Heat in Buildings Strategy Achieving Net Zero Emissions in Scotland's Buildings

Strategic Environmental Assessment

Environmental Report
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Table 1. List of abbreviations

"the 2005 Act"	The Environmental Assessment (Scotland) Act 2005
"the 2009 Act"	The Climate Change (Scotland) Act 2009
"the 2019 Act"	Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
"the draft Strategy"	The draft Heat in Buildings Strategy
AD	Anaerobic Digestion
AQMA	Air Quality Management Area
CCC	Committee on Climate Change
CCP and Energy Strategy	Climate Change Plan and Energy Strategy (2017)
CCS	Carbon Capture and Storage
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
EIA	Environmental Impact Assessment
GHG	Greenhouse gases
GW/ GWh	Gigawatt/ Gigawatt Hours
HES	Historic Environment Scotland
IIP	Draft Infrastructure Investment Plan (2020)
NPF	National Planning Framework
NS	NatureScot
PDR	Permitted Development Rights
PM_{10}	Particulate matter 10 µm in diameter
PPS	Plans, Programmes and Strategies
RHI	Renewable Heat Incentive
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Authority

SIMD	Scottish Index of Multiple Deprivation
SPP	Scottish Planning Policy
The Continuity Bill	The UK Withdrawal from the European Union (Scotland) Continuity Bill (2020)

Non-Technical Summary

Introduction

This is a non-technical summary of the Environmental Report of the draft Heat in Buildings Strategy ('The draft Strategy').

In order to meet our interim climate targets and ensure long-term delivery of our net-zero objectives, the Update to the Climate Change Plan[1] sets out that by 2030 around 50% of homes, or over a million households will need to convert to a zero or low emissions heating system. Reducing emissions from homes will mean converting the vast majority of the 167,000 off-gas homes that currently use high emissions oil, LPG, and solid fuels, as well as at least 1 million homes currently using mains gas, to zero-emissions heating. By 2030, we will also need to convert an estimated 50,000 of Scotland's non-domestic properties to zero emissions sources of heat. The Climate Change Plan Update was subject to a full Strategic Environmental Assessment[2]

The draft Strategy sets out actions and proposals for transforming our buildings and the systems that supply their heat, ensuring all buildings reach zero emissions by 2045. It provides an update to the 2018 Energy Efficient Scotland Route Map[3] and the 2015 Heat Policy Statement[4,] and brings together ambitions on energy efficiency and heat decarbonisation for Scotland into a single framework.

The draft Strategy introduces a 2045 vision and supporting energy efficiency and heat decarbonisation outcomes. It also sets out the intention, through a finalised Strategy, to set a new heat target, the purpose of which is to help monitor and track progress in delivering the deployment pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan.

To support the delivery of the sectoral emissions envelopes set out in the Update to the Climate Change Plan, and given that there is no single technology that will work in all places for all buildings, the draft Strategy proposes a mixed technology or blended pathway as the most effective and credible means of achieving net zero. It highlights that near-term deployment should focus on those measures and technologies that are ready for deployment now (energy efficiency measures, heat pumps and heat networks) and in the short term.

The draft Strategy also recognises that other strategic heat technologies have the potential to play an important role in decarbonising our buildings but are likely only to

[1] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online], Available at: Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot) (accessed 14/01/2020)

[2] Scottish Government (2020) Climate Change Plan 2018-2032 – update: Strategic Environmental Assessment – draft [online], Available at: Climate Change Plan 2018-2032 - update: strategic environmental assessment - draft - gov.scot (www.gov.scot) (accessed 04/02/2021)

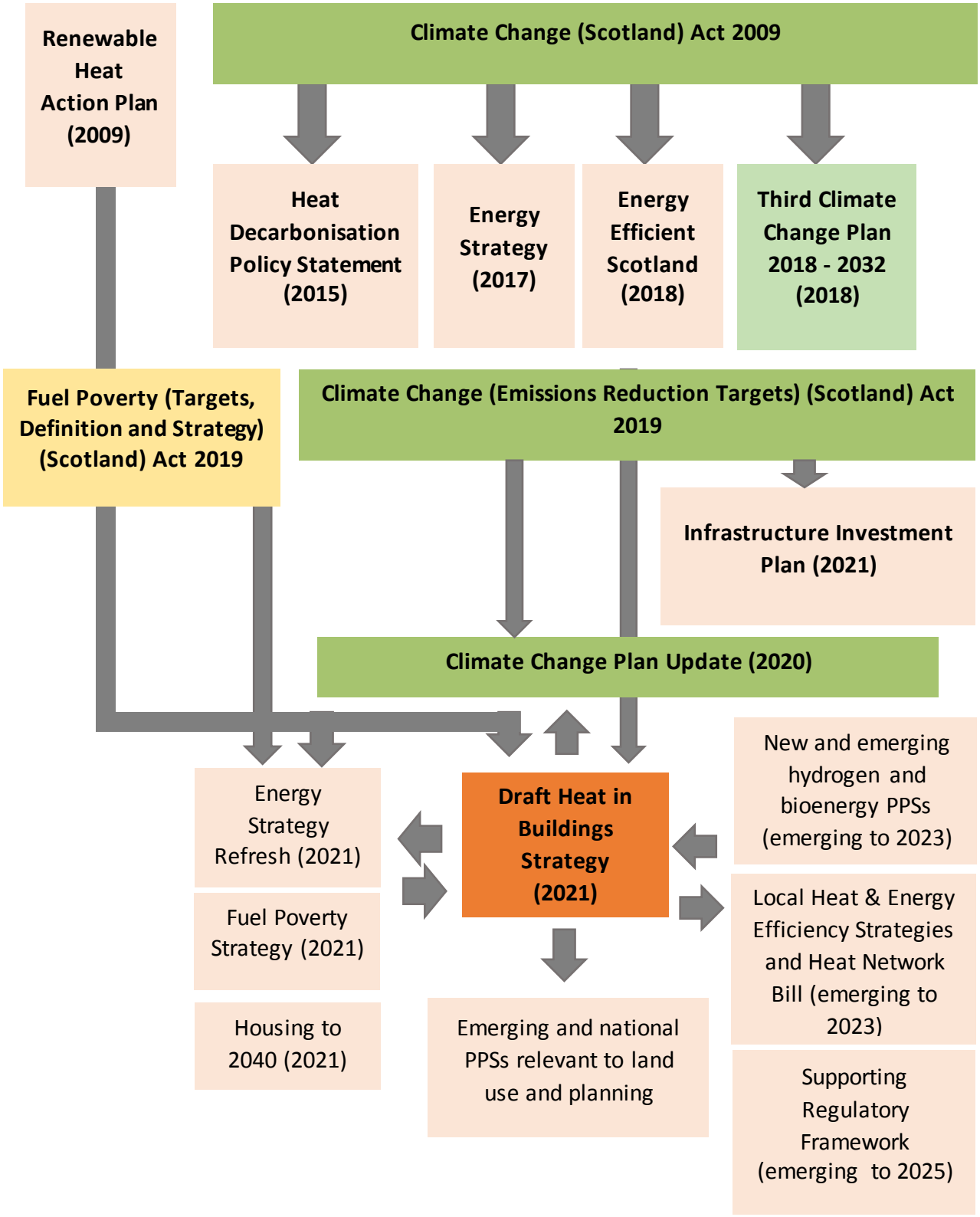
[3] Scottish Government (2018), Energy Efficient Scotland: Route map. Available at: https://www.gov.scot/publications/energy-efficient-scotland-route-map/ (accessed 10/12/19)

[4] Scottish Government (2015) Heat Policy Statement. Available at: https://www.gov.scot/publications/heat-policy-statement-towards-decarbonising-heat-maximising-opportunities-scotland/ (accessed 27/01/20)

become available at scale in the longer term, following a period of innovation and demonstration (for example, hydrogen) or will have a more limited role in decarbonising our buildings (for example, bioenergy).

Further, the draft Strategy recognises the role of a regulatory framework for zero emissions buildings. It also recognises the role of lower tier plans and strategies, such as future Local Heat and Energy Efficiency Strategies, (LHEES) in supporting the delivery of the draft Strategy's ambitions. Where any future policies and proposals are developed, these will themselves be subject to consideration in accordance with the requirements of the Environmental Assessment (Scotland) Act (2005).

The draft Strategy's policy context is presented below.


Renewable Heat Action Plan (2009)
Climate Change (Scotland) Act 2009
Heat Decarbonisation Policy Statement (2015)
Energy Strategy (2017)
Energy Efficient Scotland (2018)
Third Climate Change Plan 2018 - 2032 (2018)
Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019
Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
Infrastructure Investment Plan (2021)
Climate Change Plan Update (2020)
Energy Strategy Refresh (2021)
Fuel Poverty Strategy (2021)
Housing to 2040 (2021)
Draft Heat in Buildings Strategy (2021)
Emerging and national PPSs relevant to land use and planning
New and emerging hydrogen and bioenergy PPSs (emerging to 2023)
Local Heat & Energy Efficiency Strategies and Heat Network Bill (emerging to 2023)
Supporting Regulatory Framework (emerging to 2025)

What is Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is the assessment of the likely significant environmental effects that a public plan, programme or strategy will have on the environment if implemented. Where possible, it proposes how negative effects can be avoided or reduced and identifies opportunities for positive effects to be maximised. SEA provides an opportunity for the public to express their views on the draft Strategy and on an Environmental Report setting out the assessment findings.

The Environmental Report has been prepared in accordance with the Environmental Assessment (Scotland) Act 2005. The SEA focused on the effect of the draft Strategy on climatic factors, air, population and human health, material assets, cultural heritage and landscape.

The Environmental Report sets out the assessment findings and makes recommendations for mitigation and enhancement where appropriate. Early comments from the SEA Consultation Authorities (NatureScot, SEPA and Historic Environment Scotland) have been taken into account in shaping how the assessment has been undertaken, what it covers, and the level of detail presented in the Environmental Report.

Key Environmental Issues

CLIMATIC FACTORS: SUMMARY AND KEY ISSUES

- Observed climate change trends are likely to intensify in the future – wetter winters and drier summers with an increase in the frequency of extreme weather events and climate change can negatively impact energy infrastructure – e.g. through flooding.
- Key issues for climate change include greenhouse gas emissions from a range of sources, with energy supply and use of homes and buildings contributing to emissions.
- Climate change can also give rise to indirect effects arising from mitigation and adaptation measures.
- Climate change has also been identified as a primary pressure on many of the SEA topic areas

POPULATION AND HUMAN HEALTH: SUMMARY AND KEY ISSUES

- Scotland's population is growing and Scotland has experienced a small increase in heat demand in recent years.
- Heat in buildings accounts for approximately a fifth 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.
- The potential impacts of climate change on population and human health will not be evenly spread. (e.g. negative health impacts are likely to be disproportionately severe in area of high deprivation).

AIR: SUMMARY AND KEY ISSUES

- Whilst air quality has improved significantly, poor air quality in certain areas continues to affect human health and the environment
- Air pollution can contribute to a number of health problems and climate change may exacerbate these issues and alter current patterns and concentrations.
- Key issues for air include emissions from a number of sectors leading to air pollution with air quality and GHG emissions intrinsically linked as they both arise from broadly the same sources.
- Measures that seek to reduce emissions from buildings such as from improved energy efficiency and heat decarbonisation , have the potential to broadly contribute to improved air quality

MATERIAL ASSETS: SUMMARY AND KEY ISSUES

- Today, heat is responsible for approximately half of Scotland's energy use and buildings/ Infrastructure associated with the development/deployment of heat decarbonisation will play a key role in ensuring the future of its security of supply and decarbonisation.
- Key issues for material assets include those associated with development and infrastructure and pressure on land use.
- Changes in land use required to meet Climate change targets could also have environmental effects.

LANDSCAPE: SUMMARY AND KEY ISSUES

- Scotland has numerous designated landscapes and other landscapes areas of value and quality and changes in land use and development can affect these.
- Key issues include the potential for direct and indirect impacts on landscapes associated with the development and deployment of technologies and new infrastructure associated with heat decarbonisation .

CULTURAL HERITAGE: SUMMARY AND KEY ISSUES

- Scotland's many and varied historical sites are unique and irreplaceable.
- Development is a key pressure on the historic environment and cultural heritage, both directly in terms of damage to known and unknown features, and possible impacts on setting.

What are the conclusions of the assessment

The assessment concludes that the draft Strategy is likely to have **significant positive effects** on **climatic factors, air, population and human health** and **material assets**. This is considered likely from the introduction of a proposed new 2045 vision and wide supporting energy efficiency and heat decarbonisation outcomes that draw together existing Scottish Government policies and proposals, and from the setting of a new heat target in a finalised Strategy.

The potential for **effects in combination** with other plans, programmes and strategies has also been considered. The draft Strategy has the potential to **positively** and **cumulatively** contribute across a wide range of Scottish Government policy areas within the context in which it sits.

Taking into account the high-level nature of the draft Strategy there is however an inherent degree of **uncertainty** regarding the environmental impacts that may arise as a result of upscaling of strategically important energy efficiency measures and heat technologies now and in the future.

The assessment identifies the potential for **mixed/uncertain secondary effects on a range of SEA topics** as a result of the deployment of strategically important energy efficiency measures and heat technologies ready for deployment (including energy efficiency measures, heat pumps and heat networks) at the local level. Existing mitigation measures can help to address these.

The assessment further recognises that any **future** upscaling of heat technologies have the potential for **mixed/uncertain environmental effects across SEA topics** but precise effects would be dependent on a range of factors including the scale of development and deployment of individual technologies as well as location with respect to sensitive human, natural and cultural receptors. Existing mitigation at the local level can help to address adverse effects and relevant emerging PPS also has the potential to provide mitigation at the strategic level.

What are the proposals for mitigation and enhancement.

Where there is potential for secondary adverse effects associated with the development and deployment of strategically important energy efficiency measures and heat technologies in the short term further consideration should be given to opportunities to mitigate any such effects including at the local level. There are existing controls in place for example through the relevant consenting and licensing procedures that can help to address these. Further opportunities for strategic mitigation have also been identified.

In addition to local mitigation measures identified, the development of emerging and future PPS with a focus on specific technologies (such as national action plans), place-based approaches to energy efficiency and heat decarbonisation (such as lower tier plans) and national PPS that focus on planning and land use (such as NPF4, and the third Land Use Strategy) are particularly relevant as they could potentially provide mitigation at the strategic level.

The SEA findings support the introduction of a 2045 vision and supporting energy efficiency and heat decarbonisation outcomes. This approach, by providing a high level framework that draws together existing Scottish Government policies and proposals relating to energy efficiency and heat decarbonisation of homes and buildings can, when taken together with existing PPS, contribute to significant positive environmental effects across sectors.

The SEA findings also support the intention, through a finalised Strategy, to set a new heat target, the purpose of which is to help monitor and track progress in delivering the deployment pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan.

