million of loans and grants through our domestic and business EV funds.
- We are developing a Just Transition Plan for Transport which will help create an energy system that delivers for people, places and communities in Scotland.
- We are supporting innovation and attracting inward investment in zero emission mobility, including through the Michelin Scotland Innovation Park and the National Manufacturing Institute Scotland.
- We will make up to £58 million available for zero emission buses and charging infrastructure.
- We will accelerate the transition away from fossil fuels by supporting households and businesses to make the switch to low/zero emission vehicles, including:
  - expanding electric vehicle infrastructure with £60 million of public and private investment.
  - legislating to require new homes and non-residential buildings to include EV charging points.
  - helping to facilitate the development and rollout of the infrastructure needed for hydrogen vehicles to operate in Scotland.
  - delivering the rail decarbonisation plan.
  - working towards decarbonisation of ferry services.
  - working to decarbonise scheduled passenger flights within Scotland by 2040.

SEA topic	Score	Justification	Mitigation and enhancement

Climatic factors	++	Decarbonising the transport sector by encouraging the take-up of electric and ultra-low emission vehicles (ULEVs) will help to further reduce GHG emissions. Furthermore, supporting reduced travel journeys and active travel, as well as the decarbonisation of freight transport through electrification, and incentivising low emission aircrafts and sustainable aviation fuel may also contribute towards reductions in GHG emissions. The use of biofuels will help the transition away from fossil fuels which release GHG emissions and other pollutants. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Increased infrastructure to support decarbonising transport should be prioritised in the short term to align with the ban in 2030 of the sale of petrol and diesel cars.
Population and human health	++	Decarbonising the transport sector will significantly reduce GHG emissions and other pollutants resulting in subsequent improvements in air quality benefiting human health. Funding for active travel and reducing car use will encourage walking and cycling. This will positively benefit human health through improvements in physical health and mental wellbeing. Therefore, **significant positive direct effects** are identified in relation to population and human health. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	The green network should be accessible to a wide range of users, and should be well linked with other active travel routes and public transport modes to further reduce potential emissions from transport.
Air	++	Decarbonising the transport sector will significantly reduce GHG emissions and associated pollutants resulting in subsequent improvements in air quality, particularly in urban areas with Air Quality Management Areas (AQMAs). Therefore, **significant positive direct effects** are identified in relation to air. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Soils and geology	-	The development of infrastructure to support decarbonising the transport sector will also require land take up. Therefore, **minor negative indirect effects** are identified in relation to soils and geology. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Ensure that that disturbance of soil, particularly high carbon soils, vegetation and seabed is minimised and avoided where possible and consideration given to ensure site reinstatement to enhance carbon sequestration.
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	-	Upgrades to or the creation of new infrastructure to facilitate decarbonisation of the transport sector will likely have **minor negative direct effects** in relation to biodiversity, flora and fauna. The creation of new infrastructure could result in the disruption to habitats and species if there is development out	Potential impacts are likely to be mitigated by existing mechanisms such as the planning system, SEPA

		with urban centres. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	regulation, EIA, HRA and on-site management measures.
Cultural heritage and historic environment	-	The siting of infrastructure, particularly those of larger scales, could also have **minor negative direct effects** on the setting of cultural heritage and historic environment. However, the significance of the identified impacts will be dependent on the scale, nature and location of developments and likely to be experienced at a local level. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to cultural heritage and the historic environment.
Landscape	-	Increased development of infrastructure to support decarbonising the transport sector will also require land take and could result in new development. Therefore, **minor negative direct effects** are identified in relation to landscape. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Material assets	+/-	The promotion of electric vehicles and vehicles fuelled by biofuel may have **mixed effects** in relation to material assets. Increased use of electric transport has the potential to increase electricity demand and put pressure on existing electricity generation networks if upgrades are not made to facilitate transition towards decarbonisation. Infrastructure such as recharging points will be required to meet market demand. However, the decarbonisation of the transport sector will reduce the use of raw materials such as fossil fuel, positively effecting material assets. These effects are likely to occur in the short term, and continue into the longer term, as further decarbonisation takes place.	Opportunities should be sought to improve interconnectivity within existing networks, including wider street networks and public transport.
Lifecycle assessment of GHG emissions	Direct reductions in GHG emissions are possible through the decarbonisation of the transport sector, although there will be emissions associated with the installation of infrastructure. This will also support the move away from fossil fuels. Depending on the rate at which these changes are implemented and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Energy for Transport

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- We are developing a Just Transition Plan for Transport which will help create an energy system that delivers for people, places and communities in Scotland.
- We are supporting innovation and attracting inward investment in zero emission mobility, including through the Michelin Scotland Innovation Park and the National Manufacturing Institute Scotland.
- We will make up to £58 million available for zero emission buses and charging infrastructure.
- We will accelerate the transition away from fossil fuels by supporting households and businesses to make the switch to low/zero emission vehicles, including:
  - expanding electric vehicle infrastructure with £60 million of public and private investment.
  - legislating to require new homes and non-residential buildings to include EV charging points.
  - helping to facilitate the development and rollout of the infrastructure needed for hydrogen vehicles to operate in Scotland.
  - delivering the rail decarbonisation plan.
  - working towards decarbonisation of ferry services.
  - working to decarbonise scheduled passenger flights within Scotland by 2040.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Decarbonising the transport sector by encouraging the take-up of electric and ultra-low emission vehicles (ULEVs) will help to further reduce GHG emissions. Furthermore, supporting reduced travel journeys and active travel, as well as the decarbonisation of freight transport through electrification, and incentivising low emission aircrafts and sustainable aviation fuel may also contribute towards reductions in GHG emissions. The use of biofuels will help the transition away from fossil fuels which release GHG emissions and other pollutants. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Increased infrastructure to support decarbonising transport should be prioritised in the short term to align with the ban in 2030 of the sale of petrol and diesel cars.
Population and human health	++	Decarbonising the transport sector will significantly reduce GHG emissions and other pollutants resulting in subsequent improvements in air quality benefiting human health. Funding for active travel and reducing car use will encourage walking and cycling. This will positively benefit human health through improvements in physical health and mental wellbeing. Therefore, **significant positive direct**	The green network should be accessible to a wide range of users, and should be well linked with other active travel routes and public transport

