Midlothian Council
Tuesday 12 November 2024
Item No 8.5

Climate Change/Net Zero

Report by Kevin Anderson, Executive Director Place

Report for Decision

1 Recommendations

Council is recommended to:

i. Consider the findings and recommendations of the February 2024 Aether Climate Action Support Report (CASR) attached as Appendix C. This report details the required climate emissions reduction trajectories of the Midlothian Council estate needed to meet the Council's 2030 net zero deadline.
ii. Given the challenges (particularly financial) presented therein, approve realignment of the target deadline of 2030 for net zero emissions from the Midlothian Council estate to 2045.
iii. Instruct a refresh of the Council's Climate Change Strategy in line with recommendation (ii).
iv. Note the update on the Climate Ready South East Scotland (CRSES) work program (Appendix B).

2 Purpose of Report

2.1 The report asks Council to consider the findings of the Climate Action Support Report (CASR) prepared by Aether consultants relating to climate emissions reduction trajectories for the Council's estate. In light of the challenges presented (particularly those pertaining to finance), the Council is asked to realign the target deadline of 2030 for net zero emissions from the Midlothian Council estate to 2045 in-line with the Scottish Government's own targets.

2.2 The report also seeks Council's instruction to undertake a review of the current Council's Climate Change Strategy, taking into account the CASR. An amended strategy will be reported to Council for consideration once prepared.

2.3 The report highlights Midlothian Council's interaction in the key regional climate related work programme 'Climate Ready South East Scotland' (CRSES), overseen by Sniffer (a climate change and environmental charity) and involving Lothian, Edinburgh and Fife Councils alongside cross-sector partners. CRSES is currently seeking resident, business and commuter 'lived experience of climate effects' across the region. This is a critical evidence base in informing the work programme's key output - a regional climate and economic risk and opportunity assessment.

Date: 22 October 2024

Report Contact: Wendy Campbell, Climate Change Lead Officer
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3 Background

3.1 The Council was an early signatory to the Scottish Governments Climate Change declaration in 2007. This was a voluntary agreement that committed the Council to working with the Scottish and UK Governments to help reduce greenhouse gas emissions, taking steps to adapt to the impact of climate change, and working with communities on the issue.

3.2 The Climate Change (Scotland) Act 2009 set the legislative framework for climate change in Scotland, including mandatory targets to reduce greenhouse gas emissions up to 2050 to support the transition to a sustainable low carbon economy. The initial targets were reviewed and revised by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 which now gives Scotland some of the most stringent statutory targets in the world.

3.3 In 2014, the Council prepared its first Climate Change Strategy. In April 2019, following the UK Government's declaration, the Scottish Government declared a climate change emergency, bringing into sharp focus the scale of the problem and the urgency for action. In October 2019 new climate change legislation reset the 2009 Scottish Government's greenhouse gas emissions target from 80% by 2050 to net zero by 2045 with interim targets of at least 56% reduction in 2020, 75% by 2030 and 90% by 2040.

3.4 In December 2019, the Council declared its own Climate Emergency, agreeing to become net carbon zero across all aspects of its organisation by 2030. In response to the Council's Climate Emergency declaration, the Climate Change Strategy 2020 was prepared and approved by Council at its meeting in August 2020.

3.5 In 2023, Aether consultants were commissioned to:

- Calculate the baseline emissions for the Midlothian Council estate and provide a trajectory of emissions to 2030 given a 'business as usual' emissions reduction scenario and an ambitious emissions reduction scenario.
- Review existing policies and actions to reduce emissions identified within the Midlothian Council Climate Change Plan (and update) and engage with key Council departments to determine progress.
- Conduct a review of the Council estate by analysing electricity and gas consumption and identified the main emissions sources, outliers and buildings requiring further audit.

This cumulated in the CASR published in February 2024 (Appendix B).

Climate Action Support Report (CASR) Summary

3.6 A high-level summary of the suggested route to net zero and indicative costings outlined in the CASR is set out below

3.7 Reducing demand for energy, water and vehicle usage, and reducing the amount of waste that is generated, through behaviour changes, awareness raising, and other efficiency measures. There is an ongoing initiative to replace streetlights with LEDs which will reduce energy consumption.

3.8 Phasing out the use of fossil fuels in buildings and transportation. This will involve switching to electric systems where possible, and then supplying these with renewable electricity or another zero emission fuel:

- For buildings, this will typically include individual or communal/district heating systems that utilise heat pumps, although in some cases it may be more appropriate to use another form of heating (e.g. infrared or direct electric). Any other fossil fuel systems such as gas cookers will also need to be replaced.
- For vehicles, this will typically include switching away from petrol and diesel to electric vehicles. Where electrically powered alternatives are not yet commercially available or feasible, as in the case of specialist plant and HGVs, ultimately these will need to use another fuel such as green hydrogen or biodiesel; the Council should keep abreast of technological developments and adopt these when possible. A key enabling measure will also be to install sufficient charging points and support electricity network upgrades where necessary.
- Reviewing opportunities to source renewable energy, either via a renewable tariff or by installing renewables on Council-owned buildings and sites. This would provide financial benefits, reduce emissions, and make good use of Council assets.

3.9 Most of the remaining emissions will come from waste. The Council should continue with initiatives aimed at reducing waste and increasing rates of recycling and composting within the area. Residual emissions will require some form of technological solution, such as carbon capture and storage (CCS) being fitted to the energy from waste plant.

3.10 Finally, seek to reduce other indirect emissions from business travel by choosing sustainable travel options and EVs (electric vehicles) where possible, and signpost employees to initiatives that can support a reduction of energy use while hybrid/home working.

3.11 Under a ‘money no obstacle’ scenario where all of the actions set out in Section 5 across energy, water, waste and travel were implemented, then Midlothian Council could expect to reduce GHG (greenhouse gases) emissions by around 78-80% by 2030, compared against a 2021 baseline.

3.12 The remaining emissions in 2030 would need to be addressed through some form of carbon offsetting, given they cannot be mitigated using currently available technologies or because they are largely outside of the Council's control.

3.13 Looking beyond 2030, further reductions can be achieved through use of additional renewables, further behaviour change measures, and technological solutions such as green hydrogen or CCS. All of these would be needed to reduce the Council's emissions to net zero.

3.14 Reliance on CCS and offsetting will be lower if the Council can achieve larger emissions savings through energy efficiency measures, behavioural change, reducing demand for transport, etc. Those actions will also reduce the amount of renewable energy that is needed to power buildings and vehicles, which in turn will reduce energy bills.

3.15 A high-level costing exercise was carried out to indicate the potential scale of investment that would be required. As a rough estimate, if the Council were to upgrade all of its buildings, replace all heating systems with zero emission alternatives, and purchase electric vehicles for all applications where this is practical, the capital costs of these measures would be in the range of £60-100M, possibly higher. Note that these figures refer solely to the capital costs and do not account for wider supporting measures such as electricity grid upgrades, which would increase the total costs, nor do they account for bill savings. Furthermore, some of this expenditure would take place anyway, due to routine building maintenance, fleet replacement, etc.

What are the potential costs of actions?

3.16 Cost of measures – assumptions are in CASR Appendix D. In addition to the GHG emissions savings, the potential scale of upfront capital costs for different measures is detailed/estimated, not accounting for planned expenditure that would occur.

3.17 For example, the cost of replacing petrol cars with EVs includes the whole upfront cost of purchasing the EV, without subtracting the cost of the petrol car that might have been purchased if a like-for-like replacement was made. In other words, some of these costs would be incurred regardless of whether the Council takes additional measures to reduce its emissions.

3.18 This is not a detailed costing exercise; the Council will need to undertake separate feasibility studies to confirm the actual costs of each measure.