The SEA supports the focus of the Strategy on a mixed technology or blended pathway. By focusing on energy efficiency measures and heat technologies ready for deployment now (energy efficiency measures, heat pumps and heat networks) and recognising that hydrogen and bioenergy could play a potential role in the longer term, this can support a flexible approach to delivery of the Strategy's objectives.

The following specific opportunities for enhancement have been identified:

- To obtain the maximum environmental benefits, a focus could be given to actions that support opportunities for strategically important energy efficiency measures for people living in deprived areas and in rural areas where extreme fuel poverty rates are highest.

- To obtain maximum environmental benefits a focus could be given to deployment of zero emissions technologies in areas which currently use high carbon heating fuels, and in areas recognised as being cost effective in the short term and in areas least likely to receive a mains hydrogen supply in the longer term.
- To obtain maximum environmental benefits a focus could be given to actions that support the co-location of infrastructure associated with deployment of measures and the reuse of existing infrastructure where possible. This approach could help to support the flexible operation of smart energy networks as well as maximise benefits including helping to reduce the need for new infrastructure and electricity network upgrades as well as potential to reduce consumer bills.
- To obtain maximum environmental benefits a focus could be given to working with stakeholders, such as Historic Environment Scotland, to develop more solutions to transition Scotland's historic buildings to zero emissions heating while respecting and preserving the special characteristics of our buildings and places.

Monitoring

Section 19 of the Environmental Assessment (Scotland) Act (2005) requires the responsible authority to monitor significant environmental effects of the implementation of the PPS. This should be done in a way to enable them to take appropriate remedial action, where applicable

A wide range of existing programmes have associated monitoring in place at the national level. Building on these existing monitoring arrangements, a monitoring and evaluation framework will also be published alongside the finalised Heat in Buildings Strategy.

It is proposed that monitoring for significant environmental effects is an integral part of this framework.

What Reasonable alternatives have been considered

The 2005 Act requires the Environmental Report to identify, describe and evaluate the likely significant effects on the environmental of reasonable alternatives to a plan, programme, or strategy taking into account its objectives and geographical scope. Doing nothing is not a reasonable alternative because as a new target is now required in order to comply with S61 of the Climate Change (Scotland) Act 2009. The setting of a new heat target for buildings is required to support the delivery and the deployment pathway for reducing emissions in buildings as set out in the Climate Change Plan Update.

The assessment considers, in broad terms, the likely significant effects of the setting of a new heat target which has the delivery of net-zero objectives at its heart, which focuses on heat in buildings, and which is compatible with statutory fuel poverty targets.

We acknowledge that, in setting a new heat target there are differing levels of ambition in delivering net zero objectives. At a minimum the setting of a new heat target would need to support the delivery and the deployment pathway for reducing emissions in buildings as set out in the Climate Change Plan Update. Wherever possible the assessment seeks to draw out the potential for differing environmental effects where a new heat target supports the accelerated delivery of emissions reductions.

In terms of consideration of alternative energy efficiency and heat technology scenarios as a means to deliver a proposed target, it is considered that there are no reasonable alternatives to a mixed or blended technology pathway as the most effective and credible means of achieving our statutory emission reduction targets in the heat in buildings sector. The assessment does however draw out, wherever possible, the potential likely significant environmental effects associated with key strategic energy efficiency measures and heat technologies identified as having a role to play within the energy mix.

Next steps and consultation

Public views and comments are invited on both this Environmental report and the draft Strategy to which it relates. Responses are invited by 30 April 2021. These can be submitted:

- **Online** using the Scottish Government's consultation platform, Consultation Hub, at: https://consult.gov.scot/energy-and-climate-change-directorate/heat-in-buildings-strategy/. Consultation Hub allows you to save and return to your responses while the consultation is still open. A copy of your final response will be emailed to you.
- **By Email or Post:** Responses can be submitted by email, with the Respondent Information Form to heatinbuildings@gov.scot or by post to: Heat Strategy Unit at 5 Atlantic Quay, Glasgow G2 8LU

Following the consultation, a Post-Adoption Statement will be prepared. The Statement will reflect on the views provided on the findings of the assessment and the proposals in the Consultation Paper and will explain how the issues raised have been taken into account in finalising the Strategy.

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1. The draft Heat in Buildings Strategy ("The draft Strategy")

1.1 Introduction

1.1.1 The draft Strategy sets out actions and proposals for transforming our buildings and the systems that supply their heat, ensuring all buildings reach zero emissions by 2045. It provides an update to the 2018 Energy Efficient Scotland Route Map[5] and the 2015 Heat Policy Statement[6], and brings together ambitions on energy efficiency and heat decarbonisation for Scotland into a single framework.

1.1.2 The draft Strategy sets out a new vision as follows:

Our Vision:

"By 2045 Our Homes and Buildings are Warmer, Greener and More Efficient"

[5] Scottish Government (2018), Energy Efficient Scotland: Route map. Available at: https://www.gov.scot/publications/energy-efficient-scotland-route-map/ (accessed 10/12/19)

[6] Scottish Government (2015) Heat Policy Statement. Available at: https://www.gov.scot/publications/heat-policy-statement-towards-decarbonising-heat-maximising-opportunities-scotland/ (accessed 27/01/20)

The vision is underpinned by energy efficiency and heat decarbonisation supporting outcomes as detailed in Figure **1.**

Figure 1 – Draft Strategy Outcomes

1.1.3 This approach provides a high level framework that draws together existing and emerging Scottish Government policies and proposals relating to energy efficiency and heat decarbonisation. These underpin the high level outcomes identified and include measures to support people, places, our economy, future energy networks, delivery and investment.

1.1.4 In order to meet our interim climate targets and ensure long-term delivery of our net-zero objectives, the Update to the Climate Change Plan[7] sets out that by 2030 around 50% of homes, or over a million households will need to convert to a zero or low emissions heating system. Reducing emissions from homes will mean converting the vast majority of the 167,000 off-gas homes that currently use high emissions oil, LPG, and solid fuels, as well as at least 1 million homes currently using mains gas, to zero-emissions heating. By 2030, we will also need to convert an estimated 50,000 of Scotland's non-domestic properties to zero emissions sources of heat. The Climate Change Plan Update was subject to a full Strategic Environmental Assessment[8]

1.1.5 The consultation draft Strategy sets out the intention, through a finalised Strategy, to set a new heat target, the purpose of which is to help monitor and track progress in delivering the deployment pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan. The setting of a heat target will also help drive emissions reductions commensurate with net zero and interim climate change targets.

1.1.6 To support the delivery of the sectoral emissions envelopes set out in the Update to the Climate Change Plan, and given that there is no single technology that will work in all places for all buildings, the draft Strategy proposes a mixed technology or blended pathway as the most effective and credible means of achieving net zero. It highlights that near-term deployment should focus on those measures and technologies that are ready for deployment now (energy efficiency measures, heat pumps and heat networks) and in the short term.

1.1.7 The draft Strategy also recognises that other strategic heat technologies have the potential to play an important role in decarbonising our buildings but are likely only to become available at scale in the longer term, following a period of innovation and demonstration (for example, hydrogen) or will have a more limited role in decarbonising our buildings (for example, bioenergy).

1.1.8 Further, the draft Strategy recognises the role of a regulatory framework for zero emissions buildings. It also recognises the role of lower tier plans and

[7] Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018-2032 – update [online], Available at: Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot) (accessed 14/01/2020)

[8] Scottish Government (2020) Climate Change Plan 2018-2032 – update: Strategic Environmental Assessment – draft [online], Available at: Climate Change Plan 2018-2032 - update: strategic environmental assessment - draft - gov.scot (www.gov.scot) (accessed 04/02/2021)

strategies, such as future Local Heat and Energy Efficiency Strategies, (LHEES) in supporting the delivery of the draft Strategy's ambitions.

1.1.9 Where any future policies and proposals are developed, these will themselves be subject to consideration in accordance with the requirements of the Environmental Assessment (Scotland) Act (2005). Further detail on the draft Strategy's interaction with other plans, programmes and strategies (PPS) is provided in **Section 3.**

2. Heating Scotland's homes and buildings

2.1 Introduction

2.1.1 Buildings account for around 21% of Scotland's total greenhouse gas emissions[9]. Around 81% of homes[10] and approximately 30% of non- domestic buildings[11] using mains gas for heating. Non-domestic mains gas accounts for a greater proportion of energy use in this sector. Currently gas supplied via the mains gas network is predominantly natural gas, a fossil fuel composed mainly of methane.

2.2 Strategically Important energy efficiency measures and heat technologies ready for deployment

2.2.1 At present the main strategically important energy efficiency and low and zero emissions heat technologies that are ready for deployment in Scotland and which can make a meaningful contribution towards targets include building energy efficiency measures, heat pumps and connection to heat networks.

Energy Efficiency Measures

2.2.2 Energy efficiency measures make buildings easier to keep warm (reducing the demand for heat), and can reduce the cost of achieving thermal comfort. 'Fabric first' energy measures include draught-proofing (e.g. blocking or sealing gaps around windows, doors, and skirting boards); loft, floor and wall insulation; insulating thermal stores and heating pipes; and improving window glazing.

2.2.3 A minimum level of energy efficiency is an important prerequisite to supporting the rollout of zero and low emission heating for buildings across all technology scenarios.

Heat Pumps and Heat Networks

2.2.4 The key zero and low-emissions heating solutions available today for Scotland are heat pumps and heat networks.

2.2.5 Heat pumps provide an efficient and effective way to use electricity to heat buildings because they use electricity to draw a larger amount of heat from either air, ground or water. Heat pumps can supply heat to individual buildings or can supply a heat network.

2.2.6 Heat pumps can also be highly effective in most buildings when they are combined with appropriate energy efficiency measures. Notwithstanding this, their characteristics mean that they are not suitable for all buildings. For example, air source heat pumps require a place outside the home where an

[9] National Atmospheric Emissions Inventory. (2020), Devolved Administrations – Greenhouse Gas Reports, (National Atmospheric Emissions Inventory), URL: https://naei.beis.gov.uk/reports/reports?section_id=4

[10] Scottish Government). (2020), Scottish House Condition Survey, 2019, Table 5, (Scottish Government), URL: https://www.gov.scot/collections/scottish-house-condition-survey/

[11] Currently unpublished findings from Energy Saving Trust's modelling of Scotland's nondomestic building stock.

external unit can be fitted to a wall or placed on the ground, including space around it to ensure the flow of air. The size of heat pump will also vary depending on the home's heat demand.

2.2.7 Heat networks can heat our homes and other buildings by distributing hot water or steam through insulated pipes. The thermal energy that heats the water or steam can come from a variety of low or zero emissions sources including large-scale heat pumps, solar energy, biomass boilers, and heat captured from industrial processes such as at whisky distilleries. Estimates suggest that there were almost 30,000 homes connected to district or communal heat networks in Scotland at the end of 2018.[12] They have the potential to not only remove emissions from heating buildings but at the same time provide real consumer benefits.

2.2.8 The Committee on Climate Change has recommended that heat networks should form a significant part of Scotland's future heat supply. Heat networks can contribute to emissions reduction because they are source neutral, opening up opportunities to make use of low and zero emissions heat sources that otherwise could not be used such as low and zero emissions sources such as waste industrial heat and water.. Heat networks can also deliver heat to buildings that have limited alternative options (such as flats). Thermal storage is likely to play an important role in the operation of heat networks, helping to optimise operation and potentially reduce running costs.

2.3 Other heat technologies (Hydrogen and Bioenergy)

2.3.1 In the longer term, **hydrogen** has a potential role in decarbonising heat in buildings.

2.3.2 In broad terms there are three types of hydrogen production. So called 'Grey' Hydrogen is produced from the reforming of natural gas and this process produces both hydrogen and carbon dioxide. Blue (or low-carbon) Hydrogen is produced in the same way as grey hydrogen but the process is aligned with CCS systems which capture most of the CO2 produced, preventing it from entering the atmosphere and storing it safely in deep geological formations. Green Hydrogen is produced from the electrolysis of water, a process which splits water into its constituent parts of hydrogen and oxygen. When renewably sourced electricity is used, this process is completely green.[13]

2.3.3 The technology to produce hydrogen is well understood and in the longer term, hydrogen could also be used to displace the direct use of methane in the heating of our homes and the provision of heat and industrial processes in our heavy industries. This is because domestic central heating systems and industrial applications can potentially be adapted to use hydrogen, making the

[12] Scottish Government (2020) Annual compendium of Scottish energy statistics. Available at: https://www.gov.scot/publications/annual-compendium-of-scottish-energy-statistics/

[13] Scottish Government (2020) Hydrogen Policy Statement. Available at: Scottish Government Hydrogen Policy Statement - gov.scot (www.gov.scot) (accessed 27/01/2020)

conversion of existing gas networks to hydrogen and 'greening the gas grid' a serious consideration. [14]

2.3.4 Should the required demonstration and safety case trials prove successful, conversion of parts of the gas network in the longer term to carry 100% hydrogen could play an important role in reducing emissions from buildings to very near zero. Hydrogen may be particularly appropriate in certain locations, where there is local supply (for example from abundant renewable electricity) or where industrial demand creates economies of scale. Further, additional constraints including a repurposing of the gas network and replacement of household appliances so they are hydrogen ready, meaning that decarbonised gas is unlikely to play a large part in meeting our emissions reduction before 2030.

2.3.5 **Bioenergy** can be generated and used in a wide range of ways. Solid forms of biomass (such as forestry waste or energy crops) can be used as feedstock for combustion to produce heat. Bioenergy can be used to produce biomethane for injection into the gas grid, or further processed into liquid fuels. Certain types of bioenergy, such as food waste, may be more suitable for anaerobic digestion to produce biogas, which can then be combusted to produce heat and/or power or upgraded to biomethane.[15] .

2.3.6 In line with advice from the UK's Climate Change Committee[16] it is considered that bioenergy will have only a limited role in the future of low and zero emissions heating. The Committee recommended that bioenergy resources should only be used where their carbon reduction impact is maximised or where alternative options are not available.

[14] ibid

[15] Ricardo (2018) The potential contribution of bioenergy to Scotland's energy system. Available at: https://www.climatexchange.org.uk/media/3609/the-potential-contribution-of-bioenergy-to-scotland-s-energy-system.pdf

[16] UK Climate Change Committee (2018) Biomass in a low-carbon economy Available at: Biomass in a low-carbon economy - Climate Change Committee (theccc.org.uk) (accessed 29/01/2020)

3. Relationship with other Plans, Programmes and Strategies (PPS)

3.1 Introduction and Policy Context

3.1.1 The draft Strategy's high level policy context is illustrated in **Figure 2** below. Further detail on the relationship between the draft Strategy and other relevant Plans, Programmes and Strategies (PPS) is also included.