		effects are identified in relation to population and human health. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	modes to further reduce potential emissions from transport.
Air	++	Decarbonising the transport sector will significantly reduce GHG emissions and associated pollutants resulting in subsequent improvements in air quality, particularly in urban areas with Air Quality Management Areas (AQMAs). Therefore, **significant positive direct effects** are identified in relation to air. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Soils and geology	-	The development of infrastructure to support decarbonising the transport sector will also require land take up. Therefore, **minor negative indirect effects** are identified in relation to soils and geology. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Ensure that that disturbance of soil, particularly high carbon soils, vegetation and seabed is minimised and avoided where possible and consideration given to ensure site reinstatement to enhance carbon sequestration.
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	-	Upgrades to or the creation of new infrastructure to facilitate decarbonisation of the transport sector will likely have **minor negative direct effects** in relation to biodiversity, flora and fauna. The creation of new infrastructure could result in the disruption to habitats and species if there is development out with urban centres. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Potential impacts are likely to be mitigated by existing mechanisms such as the planning system, SEPA regulation, EIA, HRA and on-site management measures.
Cultural heritage and historic environment	-	The siting of infrastructure, particularly those of larger scales, could also have **minor negative direct effects** on the setting of cultural heritage and historic environment. However, the significance of the identified impacts will be dependent on the scale, nature and location of developments and likely to be experienced at a local level. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Develop or refer to specific design guidance for energy efficiency and renewable energy development in relation to cultural heritage and the historic environment.
Landscape	-	Increased development of infrastructure to support decarbonising the transport sector will also require land take and could result in new development. Therefore, **minor negative direct effects** are	

		identified in relation to landscape. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Material assets	+/-	The promotion of electric vehicles and vehicles fuelled by biofuel may have **mixed effects** in relation to material assets. Increased use of electric transport has the potential to increase electricity demand and put pressure on existing electricity generation networks if upgrades are not made to facilitate transition towards decarbonisation. Infrastructure such as recharging points will be required to meet market demand. However, the decarbonisation of the transport sector will reduce the use of raw materials such as fossil fuel, positively effecting material assets. These effects are likely to occur in the short term, and continue into the longer term, as further decarbonisation takes place.	Opportunities should be sought to improve interconnectivity within existing networks, including wider street networks and public transport.
Lifecycle assessment of GHG emissions	Direct reductions in GHG emissions are possible through the decarbonisation of the transport sector, although there will be emissions associated with the installation of infrastructure. This will also support the move away from fossil fuels. Depending on the rate at which these changes are implemented and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Supporting industry to reduce demand and decarbonise energy use

Energy for industry

- We will continue to offer match-funding support for industrial energy-efficiency or decarbonisation via the Scottish Industrial Energy Transformation Fund (SIETF) with £34m available to fund projects until 2026.
- We call on the UK Government to work with us on getting consumers, or other buyers, to choose low carbon products.
- We will work with the UK Government to plan and secure the delivery of the substantial infrastructure, as well as new energy generation and conversion assets, that need to be developed before industrial fuel switching (to renewable or low-carbon hydrogen and/or to electrification) and CCUS can be deployed on a large scale.
- We are supporting innovative proposals to reduce the carbon footprint of manufacturing through the Low Carbon Manufacturing Challenge Fund with £3m in 2022 and a total of £26 million over 5 years.

SEA topic	Score	Justification	Mitigation and enhancement

Climatic factors	++	Emissions from industry continue to constitute a large proportion, around 30%, of total Scottish emissions. These emissions are generated from a variety of activities across a diverse range of sectors, predominantly manufacturing, as well as mining and construction. **Significant positive direct effects** are identified in relation to climatic factors from industrial decarbonisation which will contribute to greenhouse gas emission reductions. The installation of energy efficiency measures in industry could reduce the demand for electricity and heat from fossil fuel sources within industry. Sequestering carbon emissions through carbon capture technology is also likely to have significant positive effects by reducing greenhouse gas emissions. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Ensure that where possible transport associated with industry is decarbonised to reduce overall emissions. Decarbonisation could include opportunities for: renewable energy innovation; bioenergy; hydrogen production with carbon capture and storage; and repurposing of existing strategic and critical infrastructure such as pipelines.
Population and human health	+	**Minor positive direct effects** are identified in relation to population and human health as decarbonizing industry should lead to employment and training opportunities, with positive effects on health and wellbeing. Regeneration through industrial decarbonization also have the potential to improve access to key goods and services and lead to wider benefits. Improvements to air quality from decarbonisation are also positive for human health.	
Air	+	**Minor positive direct effects** are identified as the decarbonisation of industry will reduce emissions of air pollutants improving air quality. These positive effects are expected to be within the short to long term.	
Soils and geology	-	Potential for **minor negative direct effects** identified in relation to soil from infrastructure delivery, both short term during construction activities to long term, for example, sediment disturbance and loss of seabed from laying of pipes and through land take. Construction activities and increased vessel movements in the marine environment could also lead to negative impacts, including smothering and loss of seabed and general disturbance of sediment. There is potential for soil organisms to be impacted from possible CO_2 leakage from reservoirs and pipelines. These effects are expected to occur within the short term to long term as decarbonisation occurs particularly during construction phase.	Ensure that disturbance of soil, particularly high carbon soils, vegetation and seabed is minimised and avoided where possible and consideration given to ensure site reinstatement to enhance carbon sequestration. Opportunities to enhance high carbon soils and habitats of high carbon sink value should be explored.
Water	-	Potential for both short and long term **minor negative direct effects** in relation to water on both the terrestrial and marine environments from the construction of new and upgraded infrastructure. Operational activities, including increased vessel movement, could lead to increased risk of water pollution and disturbance of the seabed. Operational discharges could also lead to potential long	Incorporate actions that reduce water demand while decarbonizing industry.