3.19 The table below summarises the results for individual measures. Overall, the total scale of investment for the costed measures is in the range of £60-100M.

Table 7 Mitigation measures and indicative costs:

Category	Mitigation measures	Indicative cost
Council fleet	Reduce fuel consumption through measures such as eco driving training, route optimisation, etc.	Up to £40K
	Replace vehicles with EVs, where practical	£13M-20M
Streetlights	Continue to replace streetlights with LEDs	£3.2M
Business travel	Use EVs or public transport, where practical	Not costed
Buildings	Retrofit buildings	£27M-40M
	Replace gas cookers with electric cookers	£200K-300K
	Switch to ZDEH (zero direct emissions heating) systems	£6M-10M
Water supply and treatment	Implement water efficiency measures	Included in costs of retrofitting (see above)
Waste	Reduce waste arisings, increase recycling	Not costed
Renewables	Install ground and roof mounted solar PV on Council owned land and buildings	Up to £25M

3.20 3.20 These calculations do not account for:

- Bill savings
- Ongoing maintenance costs
- Changes in costs over time
- Supporting infrastructure, e.g. EV charging points and electricity grid upgrades
- Administration costs to deliver the required projects Appendix D of the CASR provides more details of the assumptions underpinning these cost estimates.

4 Report Implications (Resource, Digital and Risk)

4.1 Resource

Producing an update Climate Change Strategy is a requirement for which the Council will need to meet the costs. The strategy could be

both innovative and transformational in nature, presenting huge opportunities to embed wider financial, social and environmental value and efficiencies whilst also presenting challenges across all Council Services. The intention would be for the preparation of the strategy to be coordinated by the Council's Climate Change Lead Officer. However, the need for high level input in supporting realignment and reprioritisation is acknowledged and governance mechanisms may need to be extended cross Council. There will be a need for significant cross Council input and wider (likely external) resourcing in producing a future fit practical strategy underpinned by ambitious actions and clear key performance indicators.

4.2 **Digital**

Digital support will be needed to coordinate data across the Council and with external partners. Outputs from the Climate Ready South East Scotland regional climate and economic risk and opportunity assessment (due to report March 25), will support development of the renewed Climate Change Strategy but it is expected that further analysis of this nature will also need to be undertaken at by each party, including Midlothian Council.

4.3 **Risk**

4.3.1 There is a reputational risk to the Council associated with any proposed setback in net zero targets. It is clear from the current and developing climate duties on public bodies, Scottish Government expectation of local authorities in respect of climate action is one of a lead and facilitator of collective cross-sector climate action.

4.3.2 Public bodies in Scotland are subject to legislative climate change duties as established under S44 of the Climate Change (Scotland) Act 2009. Public bodies are required to report annually on compliance with these duties and in accordance with Schedule 2 of Climate Change (Duties of Public Bodies; Reporting Requirements) (Scotland) Order 2015 as amended by the Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland) Amendment Order 2020.

4.3.3 In respect of climate adaptative duties, the Climate Change (Scotland) Act 2009, S4, sets out that a "public body must, in exercising its functions, act: in the way best calculated to help deliver any (Scottish statutory adaptation programme). Scotland is already experiencing climate change impacts, including warmer summers and wetter winters. The Met Office's UK Climate Projections 2018 (UKCP18) highlight the significant impacts of climate change in Scotland, including increasing water scarcity, flooding, and extreme weather events. In response, the Scottish Government is preparing for these challenges with the new Scottish National Adaptation Plan (SNAP3).

4.4 Ensuring Equalities (if required a separate IIA must be completed)

An integrated impact assessment (IIA) will be required for the Climate Change Strategy.

4.5 Additional Report Implications (See Appendix A)

See Appendix A

Appendices

Appendix A – Additional Report Implications
Appendix B – Climate Ready South East Scotland (CRSES) update
Appendix C - Climate Action Support Report (CASR)

APPENDIX A – Report Implications

A.1 Key Priorities within the Climate Strategy

A revised Climate Strategy would relate to all seven themes of the Single Midlothian Plan 2023-27 and be instrumental in helping support delivery of identified outcomes and actions of each of those themes.

A.2 Key Drivers for Change

Key drivers addressed in this report:

- ☒ Holistic Working
- ☒ Hub and Spoke
- ☒ Modern
- ☒ Sustainable
- ☒ Transformational
- ☒ Preventative
- ☒ Asset-based
- ☒ Continuous Improvement
- ☒ One size fits one
- ☐ None of the above

A.3 Key Delivery Streams

Key delivery streams addressed in this report:

- ☒ One Council Working with you, for you
- ☒ Preventative and Sustainable
- ☒ Efficient and Modern
- ☒ Innovative and Ambitious
- ☐ None of the above

A.4 Delivering Best Value

External work required for producing the Climate Change Strategy would be procured following local government procurement rules. These rules in themselves developed with climate considerations embedded.

A.5 Involving Communities and Other Stakeholders

An effective Climate Strategy will always necessitate both cross Council and cross sector interaction. To mitigate the economic, social and environmental impact of the activity undertaken in response to the strategy and to maximise the opportunities of moving to net zero, it will require to be informed by local, regional and national context. Local communities, their knowledge of local place and needs and wants in that regard will be integral in informing it. Co-creation of effective workstreams will also be integral and demand deep levels of partnership working alongside public, private and third sector partners.

A Participation Report would be compiled in undertaking the Climate Strategy setting out engagement undertaken.

A.6 Impact on Performance and Outcomes

A Climate Change Strategy is both holistic and innovative in nature. Carefully developed climate action has the potential to deliver efficiently, effectively and impactfully against a wide breadth of Council responsibilities, supporting action across climate, nature recovery, wellbeing and economic objectives. In terms of Council performance and outcomes, there is clear expectation from Scottish Governmnent that climate considerations permeate all public body activities this being reflected across all recent Governmental strategies (National Strategy on Economic Transformation, National Planning Framework 4, current review of water and wastewater). To meet current duties and those in advanced stages of development, all Council Services will require to invoke change, often significant. It will be critical that development of the Climate Strategy supports services in that journey and sets clear vision, objectives and key performance indicators.

A.7 Adopting a Preventative Approach

Adopting an updated and future fit Climate Change Strategy is an opportunity to prevent and mitigate future climate change impacts.

A.8 Supporting Sustainable Development

By its nature, a Climate Change Strategy aligns with sustainable development aspirations and plays a primary role in ensuring the alignment and scope of wider Council plans, programmes and policies support such outcomes. A Strategic Environmental Assessment (SEA) will be undertaken in the production of the Climate Change Strategy.

APPENDIX B

Climate Ready South East Scotland (CRSES) - update in drawing in lived experience of climate effects in Midlothian.

5. Overview of CRSES

5.1 The CRSES project is an 18-month collaboration between Sniffer and the six local authorities (Scottish Borders, City of Edinburgh, East Lothian, Fife, Midlothian and West Lothian Councils) in the Edinburgh and South East Scotland City Region. The work program is being developed as part of the Regional Prosperity Framework, with support from Capital City Partnership. Funded through the UK Shared Prosperity Fund and Scottish Government.

5.2 The project will produce a cross-sector regional climate risk and opportunity assessment in partnership with third and private sector partners. The assessment will draw on the best available scientific data and evidence. It will involve communities across the region in sharing their experiences and stories.

5.3 The assessment will identify where more action is needed and will provide the evidence needed to inform decision making across the region. Following completion of the risk assessment the project will be a catalyst for a range of local climate resilience and adaptation projects.

5.4 *Draw in of lived experience of regional climate effects* - as part of this project interested parties are encouraged to participate in submitting their lived experiences of climate change in Midlothian to CRSES's story map. The purpose of this exercise is to inform the current Climate Ready South East Scotland Region risk and opportunity assessment, raise awareness of regional climatic work programs and promote discussion and action involving communities in the work for mutual gain. The project recognises the challenges of meeting net zero emission targets and acknowledges that planning must begin now to increase levels of resilience against future climate change impacts.