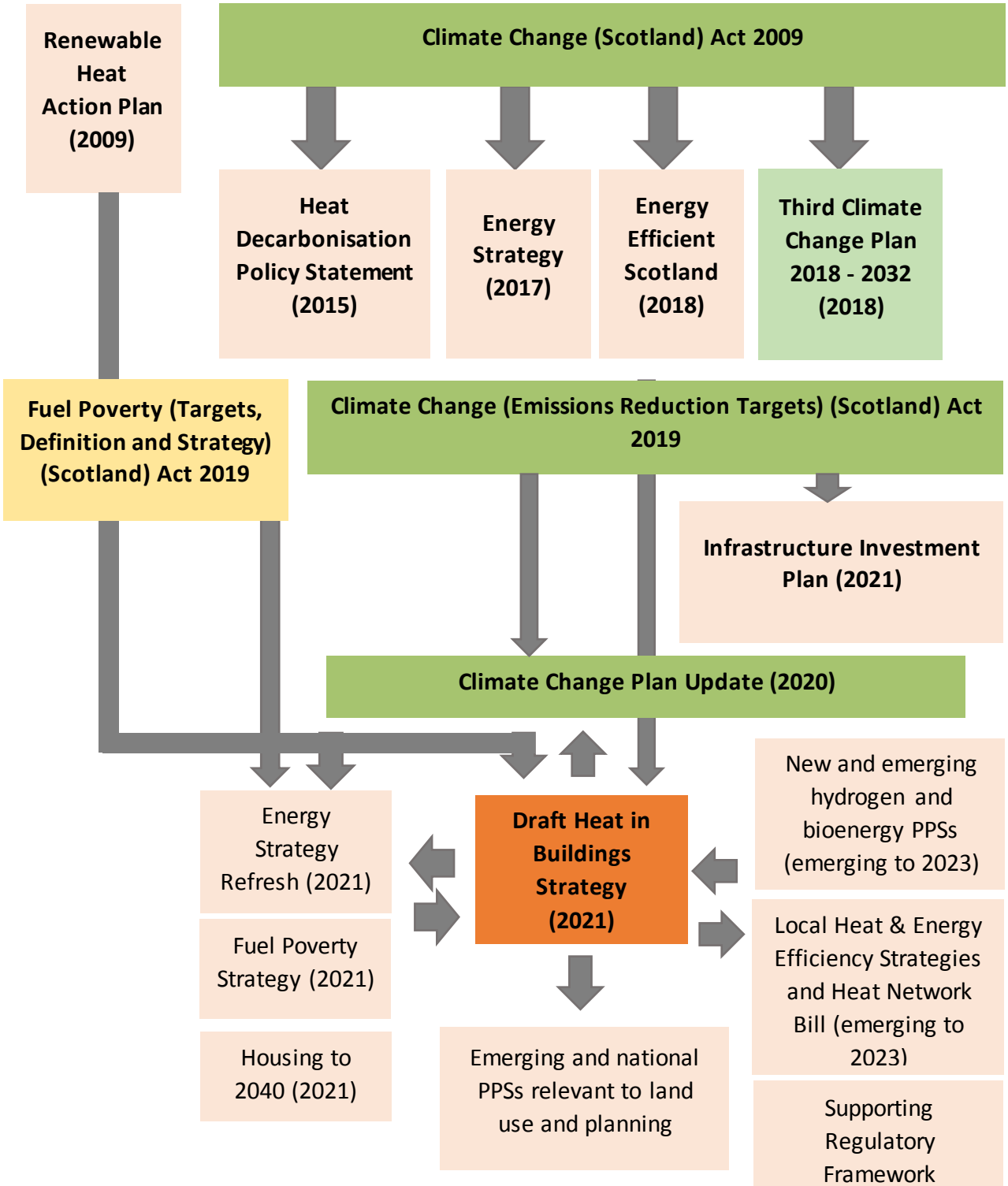

Figure 2 Policy context of the Draft Heat in Buildings Strategy

3.2 Climate and Fuel Poverty targets

Climate Change Targets

3.2.1 The draft Strategy aims to reduce the contribution of heating buildings to Scotland's greenhouse gas emissions, to help achieve ambitious climate change targets set out in legislation.

3.2.2 The Climate Change (Scotland) Act 2009[17] ("The 2009 Act") (Section 61) sets out a requirement to prepare and publish a plan for the promotion of renewable heat, including a renewable heat target, and to review the plan at least every two years. A new target is now required in order to comply with the 2009 Act's requirement and the draft Strategy seeks to fulfil this requirement.

3.2.3 Scotland's Climate Change Plan[18], published early in 2018, underlined the need to transform the way we produce, generate and use energy in Scotland - and the importance of energy as one of the key sectors of our economy. Following on from this and in response to advice from the Committee on Climate Change (CCC), published in May 2019[19], the Scottish Government acted immediately to introduce the most stringent statutory emissions reductions targets in the world.

3.2.4 The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ("the 2019 Act") [20] increases the ambition of Scotland's targets to reduce greenhouse gas emissions, including a target for net zero greenhouse gas emissions by 2045 and interim targets for reductions of 75% and 90% by 2030 and 2040 respectively. The 2019 Act also includes a range of measures to improve transparency – for example basing progress against targets on actual emissions from all sectors of the Scottish economy. There is a continuing requirement for Scottish Ministers to lay regular "Climate Change Plans" in Parliament setting out their proposals and policies for meeting targets.

3.2.5 The provisions in the 2019 Act inform the preparation of a range of Scottish Government strategic documents, including but not limited to, an update to the Climate Change Plan. The recently published Climate Change Plan update sets out the Scottish Government's pathway to our new and ambitious targets set by the Climate Change Act 2019, and is a key strategic document for Scotland's green recovery. It considers the period 2019-2032 and the level of effort that is likely to be required to meet the new 2032 greenhouse gas

[17] Scottish Parliament (2009) Climate Change (Scotland) Act [online] Available at: Climate Change (Scotland) Act 2009 (legislation.gov.uk) (accessed 14/01/2020)

[18] Scottish Government (2018) Climate Change Plan: the Third Report on Proposals and Policies 2018-2032 (RPP3) [online] Available at: https://beta.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/ (accessed 10/12/2019)

[19] Committee on Climate Change (2019) Net Zero – The UK's contribution to stopping global warming [online], Available at: https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/ (accessed 10/12/2019)

[20] Scottish Parliament (2019) Climate Change (Emissions Reduction Targets)(Scotland) Act 2019 [online] Available at: http://www.legislation.gov.uk/asp/2019/15/enacted (accessed 10/12/2019)

emissions target of 78%, as set out in the 2019 Act, in addition to taking account of the future of ambition set by the introduction of a net-zero target by 2045.

Fuel Poverty Targets

3.2.6 Statutory Fuel Poverty Targets are set in the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act (2019)[21]. The '2019 Act' sets statutory targets for reducing fuel poverty, and introduces a new definition which aligns fuel poverty more closely with relative income poverty. It requires Scottish Ministers to produce a comprehensive strategy to show how they intend to meet the new targets. Statutory 2040 fuel poverty targets require that no more than 5% of households are fuel poor, and that no more than 1% are in extreme fuel poverty by 2040.

3.2.7 Work to eradicate fuel poverty is linked to the Scottish Government's work to improve housing standards, and this has been considered as part of the 2019 Act[22]. A commitment to publish the final Fuel Poverty Strategy later in 2021 was contained within the 2020 Programme for Government.

3.3 Energy efficiency and Infrastructure

Scotland's Energy Strategy and Energy Efficient Scotland

3.3.1 Improving the energy efficiency of buildings is seen as a key driver to reducing heat demand. Scottish Ministers designated energy efficiency as a national infrastructure priority in 2015[23] and made a long-term commitment to reduce the energy demand and decarbonise the heat supply of our residential, services and industrial sectors. This commitment was then brought forwards in Scotland's Energy Strategy[24] and Energy Efficient Scotland[25].

3.3.2 Scotland's Energy Strategy[26] (2017) includes a long-term vision that by 2050 we will have a "Flourishing, competitive, local and national energy sector, delivering secure, affordable, clean energy for Scotland's households, communities and businesses". One of the Strategy's targets was for the equivalent of 50% of the energy for Scotland's heat, transport and electricity

[21] Scottish Parliament (2019), Fuel Poverty (Targets, Definition and Strategy (Scotland) Act [online] Available at: Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 (legislation.gov.uk) (accessed 10/01/2021)

[22] Scottish Government (2020) Scottish House Condition Survey 2019 [online] Available at: https://www.gov.scot/publications/scottish-house-condition-survey-2019-key-findings/ (accessed 02/02/2020)

[23] Scottish Government (2015), Infrastructure Investment Plan 2015. Available at: https://www.gov.scot/publications/infrastructure-investment-plan-2015/ (accessed 10/12/2019)

[24] Scottish Government (2017), The future of energy in Scotland: Scottish Energy Strategy. Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ (accessed 10/12/2019)

[25] Scottish Government (2017), Energy Efficient Scotland Consultation: Making our homes and buildings warmer, greener and more efficient, Available online at: https://consult.gov.scot/better-homes-division/energy-efficient-scotland/user_uploads/188061_sct0118873760-1_energy-p8.pdf (accessed (10/12/2019)

[26] Scottish Government (2017) Scotland's Energy Strategy. Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ (accessed 02/11/2020)

consumption to be supplied from renewable sources by 2030. The emerging draft Heat in Buildings Strategy will contribute to this aim.

3.3.3 The Scottish Energy Strategy will be updated in 2021. This will need to respond to the twin challenges of economic recovery from Covid-19 and Net Zero. The update can provide an opportunity to focus on the short and medium-term horizon and the sector's role in a Green Recovery.

3.3.4 The first Annual Energy Statement[27], published in May 2019 reflects on significant progress that has been made by the energy sector towards the delivery of the Energy Strategy and considers priorities and plans required to meet targets. The Statement recognises that the low and zero emissions heat sector continues to grow and commits to the publication of a Heat Decarbonisation Policy Statement in 2020 (this current draft Strategy). Scotland's programme for Government[28] recognised this commitment as a means to set out steps needed to reduce the emissions associated with heating our homes and buildings.

3.3.5 It is envisaged that this Strategy will build on the ambitious Energy Efficient Scotland route map to transform energy efficiency and support the scaling up and acceleration of existing work with the aim of reducing emissions from heating our homes and buildings to levels compatible with net zero by 2045.

3.4 Decarbonising Heating

3.4.1 In 2009, the Scottish Government adopted a target for useful renewable heat generated in Scotland to reach the equivalent of 11% of fuels (other than electricity) consumed for heat by 2020.[29] This target combined heat demand for space and water heating, cooking and industrial processes. In 2015, the Scottish Government published a Heat Policy Statement which set out the future policy direction for: addressing heat demand and its reduction; heat networks and storage; and, heat generation with a focus on using renewable and low carbon heat. The Statement set out an ambition to deliver district or communal heating to 40,000 homes or more by 2020. The most recent data available indicates that in 2018 approximately 29,600 homes were connected to district or communal heating in Scotland.[30] The statement also reaffirmed the Scottish Government's commitment to the 11% renewable heat target.

[27] Scottish Government (2019) Annual Energy Statement 2019 [online] Available at: https://www.gov.scot/publications/annual-energy-statement-2019/ (accessed 10/12/2019)

[28] Scottish Government (2019) Protecting Scotland's Future: the Government's Programme for Government for Scotland 2019-2020. Available at: https://www.gov.scot/publications/protecting-scotlands-future-governments-programme-scotland-2019-20/ (accessed 10/12/2019)

[29] Scottish Government (2009) Renewable Heat Action Plan [online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2009/11/renewable-heat-action-plan/documents/renewable-heat-action-plan-scotland-pdf/renewable-heat-action-plan-scotland-pdf/govscot%3Adocument/renewable%2Bheat%2Baction%2Bplan%2Bfor%2Bscotland.pdf (accessed 09/02/2021)

[30] Scottish Government (2020) Renewable heat target and action: 2020 update. Available at: https://www.gov.scot/publications/update-renewable-heat-target-action-2020/

3.4.2 In 2019, the Scottish Government set out a vision to 2030 for Scotland's electricity and gas networks[31], supporting an inclusive transition to a decarbonised energy system; a whole system approach across heat, transport and electricity; and smarter local energy models. It recognised 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.

3.4.3 In October 2020, an Update on Renewable Heat Target and Action[32], was published. This reported on progress towards the 11% renewable heat, stating that in 2019, useful renewable heat produced in Scotland was equivalent to 6.5% of fuels (other than electricity) consumed for heat, up from 6.2% in 2018. The statement also reported on wider progress toward heat decarbonisation, and recognised the commitment to publish a statement setting out actions to decarbonise heat supply to buildings (the Heat Decarbonisation Policy Statement – now this draft Strategy). The draft Strategy proposes to set a new heat target focused on heat in buildings, no longer including industrial heat. It seeks views on the scope and function of such a target. It also commits to continuing to publish statistics using the existing target metric for comparability.

3.4.4 Existing funding mechanisms are available to support improved energy efficiency and heat decarbonisation of homes and buildings. Scottish Government mechanisms include funding through Warmer Homes Scotland and the Low Carbon Infrastructure Transition Programme[33]. At GB-level, schemes include the GB-wide Renewable Heat Incentive (RHI)[34]. This UK Government scheme covers heat technologies such as ground and air source heat pumps and biomass boilers. The non-domestic RHI is due to close in March 2021, and the domestic RHI is due to close in March 2022. The RHI is expected to be replaced by the UK Government's Green Gas Support Scheme (due to launch Autumn 2021) and Clean Heat Grant (due to launch April 2022).

3.4.5 The 2020 – 2021 Programme for Government sets out a green recovery commitment of £1.6 billion which will directly support jobs and tackle fuel poverty. This is targeted at transforming heat and energy efficiency of buildings and rapidly accelerating the decarbonisation of homes and buildings.

[31] Scottish Government (2019), Scotland's electricity and gas networks: vision to 2030 [online], Available at: https://www.gov.scot/publications/vision-scotlands-electricity-gas-networks-2030/

[32] Scottish Government (2020) Renewable heat target and action: 2020 update [online] Available at: https://www.gov.scot/publications/update-renewable-heat-target-action-2020/

[33] Scottish Government (2020) Low Carbon Infrastructure Transition Programme. Available at: https://www.gov.scot/policies/renewable-and-low-carbon-energy/low-carbon-infrastructure-transition-programme/

[34] Ofgem (2020) Domestic Renewable Heat Incentive (RHI). Available at: https://www.ofgem.gov.uk/environmental-programmes/domestic-rhi

3.5 Infrastructure, Planning and Land Use

3.5.1 The development of the draft Strategy and its subsequent delivery will also influence and be influenced by a range of existing and emerging plans, programmes and strategies relating to infrastructure, planning and land use.

3.5.2 The Infrastructure Investment Plan for Scotland 2021-2022 to 2025-2026 was published on 4 February 2021. It sets out a long term vision of infrastructure in Scotland, which supports an inclusive, net zero carbon economy and includes details on over £26 billion of major projects and large programmes. One area of focus for the plan is decarbonising heat and boosting the energy efficiency of buildings.