		term adverse impacts. Hydrogen production is also reliant on water supply. These effects are expected to occur within the short term to long term as decarbonisation occurs.	The impacts of climate change, including flood risk, should be considered.
Biodiversity, flora and fauna	-	The construction of new and upgraded infrastructure and operational activities for carbon capture and storage associated with project sites in locations around the Firth of Forth have the potential to result in effects such as loss of functionally-linked habitat and disturbance of qualifying species on European Sites. Offshore works in the Firth of Forth also have the potential to effectively act as a barrier (due to disturbance) to migratory Atlantic salmon and/or lamprey species of the upstream River Teith SAC. Therefore, **minor negative direct effects** are identified in relation to biodiversity, flora and fauna from associated infrastructure requirements. Potential for negative effects, including from associated infrastructure requirements. Impacts are likely to arise both in the short term during construction and longer term during operation. There is potential for in-combination effects with other projects and cumulative impacts that could arise on the Firth of Forth.	Effects on biodiversity should be minimised through siting and design, and enhancement measures applied in keeping with national policy.
Cultural heritage and historic environment	-	Potential for long term **minor negative direct effects** are identified in relation to cultural heritage and historic environment on both known and unknown historic and cultural heritage assets are likely to be associated with the upgrading or conversion of existing infrastructure, and the installation of new infrastructure necessary to facilitate CCUS and hydrogen. These effects are expected to occur within the short term to long term as decarbonisation occurs.	Opportunities to minimise impacts on historic assets should be explored.
Landscape	-	Long term **minor negative direct effects** are identified in relation to landscape could arise from siting of infrastructure, particularly where new infrastructure is required. Significance of impacts will depend on a number of factors, including location and scale of development and the extent to which development is taken forward within the context of existing developed and industrial landscapes. The construction of the new and refurbishment of existing pipelines, and near shore geological storage facilities, has the potential to impact on the seabed floor.	Opportunities to minimise impacts on landscape and seascape should be explored.
Material assets	+/-	**Mixed effects** are identified in relation to material assets. Minor positive direct effects should arise from increased support for the diversification of the energy mix. Increased resilience should also arise through the role of hydrogen in energy storage, supporting fluctuations in peak demand and enabling supply to be met when disruptions arise. The use of raw materials may be required in the decarbonisation process and to building new infrastructure resulting in minor negative direct effects. These effects are expected to occur within the short term to long term as decarbonisation occurs.	Opportunities to prioritise use of existing infrastructure on and offshore which can be refurbished. The reuse of materials in construction and use of low carbon construction materials should be prioritised and waste

			materials reused or recycled on decommissioning.
Lifecycle assessment of GHG emissions	Direct GHG emissions will arise from the production, transport and installation of materials required for decarbonising industry. These infrastructure changes will result in more efficient use of energy and the decarbonisation of industry. Depending on the rate at which these changes are implemented, carbon capture and storage capacity, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Carbon capture and storage

- We will continue to work with the North East CCUS industry led alliance to support the delivery of the CCUS industry in Scotland.
- We will continue to engage with the Scottish Cluster and have offered £80 million from our Emerging Energy Technologies Fund until 2026 to support the deployment of the Scottish Cluster. Due to delays with the UK Government announcing the Scottish Cluster, we have re-profiled our offer of financial support into subsequent years.
- We will support the development and demonstration of technologies that utilise carbon dioxide and create value in CO_2 through our £5m CO_2 utilisation Challenge Fund.
- We will continue to provide funding and policy support to industry group NECCUS in financial year 2022/23, including on the development of Scottish Net Zero Road Map (SNZR) which is scheduled to be completed in early 2023.
- We will continue to build the evidence base for CCUS in Scotland, including exploration of non-pipeline transport solutions, such as CO_2 shipping and the unique opportunities these provide to Scotland (initial outputs delivered in early 2023) and the CCUS regulatory landscape in Scotland.
- We will work constructively with the UK Government on the development of CCUS in the UK and will continue to input into the Track-2 sequencing process to ensure it does not unfairly disadvantage Scotland.
- We continue to call on the UK Government to reverse its CCUS cluster sequencing decision and to accelerate the Scottish Cluster to full Track-1 status without delay.
- We also urge the UK Government to provide urgent clarity on the timelines and processes of the next stages (Track-2) of the cluster sequencing process.