5.5 Climate hazards can occur at all scales and responding to them requires collaboration across legislative boundaries. Developing a shared risk and opportunity assessment is an important opportunity to deepen collaboration among city region partners and begin working towards an ambitious and transformative approach to climate change adaptation across the city region.

Appendix C

Midlothian Council

Climate Action Support

February 2024

v. 1

Title	Climate Action Support
Customer	Midlothian Council
Recipient	Derek Oliver
Report Reference	3146
Report Status	Draft
Revisions	V1
File	

Author(s)	Annie Thornton, Harper Robertson
Reviewed by	Jennifer Kaczmarski
Signature	
Date	29/2/2024
Cover Image	Author: Gyula Peter Source: Wikimedia Commons License: Creative Commons Attribution 3.0 Unported

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Executive Summary

Background

In 2019, Midlothian Council voted to declare a climate emergency and stated its ambition to achieve net zero for its own emissions by 2030. It acknowledged the need for urgent action to reduce its contribution towards climate change.

Midlothian Council has appointed Aether to calculate their baseline emissions for their estate and to provide them with a trajectory of emissions to 2030 given a 'business as usual' emissions reduction scenario and an ambitious emissions reduction scenario. Aether also reviewed existing policies and actions to reduce emissions identified within the Midlothian Council Climate Change Plan (and update) and engaged with key council departments to determine their progress. Alongside this wider climate action planning, our team conducted a review of the council estate by analysing electricity and gas consumption and identified the main emissions sources, outliers and buildings requiring further audit.

Baseline emissions

The baseline and 2030 emissions trajectory cover the main sources of emissions included within Midlothian Council's Public Bodies Duties Climate Change Report: energy use, water supply and treatment, fuel used within Council's own vehicle fleet, electricity used for streetlighting, employee homeworking, and business travel for Council activities. We have also included emissions from all waste that the Council collects, recognising that waste management is one of the Councils' responsibilities and it has influence over how it is treated/processed.

Council housing is excluded, as are indirect emissions from procured goods and services and the wider supply chain. (These are classified as 'Scope 3 emissions'; see definition in Section 2.2.2.)

Midlothian Council's GHG emissions are estimated to be 19.5 $ktCO_2e$ in 2021/22. The Council's Scope 1 and 2 emissions from its own operations are dominated by buildings and vehicles, which together account for nearly 75% of GHG emissions. Municipal waste is estimated to account for around 17%. The other categories collectively make up <10% of the total, as shown in the table below.

Table 1 Midlothian Council's emissions in 2021/22

Emissions source	Emissions (tCO_2e)	% of total emissions
Buildings total	12,455	64%
Buildings - Electricity	*3,069*	*16%*
Buildings - Gas	*9,144*	*47%*
Buildings - Gas oil	*221*	*1%*
Buildings – Water supply & treatment	*21*	*0.11%*
Streetlighting	1,191	6%
Fleet total	1,982	10%
Fleet - Diesel	*1,694*	*9%*
Fleet - Petrol	*37*	*0.19%*

Fleet – Gas oil	*250*	*1%*
Business travel	18	0.09%
Waste (Council collected)	3,240	17%
Homeworking	605	3%
Total	**19,490**	**100%**

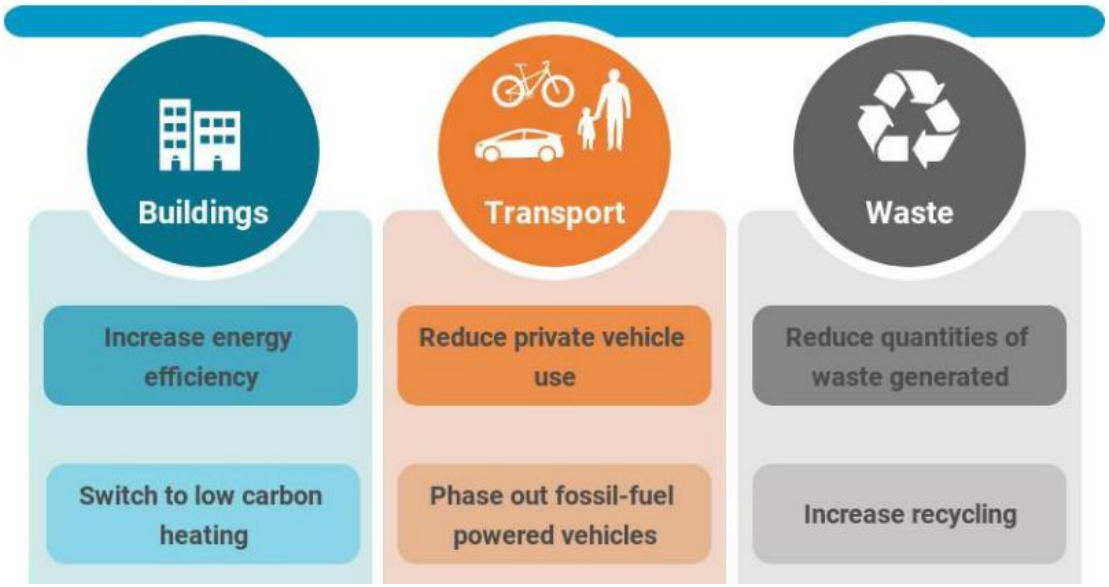
Note: Figures in this table have been rounded

Note: The majority of the Council's Scope 3 emissions have not been quantified, but these could potentially have a large impact on the results; it is not uncommon for them to represent 90-95% of a corporation's total emissions. The percentage values above should therefore be interpreted with caution because they are subject to change if additional sources of emissions are added to Midlothian's GHG inventory in future years.

Reducing emissions to zero

In order to be net zero by 2030, the Council would need to strategically use its power and influence to further decarbonise. Readers should refer to the detailed list of actions in Section 5, along with Sections 4.3 and 4.4.3 which describe priority measures and their potential scale of impact.

Figure 1. Priority actions for net zero



Strategically, the route to net zero can be summarised as follows:

- **First, reducing demand for energy, water and vehicle usage, and reducing the amount of waste that is generated**, through behaviour changes, awareness raising, and other efficiency measures. There is an ongoing initiative to replace streetlights with LEDs which will reduce their energy demands.
- **Then, phasing out the use of fossil fuels in buildings and transportation.** This will involve switching to electric systems where possible, and then supplying these with renewable electricity or another zero emission fuel.
  - For **buildings**, this will typically include individual or communal/district heating systems that utilise heat pumps, although in some cases it may be more appropriate to use another form of heating (e.g. infrared or direct electric). Any other fossil fuel systems such as gas cookers will also need to be replaced.

  - For **vehicles**, this will typically include switching away from petrol and diesel cars and vans to electric ones. Where electrically powered alternatives are not yet commercially available, as in the case of HGVs, ultimately these will need to use another fuel such as green hydrogen or biodiesel; the Council should keep abreast of technological developments and adopt these when possible. A key enabling measure will also be to install sufficient charging points and support electricity network upgrades where necessary.
- Reviewing opportunities to **source renewable energy**, either via a renewable tariff or by installing renewables on Council-owned buildings and sites. This would provide financial benefits, reduce emissions, and make good use of Council assets.