3.5.3 The third National Planning Framework (NPF)[35] and Scottish Planning Policy (SPP)[36] (published 2014) is clear that planning must facilitate the transition to a low carbon economy and help to deliver Scotland's Climate change targets. Work on NPF4 is now underway to incorporate SPP including proposals for radical change to our national planning policies and a spatial strategy to support a transition to net zero and economic recovery. Potential policy changes set out in the recently published NPF4 Position Statement[37] include:

- Introducing new policies that address a wider range of energy generation technologies for example for electrical and thermal storage, and hydrogen.
- Setting out a more practical and outcome-focused approach to accelerating a transition to low and zero emissions heating in buildings, including by linking with wider policies for green and blue infrastructure and vacant and derelict land and properties and ensuring that Local Heat and Energy Efficiency Strategies inform local development planning to ensure a single coherent approach to heat planning across Scotland.
- Encourage new buildings to connect to existing heat networks, where located in a Heat Network Zone, wherever feasible; and, encouraging applications for energy from waste facilities to provide a connection to a heat network, taking into account the practical considerations involved.

3.5.4 A draft NPF4 will likely be laid in Parliament in autumn 2021 and publicly consulted on, with a view to being adopted by Scottish Ministers in 2022.

3.5.5 It is also noted that Scottish Government is currently carrying out a multi-phase review of Permitted Development Rights in Scotland. This review includes a commitment to consider the case for new or extended PDR for

[35] Scottish Government (2014), National Planning Framework 3: A Plan for Scotland: Ambition, Opportunity, Place [online], Available at: https://www.gov.scot/Topics/Built-Environment/planning/NPF3-SPP-Review/NPF3

[36] Scottish Government (2014) Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy/

[37] Fourth National Planning Framework: position statement - gov.scot (www.gov.scot)

micro-renewables and heat networks. Detailed proposals for new micro-renewable or heat network PDR are anticipated to be considered during phase 4 of the review programme[38].

3.5.6 The Second Land Use Strategy[39] as well as the emerging Third Land Use Strategy[40] are also relevant. The Third Land Use Strategy is expected to create an overall understanding of the role of existing policies, including sustainable agriculture and how these can help support the Scottish Government's sustainable land use vison and objectives.

3.6 Other recent and emerging PPS and regulations of relevance

3.6.1 In addition to emerging national PPS detailed above, the development of the draft Strategy and its subsequent delivery will also influence and be influenced by a range of emerging PPS that focus on support for heat decarbonisation and energy efficiency and the potential future role of heat technologies (such as hydrogen and bioenergy) at the national level as well as lower tier future plans and a supporting regulatory framework. These are discussed below.

3.6.2 The Housing to 2040 Strategy will present further details on how our housing can support achievement of our net zero ambitions, whilst also delivering against wider objectives.

3.6.3 Transforming our homes and buildings will also have an impact on our wider energy systems and this will be happening at the same time as action in other sectors to reduce emissions. As set out above, The Scottish Energy Strategy will be updated this year, taking into account the whole system issues raised by this draft Heat in Buildings Strategy and our wider net zero climate targets.

3.6.4 The recently published Hydrogen Policy Statement[41] provides the framework for the development of a Hydrogen Action Plan in 2021 which will provide further details on the planned approach and necessary actions to implement the policy positions outlined within it.

3.6.5 A Bioenergy Update in the first quarter of 2021 is also expected and will establish an Expert Working Group to consider and identify the most appropriate and sustainable use of bioenergy resources within Scotland. This will inform a Bioenergy Action Plan to be published in 2023.

Local Heat and Energy Efficiency Strategies (LHEES) will be in place for all local authority areas in Scotland by the end of 2023. LHEES Strategies and Delivery Plans will provide an important platform to consider both local community and wider national infrastructure issues and their associated potential environmental effects. LHEES Strategies will set out the long term

[38] Permitted development rights - phase 1 priority development types: consultation - gov.scot (www.gov.scot)

[39] Scottish Government (2016), A Land Use Strategy for Scotland 2016 – 2021 [online], Available at: https://www.gov.scot/Topics/Environment/Countryside/Landusestrategy

[40] Scottish Government (2021), Scotland's third Land Use Strategy consultation {online], Available at: Scotland's third Land Use Strategy: consultation - gov.scot (www.gov.scot)

[41] Scottish Government (2020) Scottish Government Hydrogen Policy Statement. Available at Planning Policy. Available at: Scottish Government Hydrogen Policy Statement - gov.scot (www.gov.scot):

vision for decarbonising heat in buildings and improving their energy efficiency across an entire local authority area. For each local area, LHEES Strategies will draw on a consistent data driven methodology to:

- set out how each segment of the building stock needs to change to meet national objectives, including achieving zero greenhouse gas emissions in the building sector, and the removal of poor energy efficiency as a driver of fuel poverty;
- identify indicative heat decarbonisation zones, setting out the principal means for decarbonising buildings within each zone; and
- support the prioritisation of delivery.

Developing a Regulatory Framework for Zero Emissions Buildings

3.6.6 The 2018 Energy Efficient Scotland Route Map set out the intention to use regulation to support the transformation of our buildings. Requirements on building owners to upgrade energy efficiency and install zero emissions heating systems will be an essential underpinning for driving deployment.

3.6.7 By 2025, a new regulatory framework for zero emission heating and energy efficiency for Scotland will be developed. The framework will build on our existing commitments to extend regulation for minimum energy efficiency standards to include requirements, where possible within our legal competence, to install and use zero emission heating systems. Compliance will be required by no later than 2045, with some buildings or areas being required to comply with standards earlier. This approach will complement the requirements we will put in place for new buildings to have zero emissions heating systems from 2024[42]. For non-domestic buildings, the Scottish Government will consult on a phased approach to requiring energy efficiency levels and low carbon heat supply across new and existing buildings.

3.6.8 Heat networks will play an important role in the heat transition and once passed, the Heat Networks Scotland Bill[43] will provide a new regulatory regime to be operational by the end of 2023 to support consenting of only renewable and low carbon heat networks. The Heat Networks (Scotland) Bill proposes a duty on local authorities to consider the designation of heat network zones. Should local authorities choose to do this, we envisage that LHEES will be the primary means by which these zones will be documented.

[42] Scottish Government (2020) New Build Heat Standard – Scoping Consultation [online], Available at: New Build Heat Standard - Scoping Consultation - Scottish Government - Citizen Space (accessed 26/01/2020)

[43] Scottish Parliament Heat Networks (Scotland) Bill. Available at: Heat Networks Scotland Bill – Bills (proposed laws) – Scottish Parliament | Scottish Parliament Beta Website

The Guiding Principles

3.6.9 The UK Withdrawal from the European Union (Scotland) Continuity Bill (2020) (The Continuity Bill) [44] recently completed its Parliamentary stages on 22 December 2020 and was granted royal assent in January 2021. The provisions of the Act will be brought into force later this year[45]. The UK Withdrawal from the European Union (Scotland) Continuity Act (2021) provides Scottish Ministers with a discretionary power to continue to keep devolved law in line with EU law following the end of the implementation period. and ensures Scots law can remain closely aligned with EU standards.

3.6.10 The Act includes provisions for the continuity of environmental governance in domestic arrangements, and for the continuation of the effect of the EU environmental principles as the guiding principles on the environment in Scots law. During the passage of the Continuity Act, the principle of integration requirement was added as a fifth principle to complete the guiding principles on the environment.

3.6.11 Section 11 of the Continuity Act will place a duty on public authorities to have due regard to the guiding principles on the environment when preparing a plan, programme or strategy requiring a SEA under the 2005 Act. Whilst not yet in force, nonetheless the guiding principles are set out below and have been taken into account in the preparation of this Environmental Report:

- The principle that protecting the environment should be integrated into the making of policies;
- The precautionary principle as it relates to the environment;
- The preventative principle;
- The principle that damage should be reflected at source; and
- The polluter pays principle

3.6.12 Through its vision for all buildings to reach zero emissions by 2045, the draft Heat in Buildings Strategy has environmental protection principles at its heart. The SEA considers the potential for any likely significant environmental effects arising, both positive and negative, and where appropriate seeks to identify opportunities for avoiding or mitigating negative effects and enhancing positive effects. Further information on the assessment findings can be found in section 6 of this report.

[44] Scottish Parliament (2020) UK Withdrawal from the European Union (Continuity) (Scotland) Bill {online] Available at: UK Withdrawal from the European Union Continuity Scotland Bill – Bills (proposed laws) – Scottish Parliament | Scottish Parliament Beta Website (accessed 02/02/2021)

[45] Scottish Parliament (2021) UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 [online], Available at: UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 (legislation.gov.uk) (accessed 02/02/2021)

4. Approach to the Assessment

4.1 Purpose

4.1.1 As part of the preparation of the draft Strategy the Scottish Government (SG) is carrying out a Strategic Environmental Assessment (SEA) of its proposed content. SEA is a systematic method for considering the likely significant environmental effects of certain plans, programmes and strategies. SEA involves the following key stages:

- **Screening** – determining whether the Strategy is likely to have significant environmental effects and whether an SEA is required;
- **Scoping** – establishing a method for assessment and setting out the consultation period for the Strategy;
- **Environmental Assessment** – assessing the emerging content of the Strategy and setting out its likely significant environmental effects in an Environmental Report to be published alongside the consultation draft Strategy; and
- **Post Adoption Statement** – preparing and publishing a post-adoption statement.

4.1.2 This report has been prepared in accordance with the Environmental Assessment (Scotland) Act 2005 ("the 2005 Act") and sets out the findings of the environmental assessment stage.

4.2 SEA activities to date

4.2.1 Screening and Scoping was undertaken in November/December 2019 and a combined screening and scoping report was submitted to the SEA gateway inviting views from the consultation authorities. This determined that an SEA was required due to the potential for significant positive effects on climatic factors, population and human health and air and mixed effects on material assets.

4.2.2 The comments received from the statutory consultation authorities have been taken into account in the preparation of the Environmental Report. It is noted that as the draft Strategy developed, its focus was increasingly on setting a vision for the decarbonisation of Scotland's homes and buildings and the near-term actions that can support deployment of energy efficiency measures and low and zero emissions heat technologies. As the draft Strategy developed it was considered appropriate to scope landscape and cultural heritage into the assessment to ensure that any potential significant effects linked to the identification of strategically important energy efficiency and heat technologies could be given due consideration.

4.2.3 Where the potential for localised indirect effects are identified, including on those topics scoped out of the assessment (**biodiversity, water, and soil**) these will also be noted, as relevant.

Table 2. Scoping of SEA topics

Climatic factors	✓
Biodiversity, flora and fauna	✗
Population and human health	✓
Soil	✗
Water	✗
Air	✓
Cultural and historic heritage	✓
Landscape	✓
Material assets	✓

4.3 SEA Methodology

4.3.1 The assessment methodology has been refined from that originally identified within the scoping report, which proposed a set of assessment questions. The finalised approach has been developed to reflect the high level nature of the draft Strategy. It also draws on findings from other relevant SEA work. Key stages in the assessment methodology are described below.

Assessment Stage	Description
Stage 1	Identify relevant environmental information to inform the Environmental baseline
Stage 2	Review and collate findings of previous relevant SEA Environmental reports and summarise key findings to provide an overview of known effects
Stage 3	Assess potential for likely environmental effects (including consideration of potential cumulative, synergistic and in-combination effects) of the draft Strategy's key components : • A new 2045 vision and wide supportive energy efficiency and heat decarbonisation outcomes • Setting a new heat target.
Stage 4	Consider how the key components of the draft Strategy address key environmental issues identified, and make recommendations where appropriate for enhancing environmental benefits.

4.3.2 Early assessment work identified key environmental issues across the scoped in topics. A considerable amount of work has already been undertaken exploring the environmental effects of existing energy-related (including heat decarbonisation) polices and proposals. Of significance is the SEA of the Climate Change Plan Update (2020)[46].

4.3.3 Other SEAs of relevance that have been reviewed and relevant findings taken account of include the following:

- The Heat Generation Policy Statement (2015)[47]
- The Climate Change Plan and the Energy Strategy (2017)[48]

[46] Scottish Government (2021) Strategic Environmental Assessment of the update to the Climate Change Plan 2018-2032 [online], Available at: Strategic Environmental Assessment of the update to the Climate Change Plan 2018-2032 - Scottish Government - Citizen Space (consult.gov.scot) (accessed 16/02/2021)

[47] Scottish Government (2015) Heat Policy Statement – towards decarbonising heat: Maximising the Opportunities for Scotland [online], Available at: Heat Policy Statement Towards Decarbonising Heat: Maximising the Opportunities for Scotland (www.gov.scot) (accessed 10/02/2021)

[48] Scottish Government (2017) Draft Climate Change and Energy Strategies: joint Strategic Environmental Assessments [online}, available at: Draft Climate Change and Energy Strategies: joint strategic environmental assessments - gov.scot (www.gov.scot) (accessed 10/02/2021)

- Energy Efficient Scotland (2018)[49]
- Climate Change (Emissions Targets Reduction) (Scotland) Act (2019)[50]
- The Scottish Government's Programme for Extending Permitted Development Rights in Scotland: A Sustainability Appraisal (2019)[51]
- Draft Infrastructure Investment Plan (2020)[52]

4.3.4 The finalised assessment takes the form of a broad narrative analysis of the draft Strategy's vision and the wide energy efficiency and heat decarbonisation outcomes it identifies and the proposal to set a new heat target in the final Strategy. Potential cumulative, synergistic and in-combination effects have also been considered as relevant and opportunities for environmental enhancement have also been identified.

4.4 Alternatives

4.4.1 The 2005 Act requires the Environmental Report to identify, describe and evaluate the likely significant effects on the environmental of reasonable alternatives to a plan, programme, or strategy taking into account its objectives and geographical scope.

Do nothing/Business as Usual

4.4.2 Do nothing/business as usual is not a reasonable alternative to the draft Heat in Buildings Strategy because the Climate Change (Scotland) Act 2019 requires plans to be laid that set out the pathway to reaching our net zero and interim emissions reduction targets. As such, a heat decarbonisation Strategy is necessary.

4.4.3 In relation to the setting of a target for low and zero emissions heat, a new target is required in order to comply with the Climate Change (Scotland) Act 2009[53] (Section 61), which sets out a requirement to prepare and publish a plan for the promotion of renewable heat, including a renewable heat target, and to review the plan at least every two years.

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[49] Scottish Government (2018), Energy Efficient Scotland: Strategic Environmental Assessment [online], Available at: Energy Efficient Scotland: strategic environmental assessment - gov.scot (www.gov.scot) (accessed 10/02/2021)

[50] Scottish Government (2020), Cliamte Change Bill – Strategic Environmental Assessment [online], Available at: Climate Change Bill - strategic environmental assessment: post adoption - gov.scot (www.gov.scot) (accessed 10/02/2021)

[51] Scottish Government (2019), The Scottish Government's Programme for Extending Permitted Development Rights in Scotland: A Sustainability Appraisal [online], Available at: The Scottish Government's Programme for Extending Permitted Development Rights in Scotland: A Sustainability Appraisal (www.gov.scot) (accessed 10/02/2021)

[52] Scottish Government (2020). The draft Infrastructure Investment Plan 2021-22 to 2025-26 Strategic Environmental Assessment Environmental Report [online] available at: The Draft Infrastructure Investment Plan: 2021-22 to 2025-26 Strategic Environmental Assessment Environmental Report (www.gov.scot) (accessed 10/02/2021)

[53] Scottish Parliament (2009) Climate Change (Scotland) Act 2009. Available at: https://www.legislation.gov.uk/asp/2009/12/contents

4.4.4 To date, the 2009 Renewable Heat Action Plan [54] has fulfilled this duty and set a renewable heat target for 2020.