Score	Justification	Mitigation and enhancement
++	Carbon capture can use different chemical processes to remove carbon from the flue emissions of carbon generating processes. Captured carbon can be stored, typically in underground geological formations or utilised in industrial applications. CCUS will allow captured carbon to support the energy transition. Carbon utilisation refers to the activity of capturing carbon and then re-using it in other industrial processes. There are different production processes for making products from captured carbon including gas fermentation and microalgae growth to produce proteins and animal feed, development of synthetic	

	fuels and production of carbon nanomaterials. CO2 utilisation can produce conventional products without reliance on additional extraction of fossil carbon. CO2 utilisation can provide an alternative carbon source for production of these products, without reliance on fossil carbon. The need for this is such however that CO2 utilisation is expected to occur at much smaller scales compared to geological sequestration[294]. In addition to utilising carbon obtained through CCUS, storing carbon is also likely to have significant positive effects by reducing GHG emissions, assuming carbon storage is long term. Additionally, a NETs feasibility study will indirectly support the reduction in GHG emissions. Therefore, **significant positive direct and indirect effects** are identified in relation to climatic factors. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	
+	The promotion of CCUS may provide alternative, flexible and responsive technologies to provide energy which will have **minor positive direct effects** on population and human health, by improving reliability and security of energy supply, helping to reduce fuel poverty across Scotland. CCUS will also improve air quality having a positive effect on human health. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	
+	While CCS may have an overall positive effect on air pollution, emissions of some pollutants may increase as part of the capture process. CCS technologies require incur an energy penalty requiring 15 – 25 % more energy depending on the particular type of technology used, so plants with CCS need more fuel than conventional plants. This in turn can lead to increased 'direct emissions' occurring from facilities where CCS is installed, and increased 'indirect emissions' caused by the extraction and transport of the additional fuel. Key impacts on air pollutants include: • Sulphur dioxide (SO2) emissions from power plants are predicted to fall when carbon dioxide (CO2) is captured • Particulate matter (PM) and nitrogen oxide (NOx) emissions are expected to increase in line with the amount of the additional fuel consumed if no additional measures to reduce emissions are installed. • Ammonia (NH3) is the only pollutant for which a significant increase in emissions is expected to occur, with emissions potentially increasing by a factor of 3 or more. The foreseen increase is due to the degradation of the amine-based solvents used to capture the CO2. However, in absolute terms the increase is small compared to existing ammonia emissions in Europe, 94% of which comes from agriculture. Ammonia contributes to acidification and eutrophication of the environment and also can form harmful fine particulate matter when released in the atmosphere. Based on the assumption of an overall improvement in air quality, **minor positive direct and indirect effects** are identified in relation to air. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	

[294] Baltac, S., Mitchell, A., Conde, EGC., Platt, R.(2022) Understanding Opportunities for Developing a CO2 Utilisation Economy. Climate Exchange. [online] Available at: https://www.climatexchange.org.uk/research/projects/developing-a-scottish-co2-utilisation-economy/

-	CCUS infrastructure is likely to be located within industrial sites and to utilise existing oil and gas infrastructure but could result in land take and disturb soils. For example, negative effects are likely to be associated with the upgrading or conversion of existing infrastructure, and the installation of new infrastructure, necessary to facilitate CCUS. These effects are likely to be local or at project level. Therefore, **minor negative direct effects** are identified in relation to soil. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	The re-use of brownfield or previously developed land.
-	CCUS could lead to disturbance of the seabed and there is potential for accidental CO2 leaks polluting the marine environment or watercourses as contaminants are carried with the CO2 as it migrates to the surface. Therefore, **minor negative direct effects** are identified for water. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	
-	CCUS infrastructure could impact on local habitats and species. For example, negative effects are likely to be associated with the upgrading or conversion of existing infrastructure, and the installation of new infrastructure, necessary to facilitate CCUS. These effects are likely to be felt locally or at project level. Therefore, **minor negative direct effects** are identified in relation to biodiversity, flora and fauna. These effects are likely to occur in the medium to longer term, as further CCUS is developed.	These activities should be subject to existing mechanisms such as planning, EIA and HRA and consenting conditions prior to work being undertaken.
0	Potential for long term negative effects on both known and unknown historic and cultural heritage assets likely to be associated with the upgrading or conversion of existing infrastructure, and the installation of new infrastructure necessary to facilitate CCUS. It is likely that development will take place in the context of existing industrial landscapes, and effects should be minimised. Therefore, **negligible effects** are identified for cultural heritage and historic environment.	These activities should be subject to existing mechanisms such as planning, EIA and HRA and consenting conditions prior to work being undertaken.
0	CCUS infrastructure could impact on local landscape. For example, negative effects are likely to be associated with the upgrading or conversion of existing infrastructure, and the installation of new infrastructure, necessary to facilitate CCUS. It is likely that development will take place in the context of existing industrial landscapes, and effects should be minimised. Therefore, **negligible effects** are identified for landscape.	These activities should be subject to existing mechanisms such as planning, EIA and HRA and consenting conditions prior to work being undertaken.
+/-	Mixed effects are identified in relation to material assets. The promotion of CCUS will provide infrastructure to support emissions reductions in the short term, with **minor positive direct effects** on material assets, but will also require materials to construct the infrastructure. Additionally, materials will be required to maintain infrastructure with a potential increase in waste from the disposal of materials when no longer required. This will result in **minor negative direct effects**. These effects are likely to occur in the medium to long term, and as CCUS is developed.	The re-use of decarbonised industrial areas.
Direct reductions in GHG emissions are possible through CCUS. This will also support the move away from fossil fuels. Depending on the rate at which these changes are implemented and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Energy in agriculture