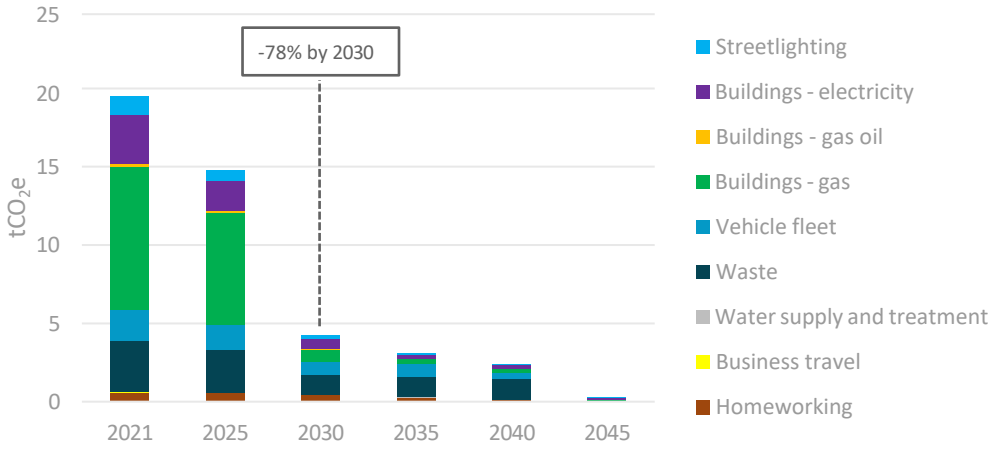
A report from 2015 found that there was potential for up to 17.5 MWp of PV to be delivered on Council-owned land.

- Once those measures are adopted, most of the remaining emissions will come from **waste**. The Council should continue with initiatives aimed at reducing waste and increasing rates of recycling and composting within the area. Residual emissions will require some form of technological solution, such as carbon capture and storage (CCS) being fitted to the energy from waste plant.
- Finally, seek to reduce **other indirect emissions** from business travel by choosing sustainable travel options and EVs where possible, and signpost employees to initiatives that can support them to reduce their energy use while home working.

Under a 'money no obstacle' scenario where all of the actions set out in Section 5 across energy, water, waste and travel were implemented, then Midlothian Council could expect to reduce GHG emissions by around 78-80% by 2030, compared against a 2021 baseline.

The remaining emissions in 2030 would need to be addressed through some form of carbon offsetting, either because they cannot be mitigated using currently available technologies (e.g. decarbonising the water treatment system), because they are largely outside of the Council's control (e.g. decarbonising homeworking), or both. This is shown on the graph below.

Figure 2. GHG emissions by source - 2030 target scenario



Looking beyond 2030, further reductions can be achieved through use of additional renewables, further behaviour change measures, and technological solutions such as green hydrogen or CCS. All of these would be needed to reduce the Council's emissions

to net zero. Reliance on CCS and offsetting will be lower if the Council can achieve larger emissions savings through energy efficiency measures, behavioural change, reducing demand for transport, and so on. Those actions will also reduce the amount of renewable energy that is needed to power buildings and vehicles, which in turn will reduce energy bills.

A high-level costing exercise was carried out to indicate the potential scale of investment that would be required. As a rough estimate, if the Council were to upgrade all of its buildings, replace all heating systems with zero emission alternatives, and purchase electric vehicles for all applications where this is practical, the capital costs of these measures would be in the range of £60-100M, possibly higher. Note that these figures refer solely to the capital costs and do not account for wider supporting measures such as electricity grid upgrades, which would increase the total costs, nor do they account for bill savings. Furthermore, some of this expenditure would take place anyway, due to routine building maintenance, fleet replacement, etc. More details on costs are provided in Section 4.6.

Governance and monitoring

There are a range of ways that the Council can strengthen its internal procedures and governance arrangements relating to climate change and carbon reduction. Some specific recommendations include:

- Reviewing ways that the Council can have an influence on wider emissions, e.g. in its role as a planning authority
- Bringing in dedicated staff to support decarbonisation efforts
- Awareness-raising among staff on topics such as waste reduction and energy efficiency

These are discussed in more detail in Section 6, which also provides suggestions for several areas where additional data could be collected, and existing collection procedures could be improved. This would provide more complete, accurate and transparent GHG accounting going forward.

Conclusions

Based on the results of this analysis, there are some overarching implications for Midlothian Council as it continues in its climate change mitigation journey:

- Maintain a high level of ambition for mitigating all sources of emissions, initially perhaps focusing on ones that are more within the Council's ability to control and can be addressed using existing technologies. These would include (a) behavioural changes and other measures to reduce demand for energy, private vehicle use, and waste and (b) switching from fossil fuels to electric alternatives where possible.
- Keep abreast of technological developments such as CCS and green hydrogen and, where possible, work with stakeholders to bring these solutions forward.
- Make sure that the Council's own policies, internal processes and funded programmes align with a net zero future and do not continue to promote dependence on fossil fuels, private vehicles, etc. Where these do not align, there should be a clear reason for doing so, and a strategy for changing practices in future, as in the case of replacing gas boilers like-for-like when these break down. In simple terms, it is important to avoid making the decarbonisation challenge even harder than it already is.

- Look at ways that the Council can facilitate wider emissions reductions, both in Midlothian and elsewhere. For example, reviewing planning policy to facilitate uptake of renewable technologies and energy efficiency measures.

Midlothian has made great progress in monitoring, measuring and reducing emissions including work on their Local Heat and Energy Efficiency Strategy, Salix carbon reduction projects and the formation of Midlothian Energy Ltd to drive investment and development of renewable energy technologies in the area. This should be celebrated and recognised. With continued commitment, increased investment and co-ordination then Midlothian Council will continue to be at the forefront of local authority emission reduction leaders in Scotland.

Contents

1 Introduction

1.1 Why is it important to take action on climate change?

There is an overwhelming scientific consensus that human activities are causing global temperatures to increase, with serious knock-on effects for our atmosphere, land and oceans. According to the UK Climate Change Risk Assessment (2022), the impacts for Scotland[1] may include:

- More severe and frequent storms and flooding
- A greater risk of wildfires and heatwaves
- Rising sea levels and coastal erosion
- Other changes in the ecosystem that pose a risk to agriculture

These effects would have a serious impact on people at a local and regional level. But when this type of disruption happens all across the world – threatening homes, businesses, food and water security, and human health – the risks become much greater.

Governments around the world have acknowledged the urgency of this problem, and international agreements such as the 1997 Kyoto Protocol and 2016 Paris Agreement have sought to mitigate the damage. This can be done by:

- reducing greenhouse gas (GHG) emissions, to limit the overall temperature rise and therefore avoid even more extreme climate change, and
- making sure that our communities, economy, and infrastructure are resilient to the changes that are already underway.

> *"Climate change is happening now. It is one of the biggest challenges of our generation and has already begun to cause irreversible damage to our planet and way of life."*
> – HM Government, 'UK Climate Change Risk Assessment' (2022)

1.2 Climate action planning in Midlothian

In 2019, Midlothian Council voted to declare a climate emergency and stated its ambition to achieve net zero for its own emissions by 2030. It acknowledged the need for urgent action to reduce its contribution towards climate change.

Midlothian's **Climate Change Strategy**, published in 2020, provides an overarching framework for action. It is structured around the following themes: energy efficiency, recycling and waste, sustainable development, sustainable travel, business processes, carbon management, governance and management, and risk.

The strategy also includes an Action Plan, which sets out specific near-term (2-3 years) steps that the Council plans to take. These include, but are not limited to, various awareness-raising and outreach activities, measures to reduce waste and promote sustainable travel choices, and initiatives that would reduce local emissions by investigating the potential for heat networks and ultra-efficient new homes.

Note: The Strategy and Action Plan, along with this report, deal with the Council's own emissions as an organisation, not emissions for Midlothian as a geographic area.