4.4.5 In order to meet our statutory interim climate targets as set out in the Climate Change Act 2019, and ensure long-term delivery of our net-zero objectives, the Update to the Climate Change Plan sets out that by 2030 over a million households will need to convert to a zero or low emissions heating system. Reducing emissions from homes will mean converting the vast majority of the 167,000 off-gas homes that currently use high emissions oil, LPG, and solid fuels, as well as at least 1 million homes currently using mains gas, to low or zero-emissions heating. By 2030, we will also need to convert an estimated 50,000 of Scotland's non-domestic properties to low or zero emissions sources of heat.

4.4.6 The draft Strategy therefore sets out the intention, through a finalised Strategy, to set a new heat target, to help monitor and track progress along the pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan.

4.4.7 Views are invited, through the consultation, on the framing of a new target.

4.4.8 The assessment considers, in broad terms, the likely significant effects of the setting of a new heat target which has the delivery of net-zero objectives at its heart, which focuses on heat in buildings, and which is compatible with statutory fuel poverty targets. Any future target that includes industrial heat would need further consideration against the requirements of the 2005 Act.

Ambition

4.4.9 We acknowledge that, in setting a new heat target there are differing levels of ambition in delivering net zero objectives. At a minimum the setting of a new heat target would need to support the delivery and the deployment pathway for reducing emissions in buildings as set out in the Climate Change Plan Update.

4.4.10 Wherever possible the assessment seeks to draw out the potential for differing environmental effects where a new heat target supports the accelerated delivery of emissions reductions.

Consideration of alternative energy efficiency and heat technology scenarios as a means to deliver the decarbonisation of homes and buildings in line with statutory climate change targets

4.4.11 There are different strategic technologies that are available now, or could become available in the future, to reduce emissions from space and water heating. These include electric heating options such as heat pumps and storage heaters, heat networks and potentially the use of renewable or low

[54] Scottish Government (2009) Renewable Heat Action Plan. Available at: https://www.gov.scot/publications/renewable-heat-action-plan/

carbon hydrogen as a replacement for methane gas in the mains gas network. As such there is a mix of technology options for reduce emissions.

4.4.12 The main technologies available for deployment today, which are likely to remain the main strategic options for the next ten years, are electric solutions (and in particular heat pumps) and heat networks. Subject to the safety and commercial case being established we may see 100% hydrogen becoming available in parts of the gas network towards the end of the decade.

4.4.13 As such, at this point in time, it is considered that there are no reasonable alternatives to a mixed or blended technology pathway as the most effective and credible means of achieving our statutory emission reduction targets in the heat in buildings sector. The assessment does however draw out, wherever possible, the potential likely significant environmental effects associated with key strategic energy efficiency measures and heat technologies identified as having a role to play.

4.4.14 Finally, it is noted that future PPS are likely to set further and more specific ambitions in this context. Of significance will be technology specific PPS (such as any new and emerging hydrogen and bioenergy PPS) as well as lower tier plans. Where any future policies and proposals are developed, these will themselves be subject to consideration in accordance with the requirements of the Environmental Assessment (Scotland) Act.

4.5 Uncertainty and potential limitations of the assessment

4.5.1 The subject matter of this assessment means that there are a number of areas of uncertainty, some of which would only be resolved as deployment of energy efficiency measures or low and zero emissions heat technologies takes place. These include:

- The precise siting and location of any new development associated with usage and deployment of identified technologies at a range of scales (such as individual appliances as well as a need for any new or upgraded infrastructure);
- The need to secure all relevant permissions and licences (such as those associated with the operation of new heat networks);
- The role technologies could play in the longer term; and
- Relevant emerging PPS (such as national technology specific PPS and future lower tier plans).

Existing planning and consenting regimes and regulatory processes, allied to good working practices and monitoring, can help ensure that potential adverse effects are avoided and positive effects enhanced.

5. Environmental Baseline

5.1 Introduction

5.1.1 Schedule 3 of the 2005 Act requires that the following be identified when undertaking an SEA:

- Relevant aspects of the current state of the environment and its likely evolution without implementation of the plan or programme.
- Environmental characteristics of areas likely to be affected.
- Relevant existing environmental problems.
- Relevant environmental protection objectives at the international, European or national level.

5.1.2 This section sets out a high level summary of the key environmental issues relevant to the draft Strategy. This is followed by a summary of how the environment is likely to evolve in the absence of the draft Strategy.

5.2 Climatic Factors

5.2.1 The global climate is changing. Since the 1880's, human activity has led to a significant increase in atmospheric greenhouse gas emissions and global warming. This has resulted in an increase in the average temperature of the atmosphere and oceans; a reduction in snow and ice cover; and sea-level rise. In Scotland, the period 2008 – 2017 was an average of 0.7°C warmer than 1961 – 1990 and had fewer days of air and ground frost. An increase in precipitation (11%) has been observed for the same period. The amount of rain from extremely wet days across the UK has also increased by 17% with the biggest observed changes seen in Scotland.[55]

5.2.2 In general, climate change projections suggest observed climate trends will continue to intensify in the future, including:

- an increase in both summer and winter average temperatures across both low and high emission scenarios;
- drier summers and wetter winters;
- an increase in the intensity of rainfall; and
- increased risk of flooding, drought, and extreme weather events.[56]

5.2.3 A report by the Intergovernmental Panel on Climate Change (IPCC), published in October 2018, predicts that the impacts and costs of global warming of 1.5°C above pre-industrial levels will be far greater than expected,

[55] Met Office (2018) UK Climate Projections 2018: Overview Report. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf

[56] Met Office (2018) UK Climate Projections 2018: UKCP18 Climate Change Over Land. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-infographic-headline-findings-land.pdf

and consequently much worse at 2ºC[57]. Further, the IPCC also reported that 1.5ºC could be reached in as little as 11 years, and almost certainly within 20 years without major reductions in CO_2 emissions. Climate change trends such as increased risk of flooding can negatively impact energy infrastructure.

5.2.4 In 2018, the total greenhouse gas emissions (GHG) emissions in Scotland were estimated to be 41.6 million tonnes of carbon dioxide equivalent ($MtCO_2e$) .The main contributors were the transport sector (excluding international) (12.9 $MtCO_2e$), business (8.4 $MtCO_2e$) agriculture (7.5 $MtCO_2e$), energy supply sector (6.8 MtCO2e), and the residential sector (6.2 $MtCO_2e$). Relatively minor totals were reported for public sector buildings, development, and waste management. Forestry was a net carbon sink and contributed to reducing emissions by approximately 5.4 $MtCO_2e$ in 2018[58].

5.2.5 Between 1990 and 2018, there was a 45.4 per cent reduction in estimated emissions, a 34.6 MtCO2e decrease. One of the most significant contributors to this overall reduction was the fall in energy supply emissions. Energy supply for electricity and heat was historically the biggest contribution to emissions, but has seen large changes over the period, reducing from 22.7 MtCO2e in 1990 to 6.8 MtCO2e in 2018 (70.1 per cent reduction). Overall Emissions reductions in this sector are mainly due to reductions in emissions from power stations and the complete cessation of coal use in electricity generation in Scotland. In addition, this long-term decrease has been due to a switch from less efficient solid and liquid fuels to natural gas for heating, and improvements in energy efficiency.

5.2.6 Climate change can also give rise to indirect impacts arising from mitigation and adaptation measures. For example energy efficiency and heat decarbonisation of Scotland's homes and buildings contributes to meeting statutory climate change targets. However, individual technologies can have negative impacts such as localised visual effects, changes in landscape and land use, and impacts on biodiversity, water and air quality, amongst others.

5.2.7 Climate change has itself also been identified as a primary pressure on many of the SEA topic areas including soil, water, biodiversity, cultural heritage and the historic environment[59].

[57] IPCC (2018) Global Warming of 1.5oC October 2018 [online] Available at: https://www.ipcc.ch/

[58] Scottish Government (2019) Scottish Greenhouse Gas Emissions 2017. Available at: https://www.gov.scot/publications/scottish-greenhouse-gas-emissions-2018/

[59] Scottish Government 2020 Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-2032 [online], Available at: Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-203: Environmental Report (www.gov.scot) (accessed 02/02/2021)

CLIMATIC FACTORS: SUMMARY AND KEY ISSUES

- Observed climate change trends are likely to intensify in the future – wetter winters and drier summers with an increase in the frequency of extreme weather events and climate change can negatively impact energy infrastructure – e.g. through flooding.
- Key issues for climate change include greenhouse gas emissions from a range of sources, with energy supply and use of homes and buildings contributing to emissions.
- Climate change can also give rise to indirect effects arising from mitigation and adaptation measures.
- Climate change has also been identified as a primary pressure on many of the SEA topic areas

5.3 Population and human health

5.3.1 Scotland has a population of around 5.4 million people. Its population density is among the lowest in Europe[60], although there is significant variation between highly urbanised areas in the Central Belt and rural and island areas including the Western Isles, the Highlands, and areas of Fife.61 By 2041, Scotland's population is expected to rise to around 5.7 million.62

5.3.2 Population and economic growth has increased energy demand globally[63]. In Scotland, heat demand dropped by 18.6% from 2005-07 to 2016, but has risen by 1.4% in the last two years.[64]

[60] House of Commons Scottish Affairs Committee (2016) Demography of Scotland and the implications for devolution - Second Report of Session 2017-17 [online] Available at: https://publications.parliament.uk/pa/cm201617/cmselect/cmscotaf/82/82.pdf (accessed 27/12/2018)

[61] National Records of Scotland (2017) Mid-Year Population Estimates Scotland, Mid-2016 – Population estimates by sex, age and area [online] Available at: https://www.nrscotland.gov.uk/files//statistics/population-estimates/mid-year-2016/16mype-cahb.pdf (accessed 27/12/2018)

[62] National Records of Scotland (2017) Population of Scotland [online] Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/scotlands-facts/population-of-scotland (accessed 07/08/2018)

[63] OECD (2011) OECD Green Growth Studies: Energy. Available at: https://www.oecd.org/greengrowth/greening-energy/49157219.pdf

[64] Scottish Government (2019) Annual energy statement 2019. Available at: https://www.gov.scot/publications/annual-energy-statement-2019/pages/3/

5.3.3 Life expectancy has generally been increasing in Scotland over the last 35 years. Since 1981, life expectancy has increased to 75.3 years and 77.1 years for males and females respectively. However, life expectancy in Scotland remains lower than the UK average and is the lowest of all UK constituent countries for both males and females.[65]

5.3.4 The Scottish Index of Multiple Deprivation (SIMD), which identifies small concentrations of multiple deprivation across all of Scotland, shows that the 15% most deprived data zones in Scotland are located predominantly in urban areas, including Glasgow, Dundee, and Edinburgh.[66]

5.3.5 Buildings account for around 21% of Scotland's total greenhouse gas emissions[67]. Around 81% of homes[68] and approximately 30% of non-domestic buildings[69] using mains gas for heating. Non-domestic mains gas accounts for a greater proportion of energy use in this sector. Currently gas supplied via the mains gas network is predominantly natural gas, a fossil fuel composed mainly of methane. Challenging weather, poor energy efficiency and reduced heating options (especially in rural areas) can contribute to making fuel bills unaffordable, resulting in fuel poverty.[70]

5.3.6 Fuel poverty is affected by levels of household income, the price of fuel required for space and water heating, the energy efficiency of housing and the use of fuel in households. In 2019 an estimated 24.6% (around 613,000 households) of all households were in fuel poverty. This is similar to the 2018 fuel poverty rate of 25.0% (around 619,000 households) but lower than that recorded in the survey between 2012 and 2015. 12.4% (or 311,000 households, a subset of the 613,000 in fuel poverty) were living in extreme fuel poverty in 2019 which is similar to the 11.3% (279,000 households) in the previous year but a decrease from the peak of 16% (384,000 households) in 2013. The median fuel poverty gap (adjusted for 2015 prices) for fuel poor households in 2019 (£700) was higher than in 2018 (£610) but similar to the median gap in 2012 to 2017. Between 2018 and 2019, rates of fuel poverty increased in remote rural areas (from 33% to 43%), increasing the gap when comparing overall urban (24%) to overall rural areas (29%). Similarly, levels of extreme fuel poverty increased in remote rural areas (from 23% to 33%), meaning that extreme fuel poverty rates in rural areas (19%) were higher than

[65] National Records of Scotland (2017), Life Tables for Scotland 2014-2016 [online], Available at: https://www.nrscotland.gov.uk/files//statistics/life-expectancy-at-scotland-level/nat-life-14-16/2014-2016-nat-life-tabs-report.pdf (accessed 07/08/2018)

[66] Scottish Government (2016) Scottish Index of Deprivation 2016 [Available at: https://beta.gov.scot/publications/scottish-index-multiple-deprivation-2016/pages/7/ (accessed 07/08/2018)

[67] National Atmospheric Emissions Inventory. (2020), Devolved Administrations – Greenhouse Gas Reports, (National Atmospheric Emissions Inventory), URL: https://naei.beis.gov.uk/reports/reports?section_id=4

[68] Scottish Government). (2020), Scottish House Condition Survey, 2019, Table 5, (Scottish Government), URL: https://www.gov.scot/collections/scottish-house-condition-survey/

[69] Currently unpublished findings from Energy Saving Trust's modelling of Scotland's nondomestic building stock.

[70] Scottish Government (undated) Home energy and fuel poverty [online] Available at: Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-203: Environmental Report (www.gov.scot) (accessed 02/02/2020)

in urban areas (11%). This increase reflects the high proportion of rural households which use electricity and other fuel types (such as solid mineral fuels) as their primary fuel type and the associated increase in fuel prices for these fuel types between 2018 and 2019. Levels of fuel poverty among households using electricity as their primary heating fuel have remained the highest, at 43%, compared to households using gas (22%), oil (28%) and other fuel types (31%) as their primary heating fuel in 2019 [71]

5.3.7 Work to eradicate fuel poverty is linked to the Scottish Government's work to improve housing standards, and this has been considered as part of the Fuel Poverty (Target, Definition and Strategy) (Scotland) Act[72]and the draft Fuel Poverty Strategy for Scotland 2018 [73].