- We are providing advice and support to help farmers and crofters reduce energy demand and decarbonise energy use through a suite of advice programmes.
- We are building our evidence base through research on opportunities to reduce demand and decarbonise energy usage across the agricultural sector.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	Supporting farming and crofting businesses to reduce their energy demand reduce emissions and exploring opportunities to generate their own energy, would increase the resilience of the businesses to these increased costs, reduce their reliance on fossil fuels, and therefore also reduce their carbon footprint. Therefore, **minor positive direct effects** are identified in relation to climatic factors. These effects are likely to occur in the short term, and continue into the longer term.	GHG emissions could be further reduced if other areas of farming are considered such as the climate impact of certain crops and animals.
Population and human health	+	Diversification into renewable energy could provide an additional income stream, allowing farms to sell surplus energy or contribute to local community energy schemes. Therefore, **minor positive direct effects** are identified in relation to population and human health, as this will further support the viability of farming with positive effects on health and wellbeing. These effects are likely to occur in the short term, and continue into the longer term, as infrastructure is installed.	Providing investment to encourage uptake of on-site energy generation.
Air	0	No significant effects are identified in relation to air.	
Soils and geology	+	Infrastructure for on-site energy generation on farms is likely to occur on already cultivated soils and any negative effects are likely to be minimal. The diversion of farm waste can result in a by-product being produced from biomethane generation. This by-product can be used as a fertiliser and enrich soils. Therefore, **minor positive direct effects** are identified in relation to soils and geology. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Ensure that that disturbance of soil, particularly high carbon soils, vegetation and seabed is minimised and avoided where possible and consideration given to ensure site reinstatement to enhance carbon sequestration.
Water	+	If farm waste is diverted and used in the generation of biomethane, there will be reduced run-off from farm waste entering local water environment. Therefore, **minor positive direct effects** are identified in relation to water. These effects are likely to be minimal and occur in the short term, and continue into the longer term, as further work takes place .	

Biodiversity, flora and fauna	+	On-site energy generation on farms is likely to be small scale with very minimal land take up on cultivated soils with lower biodiversity interest. The move towards regenerative farming and nature rich farming will enhance biodiversity and ecosystems. Therefore, **minor positive direct effects** are identified in relation to biodiversity, flora and fauna. These effects are likely to be minimal and occur in the short term, and continue into the longer term, as further work takes place.	Potential impacts are likely to be mitigated by existing mechanisms such as the planning system, SEPA regulation, EIA, HRA and on-site management measures.
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	-	On-site energy generation on farms is likely to be small scale with very minimal visual impact within the local landscape and wider countryside. However, the infrastructure to support anaerobic digestors can be quite substantial having a negative impact on the local landscape including visual impact. Therefore, **minor negative direct effects** are identified in relation to landscape. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Material assets	+	**Minor positive direct effects** are identified in relation to material assets. The installation of on-site energy generation will add a positive asset to farms and reduce the use of fossil fuels. However, the construction of energy generation infrastructure will require raw materials but this is expected to be minimal. There will also be a potential reduction in farm waste from waste diversion to generate biomethane, CO2 and digestate. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	The reuse of materials in construction and use of low carbon construction materials should be prioritised.
Lifecycle assessment of GHG emissions	Increasing on-site energy generation on farms is likely to have a minor effect on meeting Scotland's national emissions targets in the short to the long term. However, it is expected that on-site energy generation with result in lower GHG emissions for farms. The carbon footprint of the materials used in constructing the required infrastructure is unknown. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Emissions Trading

- We are currently developing the UK ETS to align it with our net zero targets. We consulted on proposals with the UK Government, Welsh Government and Northern Ireland Executive in March-June 2022 and will bring forward legislation in response to these proposals in 2023.
- We will continue to work with industry to support them to make the decarbonisation investments needed in the context of the price signal from the ETS.

SEA topic	Score	Justification	Mitigation and enhancement

Climatic factors	++	**Significant positive direct effects** are identified in relation to climatic factors as the ETS incentivises investing in industrial decarbonisation which will contribute to greenhouse gas emission reductions. The installation of energy efficiency measures in industry could reduce the demand for electricity and heat from fossil fuel sources within industry. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Ensure that where possible transport associated with industry is decarbonised to reduce overall emissions. Decarbonisation could include opportunities for: renewable energy innovation; bioenergy; hydrogen production with carbon capture and storage; and repurposing of existing strategic and critical infrastructure such as pipelines.
Population and human health	+	**Minor positive indirect effects** are identified in relation to population and human health as inward investment in decarbonizing industry should lead to employment and training opportunities, with positive effects on health and wellbeing. Improvements to air quality from investing in decarbonisation are also positive for human health.	
Air	+	**Minor positive indirect effects** are identified as investing in decarbonisation of industry will reduce emissions of air pollutants improving air quality. These positive effects are expected to be within the short to long term.	
Soils and geology	0	**Negligible effects** are identified for soils and geology.	Ensure that disturbance of soil, particularly high carbon soils, vegetation and seabed is minimised and avoided where possible and consideration given to ensure site reinstatement to enhance carbon sequestration. Opportunities to enhance high carbon soils and habitats of high carbon sink value should be explored.
Water	0	**Negligible effects** are identified in relation to water.	Incorporate actions that reduce water demand while decarbonizing industry. The impacts of climate change, including flood risk, should be considered.

Biodiversity, flora and fauna	0	**Negligible effects** are identified in relation to biodiversity, flora and fauna.	Effects on biodiversity should be minimised through siting and design, and enhancement measures applied in keeping with national policy.
Cultural heritage and historic environment	0	**Negligible effects** are identified in relation to unknown historic and cultural heritage assets.	Opportunities to minimise impacts on historic assets should be explored.
Landscape	0	**Negligible effects** are identified in relation to landscape.	Opportunities to minimise impacts on landscape and seascape should be explored.
Material assets	+	**Minor positive direct effects** are identified in relation to material assets as greater uptake of energy efficiency measures through investing in decarbonising industry will improve the energy efficiency of these assets and reduce energy demand.	Opportunities to prioritise use of existing infrastructure on and offshore which can be refurbished. The reuse of materials in construction and use of low carbon construction materials should be prioritised and waste materials reused or recycled on decommissioning.
Lifecycle assessment of GHG emissions	Direct GHG emissions will arise from the production, transport and installation of materials required for improved energy efficiency measures. These infrastructure changes will result in more efficient use of energy and the decarbonisation of industry. Depending on the rate at which these changes are implemented, carbon capture and storage capacity, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the scale of positive impact related to the carbon footprint of the materials involved and the payback period from implementing the changes.		