[1] https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Scotland-Summary-Final-1.pdf

The Climate Change Strategy and Action Plan provide a strong foundation going forward looking at GHG emissions reduction from a qualitative standpoint. The next step is to look at Midlothian Council's emissions quantitatively, and consider:

- Are these actions sufficient to achieve the net zero target?
- If not, what additional actions need to be taken?
- What scale of investment might be required, and when?

Those are the questions that this report seeks to address. It also recommends ways to improve data collection in the future, ensuring that the Council's GHG inventory is technically robust, accurate, and transparent as well as regularly updated. Finally, it suggests the type of governance structures and resourcing that the Council would need to put in place to implement the proposed changes.

The process

Aether was commissioned to undertake the following tasks:

- Step 1: Develop the council baseline GHG inventory by analysing detailed information on energy, waste, and travel
- Step 2: Identify the actions Midlothian Council needs to take to achieve its net zero target, through a collaborative process of engagement with key stakeholders
- Step 3: Calculate what the Council's future emissions might be, accounting for business as usual trends plus additional GHG reduction measures, and researching the potential costs of different options
- Step 4: Review the outcomes and suggest next steps

1.3 Policy context and other drivers

In addition to this local commitment, all Scottish Local Authorities have a duty to take action on climate change, arising from a combination of international, national, and sectoral policy requirements and legislation. Some of the key drivers are summarised below.

The UK ratified the **Paris Agreement** in 2016. The Paris Agreement is an international treaty that commits signatories to pursue action to limit global warming to 2°C, with an ambition of keeping it below 1.5°C.

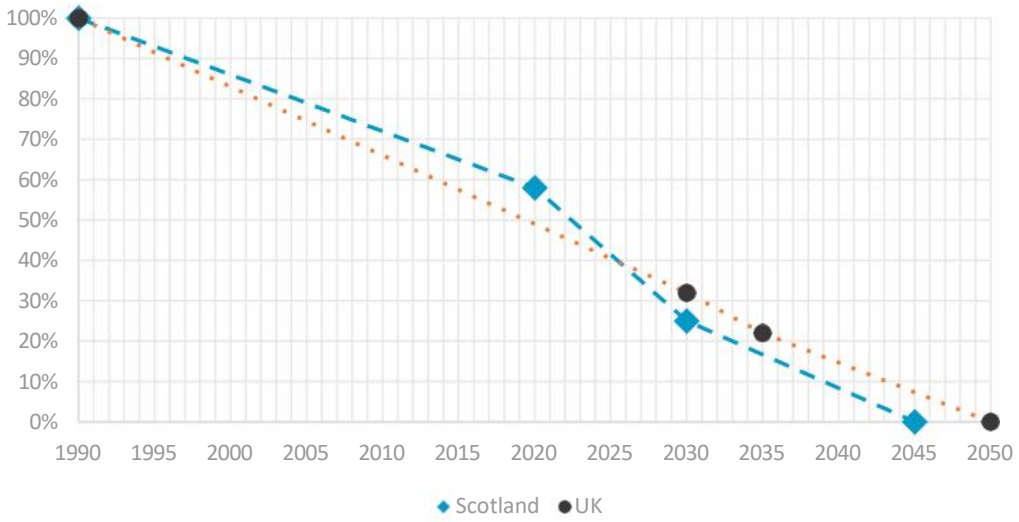
The UK **Climate Change Act 2008** (as amended in 2019) requires emissions to reduce to net zero by 2050 at the latest. Additionally, the Committee on Climate Change (CCC), which is the UK Government's independent advisory body on climate change, sets out 5-year carbon budgets that must be met as stepping stones along the way. These targets have been set in response to the scientific evidence compiled by the Intergovernmental Panel on Climate Change (IPCC)[2].

The **Climate Change (Scotland) Act** 2009 set a legally-binding GHG emissions reduction target for whole country, which is expressed as a percent (%) improvement, relative to 1990 levels. Whereas the original Act would have required an 80% cut in GHG emissions by 2050, it was amended in 2019 to require a 100% net reduction by 2045. This

[2] https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

ambitious target would require emissions to reach net zero five years in advance of the rest of the UK, as illustrated below.

Figure 3. GHG emissions reductions targets for the UK and Scotland



Under the Climate Change (Scotland) Act 2009, public sector bodies have a range of duties to in relation to climate change including mandatory reporting since 2015-16. Midlothian's annual **Public Bodies Climate Change Reports** are published online; these include estimates of the Council's corporate emissions alongside other actions the Council is taking on area-wide emissions and climate change resilience.[3]

The **2018 Climate Change Plan** for Scotland set out the Government's plans for transition towards a zero carbon economy. It contains a list of targets, funding initiatives, policy measures and other supporting actions the Scottish Government will take to achieve emissions reductions across all sectors. This was first refreshed in 2020 via the **Climate Change Plan Update** (CCPu), and at the time of writing (February 2024), the Scottish Government is preparing another update.[4] Some of the key policies described in the CCPu that are relevant to Midlothian's climate ambitions include:

Transport: Ending the sale of new combustion engine vehicles in favour of ones with zero tailpipe emissions, implementing measures to promote sustainable travel modes to contribute towards a 20% overall reduction in car kilometres, and supporting alternative fuels for vehicle types that are impractical to run on batteries, such as HGVs.

Buildings: Improving the energy performance of the existing building stock, phasing out fossil fuel heating systems in favour of ones with zero direct (i.e. onsite) emissions, and increasing the proportion of heating that is supplied via heat networks.

Notably, while most buildings must have a zero-emission heating system by 2045, for public sector buildings this target is 2038. Council housing is

[3] https://sustainablescotlandnetwork.org/reports/midlothian-council

[4] https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/

also required to meet higher standards of energy efficiency than the rest of the housing stock by 2032 – achieving a minimum EPC rating of 'B' while the minimum for other homes is a 'C' rating.

Waste: Reducing the amount of food waste that is produced, ceasing to send biodegradable waste to landfill by 2025, taking action to reduce emissions from closed landfill sites, and increasing recycling rates.

Energy: Promoting renewable energy uptake, including an expansion of offshore wind capacity, and providing support to community and locally owned schemes. There is a target for renewable energy generation to account for the equivalent of 50% of energy demand for heat, transport and electricity by 2030.

Negative emission technologies: Supporting research and development into direct air carbon capture and storage (DACCS) and bioenergy with carbon capture and storage (BECCS), both of which are needed to mitigate 'hard-to-abate' sources of emissions such as waste.

These policies and drivers have been taken into consideration when developing the list of GHG mitigation actions for Midlothian, including timescales. More details of the actions are provided in subsequent chapters.

1.4 Structure of this report

Section 2 describes Midlothian Council's current GHG emissions, and explains how these were calculated. It forms the basis for identifying additional recommendations throughout the rest of the report.

Section 3 presents an assessment of current energy use in Council-owned buildings. It then provides recommendations for priority measures to improve their performance.

Section 4 shows the potential future GHG emissions trajectory for Midlothian Council, comparing a 'business as usual' scenario against alternative pathways to net zero.

Section 5 sets out a long list of actions that the Council could take to mitigate its GHG emissions, including timescales, potential costs, co-benefits, and other practical considerations.

Section 6 describes governance arrangements for reducing emissions, and provides recommendations on how to monitor emissions in future, including data collection.

Section 7 summarises key messages and draws together conclusions from the work.

The **Appendices** provide further detail on the modelling assumptions and methodology used as part of this project.

2 Midlothian Council's current GHG emissions

This section describes Midlothian Council's current GHG emissions, and explains how these were calculated. It forms the basis for identifying additional recommendations throughout the rest of the report.

2.1 What is a GHG emissions inventory?

A greenhouse gas (GHG) inventory, or 'carbon footprint', is a dataset that quantifies the sources of GHG emissions from an organisation's operations. Different sources of emissions will be included in the inventory, depending on the type of organisation, the reason that it is reporting its emissions, and whether there are data available to provide an estimate.