5.3.8 Flooding can have significant environmental impacts and can also affect people, communities and businesses. When floods occur they disrupt day-to-day lives and their impacts can be long lasting. Climate change is expected to increase the risk of flooding, and it also brings additional risks to human health posed by changes to air quality and rising temperatures.[74]

5.3.9 The potential impacts of climate change on population and human health will not be evenly spread[75]. For example, pockets of dense urban development will be more at risk from surface water flooding and summer heat stress. In addition the effects to human health form climate change may have the

POPULATION AND HUMAN HEALTH: SUMMARY AND KEY ISSUES

- Scotland's population is growing and Scotland has experienced a small increase in heat demand in recent years.
- Heat in buildings accounts for approximately a fifth 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.
- The potential impacts of climate change on population and human health will not be evenly spread. (e.g. negative health impacts are likely to be disproportionately severe in area of high deprivation).

[71] Scottish Government (2020) Scottish House Condition Survey 2019. Available at: https://www.gov.scot/publications/scottish-house-condition-survey-2019-key-findings/

[72] The Scottish Parliament (undated), Fuel Poverty (Targets Definitions Strategy) Act 2019. Available at: https://www.legislation.gov.uk/asp/2019/10

[73] Fuel Poverty Strategy for Scotland (2018). Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/publication/2018/06/draft-fuel-poverty-scotland-2018/documents/00537470-pdf/00537470-pdf/govscot%3Adocument

[74] Scottish Government (2020) Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-2032 [online], Available at: Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-203: Environmental Report (www.gov.scot) (accessed 02/02/2021)

[75] SPICe (2012) SPICe Briefing - Climate Change and Health in Scotland. Available at: http://www.parliament.scot/ResearchBriefingsAndFactsheets/S4/SB_12-26rev.pdf

greatest impact on vulnerable people. Negative health impacts are likely to be disproportionately severe in areas of high deprivation because of the reduced ability of individuals and communities in these areas to prepare, respond and recover.[76]

5.4 Air

5.4.1 Air quality is affected by pollutants released into the atmosphere through human activity as well as from natural sources. Urban air quality has improved significantly since the 1950s. Emissions of the eight main air pollutants are lower in 2017 than they were in 1990. This rate of decline is relatively similar for particulate matter (PM10 and 2.5), oxides of nitrogen (NOx), non-methane volatile organic compounds (NMVOC), sulphur dioxide (SO2) and carbon monoxide (CO). Lead (Pb) shows a much higher rate of reduction from 1990 to 2000 coinciding with the phase-out of leaded petrol from 2000, while ammonia (NH_3) emissions have declined at a slower rate than other pollutants[77]. Despite this, in certain areas, poor air quality continues to negatively affect human health and the environment.

5.4.2 In regard to the domestic environment, since 2005 there has been an increase in emissions from the domestic sector due to an increase in popularity of open fires and wood burning stoves[78]. Approximately 38% of UK primary particulate matter emissions come from burning wood and coal in domestic open fires and solid fuel stoves. This compares with industrial combustion (16%) and road transport (12%)[79].

5.4.3 Air pollution can contribute to a number of health problems and climate change may exacerbate these issues and alter current patterns and concentrations of air pollution. For example, air pollution can lead to and exacerbate existing health problems such as respiratory conditions, and lead to reduced life expectancy.[80]

5.4.4 Where air standards are not being met, local authorities in Scotland have set up Air Quality Management Areas (AQMAs) to help reduce pollution. There are currently 38 AQMAs across Scotland's 32 Local Authorities and these have been established primarily as a result of road traffic emissions. Between 1990 and 2015 there have been reductions in emissions across all pollutants including ammonia (10%), PM_{10} (63%), NMVOC (66%), nitrogen oxides

[76] Scottish Government (2020) Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-2032 [online], Available at: Strategic Environmental Assessment of the Update to the Climate Change Plan 2018-203: Environmental Report (www.gov.scot) (accessed 02/02/2021)

[77] National Atmospheric Emissions Inventory (2019) Air Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2017. Available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1910031755_DA_Air_Pollutant_Inventories_1990-2017_Issue_1.1.pdf (accessed 11/03/2020)

[78] DEFRA (2018) Consultation on the cleaner domestic burning of solid fuels and wood [online]. Available at: https://consult.defra.gov.uk/airquality/domestic-solid-fuel-regulations/ (accessed 11/02/2020)

[79] ibid

[80] Scotland's Environment (2016) Air quality [online]. Available at: https://www.environment.gov.scot/our-environment/air/air-quality/ (accessed 10/12/19)

(71%), carbon monoxide (83%), sulphur dioxide (92%) and lead (99%). The majority of these are declared in urban areas and primarily as a result of traffic emissions.[81]

5.4.5 Key issues for air include emissions from a number of sectors leading to air pollution, with air quality contributing to a number of health problems. Air quality and GHG emissions are intrinsically linked as they both arise from broadly the same sources. Measures that seek to reduce emissions from buildings such as from improved energy efficiency and heat decarbonisation, have the potential to broadly contribute to improved air quality.

AIR: SUMMARY AND KEY ISSUES

- Whilst air quality has improved significantly, poor air quality in certain areas continues to affect human health and the environment
- Air pollution can contribute to a number of health problems and climate change may exacerbate these issues and alter current patterns and concentrations.
- Key issues for air include emissions from a number of sectors leading to air pollution with air quality and GHG emissions intrinsically linked as they both arise from broadly the same sources.
- Measures that seek to reduce emissions from buildings such as from improved energy efficiency and heat decarbonisation , have the potential to broadly contribute to improved air quality

5.5 Material assets

Energy, development and infrastructure

5.5.1 Heat (in buildings and industry) makes up approximately half of Scotland's energy consumption (52%) with transport (24.4%) and electricity (23.5%) making up approximately a quarter each. A breakdown by sector of non-transport energy consumption shows that 58.1% is accounted for by industrial and commercial sectors, with 41.9% consumed domestically. Domestic consumption of electricity and heat dropped by 20.1% in 2016, with energy consumption in transport decreasing by 2.7%. It is estimated that 20% of Scotland's total energy consumption in 2017 came from renewable sources; the highest level to date and an increase from 16% in 2016. This is attributed to an increase in installed capacity for renewable electricity and heat in 2016. In 2018, provisional figures indicate that the equivalent of 74.6% of gross

[81] Scottish Government (2018), Energy Efficient Scotland SEA Environmental Report, Available at: https://www2.gov.scot/seag/seagDocs/SEA-01352/20154.PDF (accessed 10/12/2019)

electricity consumption was from reviewable sources, rising from 70.3% in 2017.[82]

5.5.2 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. In turn, fossil fuel generation is at its lowest level, with just 10.5% of all electricity generated from oil and gas, compared to 48.4% in 2010. In 2019, useful renewable heat generated in Scotland was equivalent to 6.5% of the fuel consumed for non-electrical heat demand, an increase from 6.2% in 2018 and from 0.9% in 2008.[83]

5.5.3 Infrastructure will play a key role in ensuring security of supply and decarbonising our energy systems in the most cost effective, affordable way. Energy storage is likely to be an increasingly important part of the transition to delivering clean, affordable and secure supplies of energy[84].

5.5.4 Support for energy efficiency and heat decarbonisation as a means to deliver emission reductions from Scotland's homes and buildings is likely to require new or expanded infrastructure at a range of scales.

Land Use

5.5.5 Key land uses in Scotland include agriculture and forestry, covering over 75% of Scotland's land mass[85,86].

5.5.6 Intensive land management practices, such as the use of high levels of fertilisers and pesticides, is one of the key pressures on land with a shift toward intensification having the possibility to lead to negative impacts across a number of topics including biodiversity[87] and soil[88].

In the context of heat generation, effects will depend on the scale of technology deployment and type of technology used. Whilst recognised that bioenergy, in particular bio heating oil, bioLPG and biomass may represent the only practicable option for heat decarbonisation for a small number of

[82] Scottish Government (2019) Annual Compendium of Scottish Energy Statistics May 2019 Update [online] Available at: Annual Compendium of Scottish Energy Statistics (www.gov.scot) (accessed 02/02/2020)

[83] Energy Saving Trust (2020) Renewable Heat in Scotland, 2019. Available at: https://energysavingtrust.org.uk/wp-content/uploads/2020/10/Renewable-Heat-in-Scotland-2019_new.pdf

[84] ClimateXChange (2016) Energy Storage in Scotland - Summary of reports on thermal and electrical energy storage [online] Available at: https://www.climatexchange.org.uk/media/1391/summary_energy_storage.pdf (accessed 14/01/2020)

[85] Scottish Natural Heritage, (2018). Farming and crofting. Available at: https://www.nature.scot/professional-advice/land-and-sea-management/managing-land/farming-and-crofting

[86] Forestry Research (2019) Forestry Statistics 2019. Available at: https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2019/

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

[88] Scotland's Soils (undated) Extent of soil erosion and landslides [online] Available at: http://www.soils-scotland.gov.uk/context/erosion

buildings, in principle, an increase in use of bioenergy to supply heat (or fuels for heat) could result in land take for the production of energy crops.

MATERIAL ASSETS: SUMMARY AND KEY ISSUES

- Today, heat is responsible for approximately half of Scotland's energy use and buildings/infrastructure will be an important underpinning for heat decarbonisation.
- Key issues for material assets include those associated with development and infrastructure and pressure on land use.
- Any changes in land use required to meet climate change targets could also have environmental effects.

5.6 Landscape

5.6.1 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 well-being of its people. Scotland's landscapes play a key role in attracting tourism, affording opportunities for business and providing the setting for outdoor recreation.

5.6.2 The European Landscape Convention[89] establishes the principles for landscape work in Scotland. This highlights that all landscapes matter, they are a shared asset for all, and that people and communities should be involved in decisions affecting their landscapes. NatureScot's Landscape Character Assessment dataset[90] also recognises that much of our valued landscape resource is out-with protected areas.

5.6.3 Scotland's landscapes are constantly changing and evolving in response to both natural processes and the changing demands of society. Regional and local landscapes are becoming less distinct as a result of more similarity in building form, settlement patterns, and agricultural practices with pressures also arising from renewable and other low and zero emissions energy technologies. Similarly, in agriculture there has been a focus on maximising yields which has resulted in a move towards a monoculture, at the expense of a more diverse landscape of field types and hedgerows[91]. 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[92].

5.6.4 Climate change is expected to lead to extensive landscape change across Scotland with the greatest changes likely to occur in lowland and coastal areas where human population is highest. Direct impacts are likely as a result of changing temperatures and patterns of precipitation, weather events, and sea-level change. However, mitigation and adaptation measures are expected to have a greater influence on both Scotland's landscapes and quality of life than the direct effects of climate change[93].

5.6.5 For example, while the decarbonisation of heat is crucial to meeting Scotland's emissions reduction targets, individual technologies have the

[89] NatureScot (2020) European Landscape Convention. Available at: https://www.nature.scot/professional-advice/landscape/framework-landscape-policy/european-landscape-convention

[90] NatureScot (2020) Landscape Character Assessment. Available at: https://www.nature.scot/professional-advice/landscape/landscape-character-assessment

[91] Scotland's Environment (2014) Landscape [online] Available at: https://www.environment.gov.scot/media/1196/land-landscape.pdf (accessed 14/01/2020)

[92] ibid

[93] NatureScot (2019) Landscape: Climate change [online] Available at: https://www.nature.scot/professional-advice/landscape/landscape-policy-and-guidance/landscape-climate-change (accessed 08/01/2020)

potential for environmental impacts dependant on the scale and location of their development and deployment.

5.6.6 Key issues related to heat decarbonisation include the development and deployment of technologies, such as those associated with biomass technologies, and new infrastructure. Dependant on the scale of deployment and type of technology used, these have the potential to alter the distinctive character of existing landscape settings – both within the urban environment and beyond.

LANDSCAPE: SUMMARY AND KEY ISSUES

- Scotland has numerous designated landscapes and other landscapes areas of value and quality and changes in land use and development can affect these.
- Key issues include the potential for direct and indirect impacts on landscapes associated with the development and deployment of technologies and new infrastructure associated with heat decarbonisation.

5.7 Cultural and historic heritage

5.7.1 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.

5.7.2 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 2016, it is estimated that around 5-10% of the historic environment is designated[94].

5.7.3 Designated assets currently include World Heritage Sites, listed buildings, scheduled monuments, conservation areas and Historic Marine Protected Areas. 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. Scotland's historic environment resonates internationally and nationally, as well as being culturally important to local communities.

5.7.4 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, such as through the installation of

[94] Historic Environment Scotland (2016) Scotland's Historic Environment Audit: Summary Report 2016 [online] Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=315b3f0d-631b-4a24-b12b-a6db00ba1696 (accessed 14/01/2020)

infrastructure such as pipelines; as well as pressure from tourism/visitors, and climate change[95]. An example of these pressures is development associated with the installation and operation of fabric first energy efficiency measures, technologies such as heat pumps as well as any land management change associated with bioenergy. Climate change related impacts include damage to masonry, risk of dampness, condensation and fungal growth, vegetation growth, and accelerated decay. Historic landscapes and sites within the coastal zone are particularly vulnerable and this and these threats are likely to grow in the future, given the future predictions of the likely effects of global warming and climate change for the remainder of this century. Action to mitigate and adapt to the effects of climate change are also likely to have a significant effect.

CULTURAL HERITAGE: SUMMARY AND KEY ISSUES

- Scotland's many and varied historical sites are unique and irreplaceable.
- Development is a key pressure on the historic environment and cultural heritage, both directly in terms of damage to known and unknown features, and possible impacts on setting.

5.8 Likely evolution of the environment without implementation of the draft Strategy

5.8.1 The draft Strategy has a key role to play through ensuring that sufficient actions are in place to support heat decarbonisation and energy efficiency of Scotland's homes and buildings in order to contribute to statutory climate change targets.

5.8.2 The draft Strategy will support the acceleration of GHG emissions reductions associated with Scotland's homes and buildings in line with ambitious climate change targets. In the absence of the draft Strategy heat decarbonisation of homes and buildings might continue along observed trends meaning that decarbonising heat will take longer and will not be in line with the required pathway for reducing emissions in buildings as set out in the Update to the Climate Change Plan.

[95] Historic Environment Scotland (2019) Historic Environment Policy for Scotland [online] Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7

6. Findings of the Assessment

6.1 Introduction

6.1.1 A staged approach to the assessment has been undertaken as set out in the Assessment methodology (See **Section 4.3**). Early assessment work included a review of relevant SEA environmental reports to identify known likely environmental effects. See **Appendix A** for further details.

6.2 What are the Key Proposals

A proposed new 2045 vision and wide supportive energy efficiency and heat decarbonisation outcomes

6.2.1 To support the pathway to zero emissions for homes and buildings the draft Strategy introduces a new 2045 vision and recognises a wider set of high level outcomes that will benefit Scotland's people and places (See **Section 1** for further details). These outcomes, aligned with the National Performance Framework, will guide decision making and support the development of a holistic, people centred approach to the transition to net zero. The vision and outcomes draw together a range of Scottish Government policies and proposals relevant to energy efficiency and heat decarbonisation such as those that focus on climate change, energy and housing.