Ensuring energy security and resilience

Energy security

- We will work with key industry stakeholders and partner countries to explore the goal of a fully interconnected North Sea grid, opening up further opportunities for export of Scottish renewable energy to assist others in meeting their decarbonisation goals

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Exporting renewable energy will help the Scottish renewable energy sector to grow. This will reduce reliance on fossil fuels reducing GHG emissions. Additionally, exporting renewable energy will help other countries that cannot produce renewable energy move away from fossil fuels and transition to net zero. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected to begin in the medium term and continue into the long term.	
Population and human health	++	Exporting renewable energy will help Scotland's renewable energy sector to grow. This may open up employment opportunities particularly for people who work within the oil and gas industry. Additionally, revenues from the renewable energy sector will be able to be invested back into the community and support locally important issues. Therefore, **significant positive direct effects** are identified in relation to population and human health. These effects are expected to be in the medium term but will continue in the long term.	
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	+	**Mixed effects** are identified in relation to material assets. Minor positive direct effects are identified in relation to material assets as exporting renewable energy may allow low-carbon energy developments to grow faster and help boost the local and national economy. However, infrastructure works to the North Sea grid will be required to support this which could result in the use of raw materials and waste being produce. Therefore, minor negative direct effects are identified. These effects are expected in the medium term and to continue into the long term.	
Lifecycle assessment of GHG emissions	Direct reduction in GHG emissions are expected as exporting renewable energy will help move away from the use of fossil fuels. This is expected to be in the medium term with decreasing levels of GHG emissions expected to continue into the long term. This policy position will help Scotland meet the national		

	GHG emission reduction targets and achieve net zero by 2045. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.

Energy system operability and restoration

- We will continue to press UK Government to update technical requirements for black start services.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	System restoration (previously known as Black Start) is the procedure to recover from a total or partial shutdown of the National Electricity Transmission System. System restoration services are designated generators that are able to restore electricity to the grid without using an outside electrical supply. **Minor positive direct effects** are identified in relation to climatic factors as system restoration from renewable energy reduces the need to maintain fossil fuel powered capacity to provide this service. This will enable further decarbonization of the energy system, reducing levels of GHG emissions. It is acknowledged that further work is planned to provide full renewable system restoration capacity and these positive effects are expected to be within the long term.	
Population and human health	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on population and human health due to the scale of change.	
Air	+	**Minor positive direct effects** are identified in relation to air as the use of renewable energy to support black start services will result in less reliance on fossil fuel powered system restoration capacity. This will lead to reduced GHG emissions improving air quality. These positive effects are expected to be within the long term.	
Soils and geology	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on soils and geology as it is likely to involve minor alteration to existing or planned renewable energy generation capacity.	
Water	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on water as it is likely to involve minor alteration to existing or planned renewable energy generation capacity.	

Biodiversity, flora and fauna	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on biodiversity, flora and fauna as it is likely to involve minor alteration to existing or planned renewable energy generation capacity.	
Cultural heritage and historic environment	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on cultural heritage and the historic environment as it is likely to involve minor alteration to existing or planned renewable energy generation capacity.	
Landscape	0	Renewable based system restoration will enable the transition from fossil fuel-based system restoration services to renewable based services. This will have **negligible effects** on landscape as it is likely to involve minor alteration to existing or planned renewable energy generation capacity.	
Material assets	+/-	There are likely to be **mixed effects** on material assets. **Minor positive direct effects** on material assets are identified as a result of system restoration services being a critical resource to maintain the reliability and resilience of the electric power system without relying on fossil fuels. **Minor negative direct effects** will arise from the resources and raw materials required to provide system restoration services which could include batteries, storage and generators.	
Lifecycle assessment of GHG emissions	Direct GHG emissions reductions are expected as a result transition from reliance on fossil fuels in powering black start services to renewables. Depending on the rate at which these changes are implemented, renewable system restoration services are anticipated to have a net positive impact on achieving national greenhouse gas emissions targets. There is uncertainty over the carbon footprint of the materials involved in setting up generators and storage and therefore, the payback period from implementing the changes.		

Pumped hydro storage

Already assessed under ‘Scale up renewable energy’

Flexibility

- We urge the UK Government to make the ancillary service markets more accessible for Battery Energy Storage Systems (BESS) and other low carbon technologies ahead of fossil fuel powered alternatives.

- We commit to taking forward research to explore the opportunities available to Scotland through Vehicle to Grid technology as part of our net zero energy system.
- We will explore the role of EV battery recycling as a circular economy opportunity for Scotland.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Making the ancillary service markets more accessible for BESS and other low carbon alternatives will support the move away from fossil fuels by increasing the flexibility of the grid. Reducing reliance on fossil fuels will lower GHG emissions. The vehicle to grid technology will provide backup storage cells to the electricity grid. This will offer increased flexibility in the electricity networks improving energy efficiency. Therefore, **significant positive direct effects** are identified in relation to climatic factors. This is expected to begin in the short term and continue over the long term.	
Population and human health	+	**Minor positive direct effects** are identified in relation to population and human health as greater flexibility and capacity for back up storage cells to the electricity grid is likely to be positive for consumers offering a variety of renewable energy sources to use and a more reliable energy source. This will help to meet energy demand. The introduction of greater flexibility, could help to enhance the security and resilience of energy supply which should help to reduce overall energy demand through increased efficiency of energy use. This is expected to begin in the short term and continue over the long term.	The delivery of smart local energy solutions and smart networks should also increase flexibility.
Air	+	**Minor positive direct effects** are identified in relation to air from a reduction in GHG emissions associated with more efficient energy use which will help to improve air quality. This is expected to begin in the short term and continue over the long term.	
Soils and geology	-	There could be **minor negative direct effects** on soils and geology as due to infrastructure works and installation of back up storage cells to increase energy storage that could negatively impact local geology or undisturbed soils. Additionally, recycling facilities may be required to support EV battery recycling which could disturb undisturbed soils. These impacts would occur in the short term, reflecting the development stage of any works undertaken. There is uncertainty over the scale of future development.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	-	**Minor negative direct effects** are identified in relation to biodiversity, flora and fauna due to infrastructure works and installation of back up storage cells and recycling points for EV batteries may	Incorporate actions for biodiversity within energy efficiency measures.