Producing a GHG inventory is important for a few reasons:

- If an organisation wants to reduce its emissions, it is first crucial to understand where the emissions are coming from.
- It allows organisations to track their progress against targets over time.
- It provides a way for them to compare themselves to other, similar organisations, and to undertake benchmarking.

2.2 Inventory Methodology

2.2.1 Overview of the approach

In simple terms, a GHG inventory is produced by collecting data on the organisation's activities, and then applying a conversion factor that represents how 'carbon intensive' that activity is. This is shown in Equation 1.

Equation 1: Emission factor approach for calculating GHG emissions

Activity Data - This is a measure of the activity which is taking place, which might be in units of electricity, litres of petrol or tonnes of waste. For this inventory, activity data have been provided by Midlothian Council.

Emission Factor - This is the GHG emissions per unit of activity, which usually comes from scientific literature.

For example, estimating CO_2 emissions from the use of electricity involves multiplying data on kilowatt-hours (kWh) of electricity used by the emission factor ($kgCO_2/kWh$) for electricity, which will depend on the technologies and type of fuels used to generate the electricity. Electricity generated by coal- or gas-fired power plants will have a higher emission factor than electricity generated by a mix of fossil fuels and renewable energy.

This assessment has been produced in line with guidance set out within the internationally-recognised GHG Protocol Corporate Accounting and Reporting Standard[5],

[5] https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

which also underpins the guidance for the Scottish Public Bodies Climate Change Duties Annual Reporting co-ordinated by the Sustainable Scotland Network (SSN)[6].

2.2.2 What does this assessment cover?

This inventory covers sources of emissions that are included in Midlothian Council's Public Bodies Climate Change Report[7]:

- **Energy use**, **water supply** and **water treatment** for buildings where the Council is responsible for utility bills
- Fuel used within the Council's own **vehicle fleet**
- Electricity used for **streetlighting**
- **Business travel** for Council activities

It also includes the emissions from **waste** generated by the Council's operations. Guidance from the SSN and the Local Government Association (for England and Wales) states that local authorities should report waste emissions, although it is not yet included in Midlothian Council's public reports.

Council housing, and other properties the Council owns but where it is not responsible for utility bills, are **outside the scope** of this assessment.

There are various other sources of emissions associated with Midlothian Council's activities that should fall within the scope of this inventory, but have not been included because data were not available during the project timescale and/or because they are expected to be small in comparison with the emissions listed above.

The table below lists the sources of emissions that are considered relevant to Midlothian Council. In line with standard GHG accounting procedures, these have been grouped into three categories or 'scopes', for which definitions are also provided.

In future, it is recommended that Midlothian Council collect data and report on those additional sources for the sake of completeness. Please refer to **Section 6.1** for more recommendations on data collection.

Additional information:

- The **reporting period** for this assessment is the financial year (FY) 2021/22.
- In terms of the **geographical boundary**, this assessment encompasses any locations where Midlothian Council operates, which are primarily within Midlothian, although some waste management activities and business travel may take place elsewhere.

[6] https://sustainablescotlandnetwork.org/uploads/store/mediaupload/2179/file/PBDR%20Guidance%202023%20V1.2.pdf
[7] https://sustainablescotlandnetwork.org/reports/midlothian-council

Table 2. GHG emissions associated 2.2.2with Midlothian Council's operations

	Category definition	Emissions currently included in the inventory	Emissions not currently included in the inventory
Scope 1	**Direct** GHG emissions from sources owned or controlled by the Council	• Gas, oil or other fuels used to heat buildings where the Council pays utility bills • Fuel used in vehicles such as petrol and diesel cars, vans and HGVs	• Refrigerants, which are used in fridges, freezers, and air conditioning • Fertilizer use (e.g. on lawns or playing fields)
Scope 2	**Indirect** GHG emissions from the consumption of purchased electricity, steam or other sources of grid-generated energy	• Electricity used in Council-owned and operated facilities, including buildings and streetlamps, where the Council pays utility bills • Electric vehicle charging at the same properties*	
Scope 3	GHG emissions that occur indirectly from Council activities**, outside the control of the Council** (e.g. the Council's procured services)	• Waste – all waste collected by the Council • Water supply • Water treatment • Business travel • Home/hybrid working	• Employee commuting • Capital goods (e.g. embodied carbon of buildings) • Other purchased goods and services (e.g. social care, food and catering for schools) • Investments (e.g. pension funds) • Energy use in buildings owned by the Council where other entities pay utility bills

* Electricity used for vehicle charging cannot be disaggregated from the figures for electricity used in buildings based on the data provided.

2.2.3 Data sources

A full breakdown of the activity data used is presented in Appendix A.

Buildings, streetlighting, vehicle fleet and business travel: The activity data reported in Midlothian Council's 2021/22 climate duties report was used in the emissions calculations.

Whilst the building energy data provided by the Council contained a more detailed breakdown between building types, the total energy consumption reported in these files was substantially lower than the total energy consumption reported in Midlothian's climate duties report for gas and electricity. It is assumed that the activity data in the Public Sector Bodies report is more comprehensive, so this was used to calculate the Council's baseline emissions.

Waste: Waste data for the Council's own operational waste was requested but was not available. We have therefore used the total amount of waste collected by the Council, based on statistics for 2021 published by the Scottish Environmental Protection Agency (SEPA). Although the Council's operations only generate a small amount of this waste, all of the waste can be considered a Scope 3 emissions source for Midlothian Council, since it is responsible for waste management and commissions the energy from waste plant.

Home/hybrid working: The activity data reported in Midlothian Council's 2021/22 climate duties report was used in the emissions calculations.

Emissions factors: Emissions factors for greenhouse gas reporting are published annually by the UK Government. The 2021 dataset was used to calculate emissions for the financial year 2021/22 for buildings, streetlighting, vehicle fleet, business travel and waste.[8] The homeworking emission factor from Sustainable Scotland Network's Reporting Guidance 2020/21[9] was used in order to align with Midlothian Council's climate duties report. Emissions factors have been checked for consistency with Midlothian Council's 2021/22 climate duties report. For water supply and treatment, there is a slight discrepancy between the figures used in that report and the UK Government's statistical publication; we have used the latter. This does not have a significant impact on the results.

2.3 Council GHG Emissions in 2021-22

Midlothian Council's GHG emissions are estimated to be 19.5 $ktCO_2e$ in 2021/22. A more detailed breakdown of the Council's emissions is presented in **Table 3**.

Table 3 Midlothian Council's emissions in 2021/22

Emissions source	Emissions (tCO_2e)	% of total emissions
Buildings total	12,455	64%
Buildings - Electricity	*3,069*	*16%*
Buildings - Gas	*9,144*	*47%*
Buildings - Gas oil	*221*	*1%*
Buildings – Water supply & treatment	*21*	*0.11%*
Streetlighting	1,191	6%
Fleet total	1,982	10%
Fleet - Diesel	*1,694*	*9%*
Fleet - Petrol	*37*	*0.19%*
Fleet – Gas oil	*250*	*1%*
Business travel	18	0.09%
Waste (Council collected)	3,240	17%
Homeworking	605	3%
Total	**19,490**	**100%**

Note: Figures in this table have been rounded

[8] www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021
[9] www.sustainablescotlandnetwork.org/uploads/store/mediaupload/1572/file/CC%20Reporting%20Master%20Guidance%202021%2013.07.21.pdf