Setting a new heat target

6.2.2 The draft Strategy sets out the intention, through a finalised Strategy, to set a new heat target, the purpose of which is to help monitor and track progress in delivering the deployment pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan. The target will also help drive emissions reductions commensurate with net zero and interim climate change targets.

6.2.3 The draft Strategy recognises that those measures ready for deployment (energy efficiency measures, heat pumps and heat networks) have an important strategic role now. It further recognises the potential future role that hydrogen and bioenergy could play in the longer term.

6.3 What are the environmental issues of relevance

6.3.1 Key environmental issues of relevance relate to the SEA topics of climatic factors, air, population and human health, material assets, landscape and cultural and historic heritage.

6.3.2 Key issues for **climatic factors** include greenhouse gas emissions from a range of sources, with energy supply and use of homes and buildings contributing to emissions. Observed climate change trends (such as wetter winters, drier summers and extreme weather events) are likely to intensify in the future and this can negatively impact on energy infrastructure (such as through flooding). Climate change can also give rise to indirect effects arising from mitigation and adaptation measures. For example energy efficiency and heat decarbonisation of Scotland's homes and buildings contributes to meeting statutory climate change targets. However, individual technologies can have negative impacts such as localised visual effects on cultural and

historic heritage, changes in landscape and land use, and impacts on biodiversity, water and air quality, amongst others. Climate change has also been identified as a primary pressure on many of the SEA topic areas.

6.3.3 Key issues for **population and human health** include challenging weather, poor energy efficiency and reduced heating options (especially in rural areas) which can contribute to making fuel bills unaffordable, resulting in fuel poverty. The potential risks and benefits of climate change on population and human health will not be evenly spread. For example, areas of dense urban development will be more at risk from surface water flooding and summer heat stress. In addition the effects to human health from climate change may have the greatest impact on vulnerable people. Negative health impacts are likely to be disproportionately severe in areas of high deprivation because of the reduced ability of individuals and communities in these areas to prepare, respond and recover.

6.3.4 Key issues for **air** include emissions from a number of sectors leading to air pollution, with air quality contributing to a number of health problems. Air quality and GHG emissions are intrinsically linked as they both arise from broadly the same sources. Measures that seek to reduce emissions from buildings such as from improved energy efficiency and heat decarbonisation, have the potential to broadly contribute to improved air quality.

6.3.5 Key issues for **material assets** include those associated with development and infrastructure and pressure on land use. Energy efficiency and heat decarbonisation as a means to support emission reductions from Scotland's homes and buildings will require new or expanding infrastructure facilities at a range of scales[96]. Changes in land use required to meet wider climate change targets could also have environmental effects.

6.3.6 Key issues for **landscape** include the potential for direct and indirect impacts associated with the development and deployment of energy efficiency measures and heat technologies and their associated infrastructure. For example, land use change and intensification associated with incremental and on-going development such as infrastructure and energy projects.

6.3.7 Key issues for **cultural heritage** include development which is a key pressure on the historic environment and cultural heritage, both directly in terms of damage to known and unknown features, and possible impacts on setting such as changes to the fabric of buildings.

6.4 What are the likely significant environmental effects of key proposals

A proposed new 2045 vision and wide supportive energy efficiency and heat decarbonisation outcomes

[96] Scottish Government (2019) Review of the Scottish Planning System - Planning Bill: strategic environmental assessment Environmental Report [online], Available at: A18245998_FINAL.pdf (consult.gov.scot) (accessed 03/02/2020)

6.4.1 The proposed new vision and high level outcomes provide a high level framework that draws together existing Scottish Government policies and proposals relating to energy efficiency and heat decarbonisation of homes and buildings. When taken together with existing PPS this can contribute to **significant positive effects** for **climatic factors, population and human health, air and material assets**.

6.4.2 For example, where the vision and outcomes focus on sustainable sourcing of fuels consistent with net zero targets and support for flexible and stable energy networks for example, these can contribute to broad environmental benefits for **climatic factors, air**, **population and human health** and **material assets**. Where outcomes focus on reducing fuel poverty and sustainable jobs for example, these can contribute to broad environmental benefits for **population and human health.** Where outcomes recognise existing biodiversity targets this can also contribute to broad environmental benefits for **biodiversity, soil and water**.

Strategically important energy efficiency measures and heat technologies in the short term

6.4.3 In particular, it is considered likely that a focus on strategically important energy efficiency measures and heat technologies ready for deployment will **broadly** and **cumulatively** contribute to **significant positive effects** for **climatic factors, air, population and human health** and **material assets** in the **short term**.

6.4.4 For example, **cumulative positive effects** for **climatic factors** are considered likely as a result of reducing GHG emissions associated with broad support for measures that reduce the overall demand for heat. Associated **air quality** improvements are also considered likely due to linkages between sources of GHG emissions and air pollutants such as particulate matter.

6.4.5 **Cumulative positive effects** for **population and human health** are also considered likely where a focus is given to reducing fuel poverty. For example, fabric first measures can help to reduce the cost of achieving thermal comfort. Individual heat pumps can also be highly effective in most buildings when they are combined with appropriate energy efficiency measures. Real consumer benefits can also arise where the draft Strategy supports more affordable and locally available supplies of heat associated with heat networks.

6.4.6 **Cumulative positive effects** for **material assets** are also considered likely as a result of benefits associated with a greater diversity in technologies and future-proofing energy supply as a means to support greater resilience to the effects of climate change.

6.4.7 **Mixed/uncertain secondary effects** on a **range of SEA topics** could also occur as a result of the take up of strategically important energy efficiency measures and heat technologies ready for deployment. Effects could range from **permanent** to **temporary** and significance would be dependent on a number of factors, including scale, siting and design. These are discussed further below.

Energy efficiency measures

6.4.8 **Localised mixed/uncertain secondary effects** on a **range of SEA topics** could occur as a result of the deployment of energy efficiency measures. Any potential adverse effects are considered likely to be **largely localised** because they relate to the fabric of individual buildings.

6.4.9 For example, the installation and operation of efficiency measures could in principle give rise to some localised **negative effects** on **biodiversity** (as a result of works undertaken to roof cavities (i.e. insulation) which may hold bat roosts), on **cultural and historic heritage** (such as directly from visual impacts on settings), and on **landscapes** (such as directly from visual impacts on settings). Localised negative effects on **population and human health** and **air** quality in the short term could also occur (such as from construction activities and development work) but these are considered likely to be **temporary** in nature. **Localised positive effects on population and human health** are also considered likely (as a result of reducing the cost of achieving thermal comfort).

6.4.10 Any potential adverse impacts are considered likely to be mitigated by existing mechanisms such as the planning system as well as environmental guidance and on-site management measures. Local mitigation is discussed further in Section **7.**

Heat pumps and heat networks

6.4.11 **Localised mixed/uncertain secondary effects** on a **range of SEA topics** could occur as a result of the deployment of heat pumps and heat networks, the significance of which would be largely dependent on the scale as well as location with respect to sensitive human, natural and cultural receptors.

6.4.12 Previous SEA work recognises that the installation of district heating network infrastructure such as pipes has the potential for **localised environmental effects** including **short term negative effects** on **material assets** from new development activities. **Localised negative effects** on **population and human health** could also arise such as, through noise linked to the operation of heat pumps. **Potential localised negative effects** on **landscape and cultural and historic heritage** could also occur as a result of at scale changes to infrastructure necessary for deployment. For example, the installation of an individual air source heat pump would require an external unit, which would require a place outside the home where it can be fitted to a wall or placed on the ground, including space around it to ensure the flow of air. The size of the unit could vary greatly depending on the building's heat demand and the local characteristics.

6.4.13 **Localised positive effects** on **material assets** and **population and human health** could also occur from support for more affordable and locally available supplies of heat associated with heat networks. Effects could be maximised where individual heat pumps are combined with appropriate energy efficiency measures which makes them highly effective in most buildings.

6.4.14 Any potential adverse impacts are considered likely to be mitigated by existing mechanisms such as the planning system as well as environmental guidance

and on-site management measures and these, as well as potential strategic mitigation opportunities, are discussed further in Section **7.**

Strategically important heat technologies with the potential to play a role in the longer term

6.4.15 Heat technologies identified as playing a potential future role in heating homes and buildings (principally hydrogen) could also potentially **broadly** and **cumulatively** contribute to **significant positive effects** for **climatic factors, air, population and human health** and **material assets** identified above in the longer term.

6.4.16 **Low carbon or 'Green' Hydrogen** is recognised by the draft Strategy as having a potential role as a source of energy for heating buildings as a future alternative to natural gas. Noting constraints in the near-term availability of hydrogen, coupled with a need to establish the standards and safe systems for its use, repurpose the gas network and replace household appliances, decarbonised gas is unlikely to play a large part in reducing emissions before 2030.

6.4.17 The deployment of blue (or low-carbon) hydrogen (where aligned with CCS systems) and green hydrogen at scale has the potential lead to **significant positive effects** for **climatic factors** as well as **associated positive effects** on **air** and **population and human health.**

6.4.18 Previous SEA work recognises that proposals which encourage the uptake of low carbon technologies such as CCS and hydrogen may result in development which could have **adverse effects** on topics such as **landscape and cultural heritage.** However, significance will depend on a range of factors including scale of development, and the quality and sensitivity of receiving environments**.**

6.4.19 There is also potential for **uncertain effects** on **material assets** in the longer term. This is considered possible as a result of 'at scale' deployment of hydrogen as a replacement for natural gas which could potentially result in a need for new or upgraded infrastructure (such as CCS and pipework) which could in turn impact on sensitive human, natural and cultural receptors. The significance of any future potential effects however would be largely dependent on the scale of deployment, and associated infrastructure requirements.

6.4.20 **Adverse localised effects** on **a number of SEA topics** such as **population and human health**, **soil, water, air** and **biodiversity**, as a consequence of construction and infrastructure improvement works could also occur but it is recognised that these effects are likely to be **temporary** in nature.

6.4.21 **Bioenergy** is recognised in the draft Strategy as likely to have a limited role in supporting heat decarbonisation of homes and buildings where other technologies are not appropriate. The draft Strategy also notes that the volume of bioenergy likely to be available in the short term is limited by constraints on primary biomass resources, and the higher value of some bio-resources in decarbonising other sectors.

6.4.22 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. This is because visual effects on **landscapes** and **cultural heritage** can arise from the uptake of technologies at both national and local scale including through changes in land use.

6.4.23 Any potential environmental effects associated with future development and deployment of **hydrogen and/or bioenergy** will need to be considered in due course as part of the development of proposals to support their introduction and these will be considered against the requirements of the 2005 Act. Existing mitigation measures as well as opportunities for strategic mitigation are discussed in Section **7**.

Setting a new heat target

6.4.24 The setting of a new heat target which has the delivery of net-zero objectives at its heart, focuses on heat in buildings, and is compatible with statutory fuel poverty targets can lead to **significant positive effects** for **climatic factors,** through its support for delivering the deployment pathway for reducing emissions in buildings as set out in the update to the Climate Change Plan.

6.4.25 Linked to this, there is potential for associated **significant positive effects** for **air quality** (as emissions and air pollutants often originate from the same source), as well as associated benefits for **population and human health.** Previous SEA work highlights that further benefits for **population and human health** are also likely to arise from improved security of energy supply and reduced heat demand, which may also have benefits for general health and wellbeing. The above benefits are likely to be experienced to a greater extent where support is focused towards those living in deprived areas.

6.4.26 **Significant positive effects** for **material assets** are also considered likely from a focus on a mixed technology or blended pathway. This is because a focus on strategically important technologies that are ready for deployment (energy efficiency measures, heat pumps and heat networks) in the **short term**, as well as recognition of a potential role for **hydrogen** (and, in a limited way, **bioenergy**) in the **long term**, can enable the flexible and stable operation of the energy network at a national scale.

Ambition

6.4.27 We acknowledge that, in setting a new heat target there are differing levels of ambition in delivering net zero objectives. At a minimum the setting of a new heat target would need to support the delivery and the deployment pathway for reducing emissions in buildings as set out in the update to the Climate Change Plan.

6.4.28 A more ambitious target could support reductions in **GHG emissions** over a shorter timeframe, for example as a result of a higher rate of deployment of strategically important energy efficiency measures and heat technologies, with benefits arising for **climatic factors**. **Associated positive environmental effects** including for factors such as **air quality population and human health** would also be realised more quickly.

6.4.29 A more ambitious target could also have the potential for **adverse environmental effects**. In particular, as a result of a more ambitious target any potential associated greater levels of deployment of heat technologies could necessitate the need for new and upgraded infrastructure which could potentially realise **adverse environmental effects** on **Material assets** as well as **other SEA topics** in the **shorter term.** Taking into account the strategic nature of the draft Strategy, and the level of inherent uncertainties, including for example the longer-run energy mix, it is not possible to be precise at this time.

6.5 Do the key proposals address key environmental issues identified?

6.5.1 Taken together, and when considered in the round, the proposals set out in the draft Strategy are likely to contribute to addressing the key environmental issues identified. Significant reductions in **GHG emissions** associated with Scotland's homes and buildings are likely as well as **associated benefits** for **air** and **population and human health** (including through measures which help mitigate fuel poverty). Further, a blended or mixed technology pathway can contribute to diversifying energy supply and can support the use of local energy systems, with the potential to improve the resilience of energy networks (including to the impacts of climate change).

6.5.2 The assessment recognises that there is potential for direct and indirect impacts on **cultural and historic heritage** and **landscape** associated with the development and deployment of energy efficiency measures and heat technologies and their associated infrastructure now and in the future. It is considered that existing mitigation measures as well as strategic mitigation opportunities can help ensure that potential adverse effects are avoided and positive effects enhanced. Further opportunities for mitigation and enhancement are included in Section **7.**

7. Conclusions, Mitigation and Enhancement

7.1 Conclusions

7.1.1 The assessment concludes that the draft Strategy is likely to have **significant positive effects** on **climatic factors, air, population and human health** and **material assets.** This is considered likely from the introduction of a proposed new 2045 vision and wide supporting energy efficiency and heat decarbonisation outcomes that draw together existing Scottish Government policies and proposals, and from the setting of a new heat target in a final Strategy.

7.1.2 The potential for effects **in combination** with other plans, programmes and strategies has also been considered. The draft Strategy has the potential to **positively** and **cumulatively** contribute across a wide range of Scottish Government policy areas within the context in which it sits.

7.1.3 Taking into account the high-level nature of the draft Strategy there is however an inherent degree of **uncertainty** regarding the environmental impacts that may arise as a result of upscaling of strategically important energy efficiency measures and heat technologies now and in the future.

7.1.4 The assessment identifies the potential for **mixed/uncertain secondary effects** on a **range of SEA topics** as a result of the deployment of strategically important energy efficiency measures and heat technologies ready for deployment (including energy efficiency measures, heat pumps and heat networks) at the **local level**. Existing mitigation measures can help to address these**.**

7.1.5 The assessment further recognises that any **future** upscaling of heat technologies has the **potential for mixed/uncertain environmental effects across SEA topics** but precise effects would be dependent on a range of factors including the scale of development and deployment of individual technologies as well as location with respect to sensitive human, natural and cultural receptors. Existing mitigation at the local level can help to address these and relevant emerging PPS also has the potential to provide mitigation at the strategic level.