		give rise to some localised negative effects on biodiversity. These effects will occur in the short term, and continue into the longer term.	
Cultural heritage and historic environment	-	**Minor negative direct effects** are identified in relation to cultural heritage and the historic environment due to infrastructure works and installation of back up storage cells and recycling points for EV batteries may give rise to some localised negative effects on cultural heritage and historic environment. These effects will occur in the short term, and continue into the longer term.	
Landscape	-	**Minor negative direct effects** are identified in relation to landscape due to infrastructure works and installation of back up storage cells and recycling points for EV batteries may give rise to localised negative effects on terrestrial and marine environment. More significant effects could occur in more sensitive landscapes. These effects are likely to occur in the short term, and continue into the longer term.	Develop or refer to specific design guidance for renewable energy development in relation to areas of high landscape value.
Material assets	++/-	**Mixed direct effects** are identified in relation to material assets. **Significant positive effects** could arise through support for energy grid infrastructure and potential to increase flexibility, efficiency and resilience of the energy network as a whole, greater flexibility in managing demand and supply with increased resilience of significant importance in rural, remote and fragile locations. Improving the flexibility of the system to cater for variations in energy demand and further decentralising energy production, could reduce pressure on existing supply and distribution networks and improve longer term resilience to climate change impacts. Additionally, the recycling of EV batteries will have a positive effect as it will reduce the volume of waste going to landfill and ensure that materials are re-used where possible. However, **minor negative effects** are expected due to the demand for raw materials to create back up storage cells and recycling points for EV batteries. This is expected to begin in the short term and continue over the long term.	
Lifecycle assessment of GHG emissions	Direct GHG emissions will arise from the production, transport and installation of back up storage cells and recycling points for EV batteries. This may include energy intensive materials for the production of batteries, concrete, cabling and power generating infrastructure. However, these developments improve flexibility in Scotland's energy system resulting in reductions in GHG emissions in the over a long time period as improvements to the flexibility of the energy system are made. Improving the flexibility of the energy system and increasing energy storage will help Scotland meet its national targets of GHG emissions reductions. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Energy network resilience

- We will continue to seek to influence UK Government decision-making to ensure Scottish interests and all risks are fully taken account of.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	+	**Minor positive direct effects** are identified in relation to climatic factors as continuing to work with the UK Government will provide the tools and information to ensure resilience of the network to climate change, through adaptation measures.	
Population and human health	+	**Minor positive direct effects** are identified in relation to population and human health as continuing to work with the UK Government will help support energy network resilience through education and encouraging local action within communities. Minor positive indirect effects on population and human health as increasing public engagement will support reduced energy demands offering wider benefits of lower energy costs and levels of fuel poverty.	
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water.	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape.	
Material assets	0	No significant effects are identified in relation to material assets.	
Lifecycle assessment of GHG emissions	Indirect reductions in GHG emissions are expected as a result of energy network resilience. This is expected to be slow in the short term at the early stages of increased resilience with decreasing levels of GHG emissions due to lower energy demand expected from wider enhanced resilience. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Climate impacts

- We will develop the next statutory Climate Change Adaptation Programme for publication in 2024, in response to the full set of 61 risks and opportunities identified in the 2021 UK Climate Change Risk Assessment.
- We will improve our response to climate related events by facilitating the local authority roll out of the Persons At Risk Distribution (PARD) system.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	The actions support national and local adaptation to climate change. Understanding how to adapt to climate change will link in with climate change resilience and ensure the resilience of the future enhanced renewable energy network. It also ensures consideration of climate risks to future development. Therefore, **significant positive direct effects** are identified in relation to climatic factors. These effects are expected in the short to the long term.	
Population and human health	+	Development of the Climate Change Adaptation Programme will help to better understand the risks that climate change can present to communities and businesses. This will indirectly benefit communities and businesses by being able to adapt to climate change. An additional indirect benefit to decarbonising buildings through improved energy efficiency (through insulation for example) is increased resilience to hot weather/heatwaves. It will also help communities and businesses to adapt to climate change. The rollout of the Persons At Risk Distribution system will help communities and individuals respond to the effects of climate change. This will improve community resilience to climate change. This will result in **minor positive direct effects**. These effects are expected within the short to medium term.	
Air	0	No significant effects are identified in relation to air.	
Soils and geology	0	No significant effects are identified in relation to soils and geology.	
Water	0	No significant effects are identified in relation to water	
Biodiversity, flora and fauna	0	No significant effects are identified in relation to biodiversity, flora and fauna.	
Cultural heritage and historic environment	0	No significant effects are identified in relation to cultural heritage and historic environment.	
Landscape	0	No significant effects are identified in relation to landscape	

Material assets	+	**Minor positive indirect effects** are identified in relation material assets as this policy will ensure that Scotland can adapt to climate change and remains resilient. This will indirectly help reduce any risks posed from climate change. These effects are expected within the short to medium term.	
Lifecycle assessment of GHG emissions	An indirect reduction in GHG emissions is expected as this policy position will help support continued climate change resilience. Climate change adaptation will help support Scotland achieving net zero as people and communities better understand their carbon footprint and impact on the environment and climate change. This is expected to be slow but immediate in the short term at the early stages of climate action with decreasing levels of GHG emissions expected to continue into the long term. It is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets.		