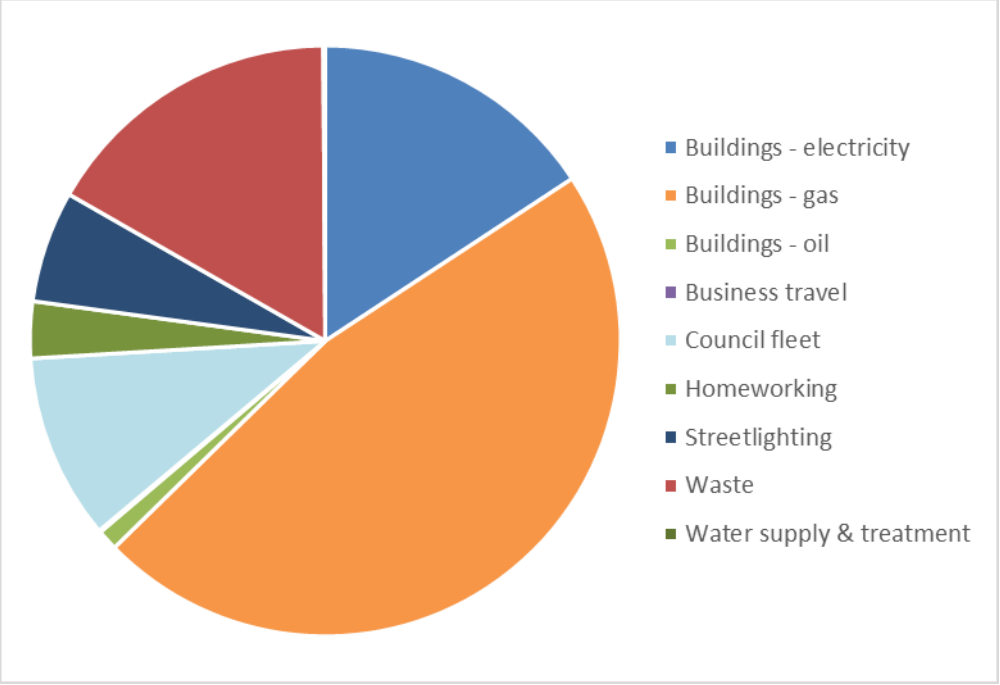
The Council's Scope 1 and 2 emissions from its own operations are dominated by buildings and vehicles:

- Operational buildings are a significant source of GHG emissions for Midlothian Council, and account for 64% of the GHG emissions that have been quantified. The use of natural gas in the Council's buildings accounts for just under half of total emissions. The second largest contributor to Midlothian's carbon emissions is electricity consumption in buildings. There is also a small amount of gas oil used for heating which accounts for around 1% of emissions.
- The Council's vehicle fleet contributes 10% of total GHG emissions. Within this category, the majority of emissions relate to the use of diesel, with petrol and gas oil accounting for a small proportion of fleet emissions.
- Streetlighting accounts for around 6% of Midlothian's emissions.

Among the Scope 3 (indirect) emissions that have been quantified, the most significant source of emissions (17% of the total) is from waste; however, as stated previously, this includes all waste collected by the Council. The Council's own operational waste is likely to be a small proportion of this. It is also worth noting that emissions from waste in this calculation are dominated by waste that is sent to landfill, and it is understood that this practice has been stopped. If the same amount of waste was sent to the incinerator, GHG emissions from waste would be significantly lower than indicated. The values presented here should be interpreted with particular caution as they do not necessarily reflect current waste management practices, and include waste generated by organisations and individuals not associated with Midlothian Council.

The remaining Scope 3 emissions that have been quantified in this study are associated with homeworking (3%), water supply and treatment (0.1%) and business travel (0.1%).

Figure 4 Midlothian Council's GHG emissions by source



Note: The majority of the Council's Scope 3 emissions have not been quantified, but these could potentially have a large impact on the results; it is not uncommon for them to represent 90-95% of a corporation's total emissions. The percentage values above should therefore be interpreted with caution because they are subject to change if additional sources of emissions are added to Midlothian's GHG inventory. They could also change for methodological reasons; for instance, the emission factor for homeworking is based on an average that is not specific to Midlothian Council's own staff. A more detailed estimate might produce a different result.

3 Energy use in Council buildings

This section presents an assessment of current energy use in Council-owned buildings. It then provides recommendations for priority measures to improve their performance.

3.1 Why are we interested in energy use?

Midlothian Council owns a variety of buildings, including Council offices, leisure centres, schools, residential care homes, and others. These buildings use a significant amount of heat and power, and therefore account for a significant proportion of Midlothian Council's operational GHG emissions – as well as operating costs.

The purpose of this analysis was to try and identify which buildings use the most energy, and to identify priority actions for the Council to improve those buildings' performance. This has informed the analysis of future emissions pathways, and recommendations for further work e.g. building energy audits and detailed feasibility studies.

3.2 Energy Data

Midlothian Council provided gas and electricity consumption data for all Council-owned buildings (where information was available). This was used to identify:

- The buildings with the highest energy demand overall (kWh), i.e. the total amount used each year; and
- The most energy-intensive buildings (kWh/m^2 per year), accounting for the differences in building size.

For a sub-set of buildings, the analysis also looked at *patterns* of energy use: how these vary seasonally, across the week, and in relation to outdoor temperature changes. The latter is referred to as 'degree day analysis'.[10]

Where possible, we sought to fill gaps in the data by referring to Energy Performance Certificates (EPCs) for the buildings in question. These list the floor area of the building and provide a rough indication of its energy efficiency levels and running costs based on modelled estimates, not the actual energy bills.

The analysis covered energy use at the following types of premises:

- Council offices
- Commercial buildings
- Community centres

[10] Information on degree days was taken for Edinburgh from https://www.degreedays.net/

- Schools
- Libraries
- Public parks
- Depots
- Sports and leisure centres
- Residential accommodation and social care
- Public toilets
- Cemeteries
- Other miscellaneous non-residential buildings

Council housing was excluded from the analysis.

Note: Although efforts were made to ensure that the dataset was complete, this exercise found some discrepancies which could not be resolved within the timeframe of the project. For example, EPCs were provided for some buildings for which energy data were unavailable, and vice-versa. It has been assumed that the list of Council buildings with associated gross internal area (GIA) covers Midlothian Council's main buildings and have matched this data to gas and electricity consumption on the basis of postcode, where possible.

It was not possible to match some buildings on this list with energy data due to inconsistencies in the energy data, and therefore some of Midlothian Council's buildings will be missing from the analysis. Recommendations for improving future data collection are presented in Section 6.2 of this report.

3.3 Buildings Energy Intensity

3.3.1 Buildings with high energy and gas consumption – comparisons with benchmarks

The buildings with the highest electricity and gas consumption were identified and these are presented in **Appendix 1**.

Although it is important to consider which buildings contribute most to emissions to ensure that actions will have a bigger impact on the overall emissions total, it is of limited use to consider energy consumption without considering other factors such as building size and type. Unsurprisingly, the buildings at the top of both lists were mostly leisure centres with pools and high schools which are expected to have reasonably high energy demands.

The buildings with the highest intensity electricity usage (annual electricity consumption by GIA), listed in **Table 4**, were compared to Scottish benchmarks for electricity use in public sector buildings.[11] These include average, maximum and minimum values; data for Midlothian's buildings were compared against this range.

Of the 20 buildings, five were found to be higher than the benchmark values. All other buildings included in the list were found to be within or lower than the expected range

[11] The Scottish public sector benchmarks are based on the energy use of over 9,000 individual sites, as reported by Scottish Local Authorities and other public sector organisations that participated in the voluntary benchmarking exercise in 2021. https://www.zerowastescotland.org.uk/resources/scottish-public-sector-benchmarking-tool

for electricity consumption. Three of those buildings identified as having unusually high electricity use were care homes or accommodation.

The care home at 1A Eastfield Drive, which had the highest electric intensity of all Midlothian's operational buildings, was 26% higher than the expected electricity use range for similar buildings. Newbattle Community Campus and Kings Park Primary School were also identified as having unusually high electricity consumption, by 26% and 5% respectively.