7.2 Mitigation

Local mitigation measures

7.2.1 Where future development and deployment of strategically important energy efficiency measures and heat technologies have the potential to result in **secondary mixed/uncertain effects** consideration should be given to opportunities to mitigate any such effects at lower tiers of plan-making and at the project level.

7.2.2 There are a range of existing mitigation measures in place which may apply including EIA, environmental management plans, European protected species licencing, and through the planning system as well as best practice guidance

such as that with a focus on landscape[97] and the historic environment[98] Sustainability management tools such as those under the Renewable Heat Incentive, which includes requirements for biomass used in renewable heat installations to meet a set of sustainability criteria that aim to guarantee that it was sustainably produced, are also relevant.

Strategic Mitigation

7.2.3 The assessment further recognises that any **future** upscaling of heat technologies has the **potential for mixed/uncertain environmental effects across SEA topics** but precise effects would be dependent on a range of factors including the scale of development and deployment of individual technologies as well as location with respect to sensitive human, natural and cultural receptors. Emerging and future PPS at the lower-tier can potentially provide for more detailed consideration of environmental effects and set out the potential for future strategic level mitigation, taking into account the findings of this SEA.

7.2.4 In addition to local mitigation measures identified above, the development of emerging and future PPS with a focus on specific technologies (such as national action plans), place-based approaches to energy efficiency and heat decarbonisation (such as lower tier plans) and national PPS that focus on planning and land use (such as NPF4, and the third Land Use Strategy) are particularly relevant as they could potentially provide mitigation at the strategic level.

7.2.5 For example, at the national level, the revision of the National Planning Framework, which in future will incorporate Scottish Planning Policy, will look to provide stronger support for sustainable, low and zero emissions developments including ways to actively facilitate decarbonised heating and electricity generation and distribution. Potential policy changes set out in the recently published NPF4 Position Statement include:

- Introducing new policies that address a wider range of energy generation technologies for example for electrical and thermal storage, and hydrogen.
- Setting out a more practical and outcome-focused approach to accelerating a transition to low and zero emissions heating in buildings, including by linking with wider policies for green and blue infrastructure and vacant and derelict land and properties and ensuring that LHEES inform local development planning to ensure a single coherent approach to heat planning across Scotland.

7.2.6 The roll-out of Local Heat and Energy Efficiency Strategies will provide an important platform to consider both local community and wider national infrastructure issues and their associated potential environmental effects.

[97] Such as Micro renewables and the natural heritage - revised guidance | NatureScot

[98] such as https://www.historicenvironment.scot/advice-and-support/your-property/saving-energy-in-traditional-buildings/

These Strategies will set out the long term vision for decarbonising heat in buildings and improving their energy efficiency on a local authority area basis.

7.3 Opportunities for Enhancement

7.3.1 The SEA findings support the introduction of a 2045 vision and supporting energy efficiency and heat decarbonisation outcomes. This approach, by providing a high level framework that draws together existing Scottish Government policies and proposals relating to energy efficiency and heat decarbonisation of homes and buildings, when taken together with existing PPS, can contribute to significant positive environmental effects across sectors.

7.3.2 The SEA findings also support the intention, through a finalised Strategy, to set a new heat target, the purpose of which is to help monitor and track progress in delivering the deployment pathway for reducing emissions in buildings, as set out in the Update to the Climate Change Plan.

7.3.3 The SEA supports the focus of the draft Strategy on a mixed technology or blended pathway. By focusing on energy efficiency measures and heat technologies ready for deployment now (energy efficiency measures, heat pumps and heat networks) and recognising that hydrogen could play a potential role in the longer term, this can support a flexible approach to delivery of the Strategy's objectives.

7.3.4 The following specific opportunities for enhancement have been identified:

- To obtain the maximum environmental benefits, a focus could be given to actions that support opportunities for strategically important energy efficiency measures for people living in deprived areas and in rural areas where extreme fuel poverty rates are highest.
- To obtain maximum environmental benefits a focus could be given to deployment of zero emissions technologies in areas which currently use high carbon heating fuels, and in areas recognised as being cost effective in the short term and in areas least likely to receive a mains hydrogen supply in the longer term.
- To obtain maximum environmental benefits a focus could be given to actions that support the co-location of infrastructure associated with deployment of measures and the re-use of existing infrastructure where possible. This approach could help to support the flexible operation of smart energy networks as well as maximise benefits including helping to reduce the need for new infrastructure and electricity network upgrades as well as supporting the potential to reduce consumer bills.
- To obtain maximum environmental benefits a focus could be given to working with stakeholders, such as Historic Environment Scotland, to develop more solutions to transition Scotland's historic buildings to zero emissions heating while respecting and preserving the special characteristics of our buildings and places.

8. Monitoring

8.1.1 Section 19 of the Environmental Assessment (Scotland) Act (2005) requires the responsible authority to monitor significant environmental effects of the implementation of the PPS. This should be done in a way to enable them to take appropriate remedial action, where applicable.

8.1.2 A wide range of existing programmes have associated monitoring in place at the national level. For example, Energy Efficient Scotland[99] contains monitoring and evaluation measures which will be used throughout its lifetime to make sure we are on track to achieve its vision, aims and objectives.

8.1.3 In addition the Annual Energy Statement reports[100] and the Annual compendium of Scottish energy statistics[101] on progress towards the targets outlined in the 2017 Scottish Energy Strategy[102]. This includes reporting on heat demand, main sources of heat and the amount of renewable heat generated annually.

8.1.4 Building on these existing monitoring arrangements, a monitoring and evaluation framework will also be published alongside the finalised Heat in Buildings Strategy. It is proposed that this will focus on monitoring the impact the transition to warmer, greener and more affordable homes and buildings has on people and communities. It is anticipated that it will set out:

- a comprehensive framework covering homes, work places, public sector buildings and other non-domestic buildings; and
- a range of output and outcome indicators, linked to our outcomes, to inform an annual statement of progress, taking account of the Climate Change Plan monitoring framework, monitoring and evaluation requirements for Fuel Poverty as required by the Fuel Poverty (Targets, Definition and Strategy) Act 2019.

8.1.5 It is proposed that monitoring for significant environmental effects is an integral part of this framework.

[99] Scottish Government (2018) Energy Efficient Scotland Route Map. Available at: https://www.gov.scot/publications/energy-efficient-scotland-route-map/

[100] Scottish Government (2019) Annual energy statement 2019. Available at: https://www.gov.scot/publications/annual-energy-statement-2019/pages/3/

[101] Scottish Government (2020) Annual compendium of Scottish energy statistics. Available at: https://www.gov.scot/publications/annual-compendium-of-scottish-energy-statistics/

[102] Scottish Government (2017) Scottish Energy Strategy. Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/

9. Next Steps and Consultation

9.1.1 Public views and comments are invited on both this Environmental report and the draft Strategy to which it relates. Details of how to respond are provided below:

When can I respond?
Respondents are asked to submit responses to this Environmental Report directly to the Scottish Government by closing date of 30 April 2021.
How can I respond?
Online: You can respond online using the Scottish Government's consultation platform, Consultation Hub, at: https://consult.gov.scot/energy-and-climate-change-directorate/heat-in-buildings-strategy/ Consultation Hub allows you to save and return to your responses while the consultation is still open. A copy of your final response will be emailed to you.
By Email Responses can be submitted by email to heatinbuildings@gov.scot **By Post:** Heat Strategy Unit at 5 Atlantic Quay, Glasgow G2 8LU
How will responses be considered?
Following the consultation, a Post-Adoption Statement will be prepared. The Statement will reflect on the views provided on the findings of the assessment and the proposals in the Consultation Paper and will explain how the issues raised have been taken into account in finalising the Strategy.
Consultation Questions on the Environmental Report
Respondents may find the following questions helpful to provide a focus for their responses to this Environmental Report. Please note that responses do not need to be limited to these questions, and more general comments on this Environmental Report and the proposals set out in the Consultation Paper are also invited.
1. What are your views on the accuracy and scope of the information used to describe the SEA environmental baseline set out in the Environmental Report? 2. What are your views on the reasonable alternatives set out in the Environmental Report? 3. What are your views on the predicted environmental effects as set out in the Environmental Report? 4. What are your views on the findings of the SEA and the proposals for mitigation and monitoring of the environmental effects set out in the Environmental Report?

APPENDIX A - Stage 1 Assessment summary

Table 3. Summary of relevant SEA findings by environmental topic

- **Significant positive effects** on **climatic factors** are likely as a result of measures that reduce demand for heat and efficiencies in supply. The continued development of renewable and low carbon technologies (such as hydrogen) as well as storage improvements will support decarbonisation of the energy sector. (**Heat Policy Statement (HPS) and Climate Change Plan and Energy Strategy (CCPES) SEAs).**
- **Minor positive long term effects** on **climatic factors** are likely to result from an increase in heat networks **(Permitted Development Rights (PDR) SEA)**
- Promoting storage capacity and a more balanced mix of heat supply could aid in adapting to challenges presented by a changing climate, such as managing the peaks and troughs associated with heat demand, particularly during extreme climatic events. **(HPS)**
- **Significant positive effects** on **air quality** are likely from measures that reduce energy generation emissions and support district heat regulation (**HPS and Energy Efficient Scotland (EES) SEAs**).
- Technologies such as bioenergy could give rise to **localised negative effects** on **air quality** in areas where air pollutants are already concentrated, for example, AQMAs. However, these are not expected to be significant due to existing regulatory regimes (**HPS SEA**)
- **Significant positive effects** on **population and human health** are likely to result from energy efficient, low carbon, and low cost heat as a result of improved living conditions, particularly for vulnerable groups such as people in fuel poverty or with respiratory conditions. (**HPS and CCPES Strategy SEAs**)
- The installation of district heating network infrastructure such as pipes has the potential for localised environmental effects across a range of SEA topics. For example **short term negative effects** on **material assets** from new development activities and **localised negative effects** on **population and human health** could arise through noise linked to the operation of heat pumps. (**EES and CCPES SEAs**)
- Visual effects can arise from the uptake of technologies at both national and local scale including through changes in land use. (CCP and Energy Strategy). An increased uptake of biomass could **cumulatively** raise some challenges regarding **material assets (land use)** such as forestry expansion and agriculture (**HPS and EES SEAs)**
- The installation of heat and energy efficiency measures has the potential for **localised negative effects** on the **landscape** However, significance will depend on range of factors including scale of development, quality and sensitivity of receiving environments **(HPS SEA)**

Environmental topics	More detailed relevant SEA findings by SEA Topic
Climatic factors	• Reducing the need for heat, efficient supply, renewable technologies and low carbon generation, will potentially reduce overall GHG emissions arising from heat use (**HPS; CCPES and Climate Change Plan Update (CCPU SEA**) • The continued development of renewable and low carbon technologies will support decarbonisation of the energy sector, complemented by energy storage and new and emerging technologies, such as hydrogen and CCS. **(CCPES and CCPU SEA's)** • Minor positive long term effects on reducing GHG through use of low carbon energy sources, and supporting climate change adaptation through resilience of the energy supply network as a result of granting permitted development rights for heat networks. **(PDR SEA)** • Significant positive impacts as a result of the reuse of existing assets; the decarbonisation of the heat network and increased energy efficiency, as well as from innovation supporting the decarbonisation of energy systems **(Infrastructure Investment Plan SEA)** • Promoting storage capacity and a more balanced mix of heat supply could aid in adapting to challenges presented by a changing climate, such as managing the peaks and troughs associated with heat demand, particularly during extreme climatic events. **(HPS SEA)** • Provisions which can support climate change adaptation include improvements in the energy efficiency of housing stock, reducing energy demand and consumption and improving the resilience of energy infrastructure. **(CCPES SEA)**
Air quality	• Supporting measures to reduce demand and increase energy efficiency has the potential to lead to reduced demand for the electricity produced and so emissions from large scale power plants. **(HPS SEA)** • Reducing energy generation emissions is likely to improve air quality **(CCPES and CCPU SEA)** • Technologies such as biomass and energy from waste could generate localised emissions with these being potentially detrimental in areas where air pollutants are already concentrated, for example, AQMAs. These are not expected to be significant due to existing regulatory regimes **(HPS SEA)** • With reductions in GHG emissions are likely to come associated benefits to air quality, especially if there is a

Environmental topics	More detailed relevant SEA findings by SEA Topic
	greater reduction in the use of traditional fuels for energy. Improvements in air quality may have benefits for population and human health including a reduction in exposure to cold and damp properties **(CCPU SEA)** • Positive effects as a result of district heat regulation **(EES SEA)**
Population and human health	• Whilst biomass is subject to regulation and standards, it is not carbon neutral and the biomass combustion process can result in the emission of air pollutants that are potentially harmful to human health **(CCPES SEA)** • Addressing energy efficiency issues and providing low carbon, low cost heat is likely to have a beneficial impact on living conditions, particularly those vulnerable to the impacts of damp (such as respiratory conditions) and those considered to be fuel poor (HPS and CCPES SEA). • Benefits for human health likely as a result of making buildings more resilient to the effects of climate change, improving network reliability and though promoting the decentralisation of energy and increased uptake of heat and electricity generation at local level **(CCPES and CCPU SEA)** • In some instances, negative impacts can arise through operational activities, such as the potential for noise disturbance arising from heat pumps. **(CCPES and CCPU SEA)**
Material assets	• Potential benefits as a result of the expansion of energy generating resources, including to future proof assets; greater uptake of new low carbon technologies, particularly local generation, could reduce pressure/demand on other energy resources and improve energy efficiencies across the sector. **(HPS and CCPES SEA's)** • The provision of feedstocks and increased uptake of biomass could cumulatively raise some challenges regarding forestry expansion and management and agricultural land use. **(HPS and EES SEA's)** • the installation of district heating network infrastructure such as pipes could result in environmental effects, including impacts to material assets from construction activities and siting of developments; **(EES SEA's)**
Landscape	• Cumulative effects on landscapes and townscapes from the installation of new technologies and associated infrastructure. However, significance will depend on range of factors

Environmental topics	More detailed relevant SEA findings by SEA Topic
	including scale of development, quality and sensitivity of receiving environments (HPS) • Visual effects can arise from the uptake of technologies at both national and local scale including through changes in land use. **(CCPES SEA)** • Adverse effects on landscape as a result of heat infrastructure; for example, a large-scale switch from natural gas to hydrogen, requiring upgrades to the gas network and new supporting infrastructure **(CCPU SEA)**
Cultural heritage	• Negative effects are identified in relation to developments or changes to historic buildings **(EES and CCPU SEA's);** Climate Change Plan Update) • Potential significant negative effects on cultural heritage could occur from heat pumps, and impacts on setting may be reversible, however physical impacts may be permanent **(PDR SEA)**

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