Energy markets and network regulation

Electricity market arrangements, network investment, grid charging methodologies and constraint costs

Electricity Market Arrangements

- We are engaging with the UK Government to ensure that any reform of the wholesale market supports continued deployment of renewable generation and adequate protection to consumers.
- We will continue to call on the UK Government to reform the GB wholesale market to enable consumers, communities and businesses in Scotland to share the benefits of low cost renewable power.
- We will continue to call on the UK Government to reform the market to break the link between the price of electricity and the cost of gas.

Network investment

- We are working closely with network companies to support timely delivery of required electricity network infrastructure.
- We are engaging with Ofgem and the network operators to provide clear and transparent information on the impact of SG policies and targets on network infrastructure.
- We are influencing policy and regulatory reform at a UK level – for example through the Offshore Transmission Network Review (OTNR).

Grid charging methodologies

- We will continue to press for reforms to the transmission charging arrangements through Ofgem's transmission charging task force and National Grid modifications.

Constraint costs

- We will continue to work with National Grid ESO, transmission owners and Ofgem to explore opportunities to accelerate planned network investment to relieve constraints.
- We will continue to work with National Grid ESO to explore opportunities to use the value of constraints as a means of incentivising demand – such as heat and hydrogen.
- We are engaging with the UK Government to ensure that any form of the whole market supports continued deployment of renewable generation and adequate protection to consumers.

SEA topic	Score	Justification	Mitigation and enhancement
Climatic factors	++	Across the whole of Scotland there will be continued support for network infrastructure enhancement, addressing barriers to delivery of these enhancements and market mechanisms to improve access to the benefits of low-cost renewable power. To achieve net zero by 2045 the electricity network across Scotland will continue to be decarbonised with an increasing amount of electricity being generated from renewable sources and increased flexibility provided within the electricity network which will reduce GHG emissions. These actions will support increased renewable energy generation through network improvements and grid charging methodologies. Therefore, **significant positive direct and indirect effects** are identified in relation to climatic factors. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Network improvements could expand beyond heat and hydrogen.
Population and human health	++	Network infrastructure enhancement will deliver a more efficient energy system that has the potential to be more reliable and flexible. Reforming wholesale market arrangements will also reduce the costs of renewable electricity, reducing fuel poverty. Therefore, **significant positive direct and indirect effects** are identified in relation to population and human health. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Fairer charging arrangement could include reducing costs of charging an electric vehicle.
Air	+	**Minor positive direct effects** are identified in relation to air as upgrading the electricity network, increasing the efficiency and resilience of the system will reduce GHG emissions from non-renewable sources, which will also improve air quality. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Soils and geology	-	**Minor negative direct effects** are identified in relation to soils and geology as soil disturbance is expected during upgrades to electricity networks. Additionally, there is the potential for sediment disturbance and loss and compaction of soils through investing in infrastructure These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	
Water	-	**Minor negative direct effects** are identified in relation to water as potential for negative impacts to affect water environments from the construction of new and upgraded infrastructure and operational activities to support electricity networks. These effects are expected to be within both the short term and long term.	

Biodiversity, flora and fauna	-	**Minor negative direct effects** are identified in relation to biodiversity, flora and fauna as upgrading electricity networks could impact on species and their habitats. There is also particular threat to habitat fragmentation. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Existing mechanisms such as planning, EIA and HRA and consenting conditions required prior to work being undertaken.
Cultural heritage and historic environment	-	Potential for long term negative effects on both known and unknown historic and cultural heritage assets are likely to be associated with investing in infrastructure and providing charging infrastructure. Therefore, **minor negative direct effects** are identified in relation to cultural heritage and historic environment.	Existing mechanisms such as planning, EIA and HRA and consenting conditions required prior to work being undertaken.
Landscape	--	The upgrading of electricity networks has the potential to impact on the local landscape and countryside. Therefore, **significant negative direct effects** are identified in relation to landscape. The siting of new infrastructure and charging infrastructure may have a visual impact on the urban landscape. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	Existing mechanisms such as planning, EIA and HRA and consenting conditions required prior to work being undertaken.
Material assets	+/-	**Mixed effects** are identified in relation to material assets. Upgrading the electricity network and improving the flexibility may require additional infrastructure using raw materials during the construction and maintenance. There will also likely be an increase in waste during construction and maintenance of infrastructure. Therefore, minor negative direct effects are expected. Minor positive direct effects are identified as upgrading the electricity networks will improve their efficiency and allow for increased use of renewable energy. These effects are likely to occur in the short term, and continue into the longer term, as further work takes place.	The use of low carbon materials should be encouraged.
Lifecycle assessment of GHG emissions	Upgrading and enhancing Scotland's electricity networks will make significant contributions to reducing GHG emissions. Improvements to the electricity network will support the continued use of renewable energy and improve the efficiency and reliability of the electricity transmission network. However, investing in infrastructure may require the use of raw materials. Depending on the rate at which these changes are implemented, and the carbon footprint of the materials used, it is anticipated that these changes could have a net positive impact on achieving national greenhouse gas emissions targets. In the long term, it is likely that upgrading electricity networks will continue to support a renewable energy system helping to achieve net zero by 2045.		