Both of the council's main office buildings feature in the list of buildings with the highest electricity intensity, although both are within range of benchmark values.

Table 4 Buildings with the highest electricity use intensity, compared to benchmarks for Scotland

Building	Intensity (kWh/m^2/yr)	Benchmark category	Comparison against benchmarks
1A Eastfield Drive	161	Care homes	26 % Higher than range
Penicuik House	133	Care homes	5% Higher than range
Pentland House HEP	124	Care homes	Within range
Stobhill Depot	112	Depot	Within range
Penicuik Pool and Library	107	Leisure centre - indoor dry sports and swimming pool	Lower than range
Parkhead Lodge	97	Accommodation	2% Higher than range
Loanhead Centre	95	Sports and leisure	Lower than range
Highbank HEP	94	Care homes	Within range
Midlothian House	91	Offices	Within range
Cowan Court	90	Care homes	Within range
Newbattle Community Campus	87	Secondary school with pool	26% Higher than range
Newton Grange Leisure Centre	86	Sports and leisure	Lower than range
Newbyres Village Care Home	82	Care homes	Within range
Fairfield House – Main Building	78	Offices	Within range
Roslin Library	76	Library	Within range
Kings Park Primary School	74	Primary & secondary educational buildings	5% Higher than range
Gorebridge Childrens Home	67	Care homes	Within range
Beeslack High School	58	Primary & secondary educational buildings	Within range
Burnbrae Primary School	58	Primary & secondary educational buildings	Within range
Gorebridge Leisure Centre	57	Sports and leisure	Lower than range

Similarly, the buildings with the highest gas consumption intensity were also compared to Scottish benchmarks. The results are shown in **Table 5**. Of the 25 buildings included in the list, only 8 were found to be in range of benchmark values, and all others had higher than expected gas consumption when compared to buildings of similar type.

Table 5 Buildings with the highest gas consumption intensity, compared to benchmark values

Building	Intensity (kWh/m^2/yr)	Benchmark category	Comparison against benchmarks
Parkhead Lodge	889	Accommodation	214% Higher than range
Penicuik Pool and Library	526	Leisure centre - indoor dry sports and swimming pool	Within range
1A Eastfield Drive	503	Care homes	40% Higher than range
St Mattews RC Primary School	497	Primary and secondary educational buildings	166% Higher than range
Stobhill Depot	453	Depot	144% Higher than range
Glencourse Primary School Now ASN	408	Primary and secondary educational buildings	118% Higher than range
Roslin Library	402	Library	51% Higher than range
Hawthorn Children's Centre	399	Day centre	34% Higher than range
Loanhead Centre	350	Sports and leisure	Within range
Penicuik High New Pavilion	330	Cultural, recreational and events	21% Higher than range
Kings Park Primary School	325	Primary and secondary educational buildings	74% Higher than range
Cowan Court	315	Care homes	55% Higher than range
Highbank HEP	311	Care homes	Within range
Fairfield House Main Building	288	Offices	42% Higher than range
Gorebridge Children's Home	286	Care homes	Within range
Newbattle Comm Education Centre	285	Community centre	0.5% Higher than range*
Kilbreck House	283	Accommodation	0.1% Higher than range*
Midfield House	281	Care homes	Within range
Sacred Heart RC Primary School	274	Primary and secondary educational buildings	46% Higher than range
Penicuik High School	260	Primary and secondary educational buildings	39% Higher than range
Penicuik Complex Care	252	Care homes	Within range

Newtongrange Primary School	252	Primary and secondary educational buildings	35% Higher than range
Gorebridge Leisure Centre	249	Sports and leisure	Within range
Penicuik Town Hall	231	Offices	14% Higher than range
Brightsparks	231	Day centre	Within range

** These values are only slightly above the stated range; when considering the uncertainty associated with any benchmarking exercise, along with natural variations in weather and usage patterns, this difference may not be significant.*

In some cases, gas consumption was significantly higher than benchmark values. The gas intensity reported for Parkhead Lodge was over three times larger than the benchmark value. St Matthews RC Primary School, Stobhill Depot and Glencourse Primary School all had gas use intensities that were over double expected values.

Of the Council's two main office buildings, Fairfield House has gas consumption that exceeds benchmark values. Midlothian House does not appear in the list of the top 25 buildings for gas consumption intensity and is also within the expected benchmark range for office buildings.

It is difficult to understand the full extent of energy use in Midlothian Council's buildings due to uncertainty about the coverage of the energy data. Inconsistencies between datasets suggest that some buildings have not been included in the data that were supplied to us.

The energy intensity analysis demonstrates that some Council buildings have energy consumption that is much higher than expected, especially for gas consumption. It is understood that Midlothian Council has already scheduled energy audits for some of its buildings in the financial years 2023/24 and 2024/25, although a list of those buildings selected for these initial audits has not been received.

Recommendations:

It is recommended that the Council ensure that complete and consistent energy data are recorded. Data collection needs are discussed further in Section 7.1.

It is strongly recommended that Midlothian Council completes energy audits for buildings with the highest energy use or energy use intensity and looks into the potential reasons for this. It is recommended that audits for buildings with high energy use and high energy intensities are prioritised.

3.3.2 Midlothian House vs. Fairfield House: Energy use and emissions

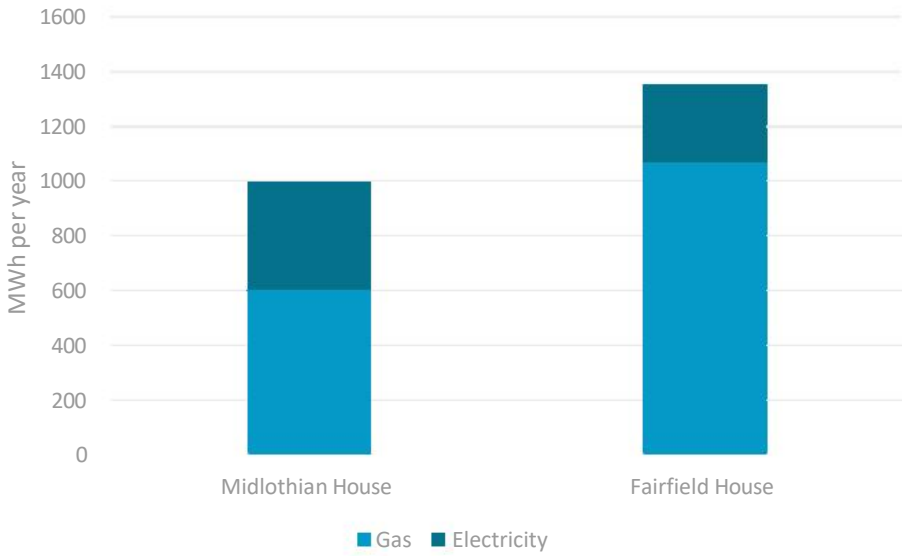
The Council is currently considering whether to close Midlothian House or Fairfield House. This section provides a brief comparison of these properties in regard to energy use and GHG emissions. It also discusses the potential impacts from demolishing and rebuilding, if and when one of the properties is sold.

The methodology and data sources used to calculate energy and GHG emissions have been described previously in **Section 2.2**. Embodied carbon (that is, the indirect

emissions from the construction and materials) has been estimated based on RIBA benchmarks.[12]

Energy use: These two properties have relatively high energy use compared with other buildings in the Council's portfolio, and are within the top 20 for both gas and electricity (see Section 3.3.1). Total gas and electricity consumption (kWh) in Fairfield House is around 35% higher than in Midlothian House, although it is around 15% smaller.

Figure 5. Energy: Midlothian House vs Fairfield House

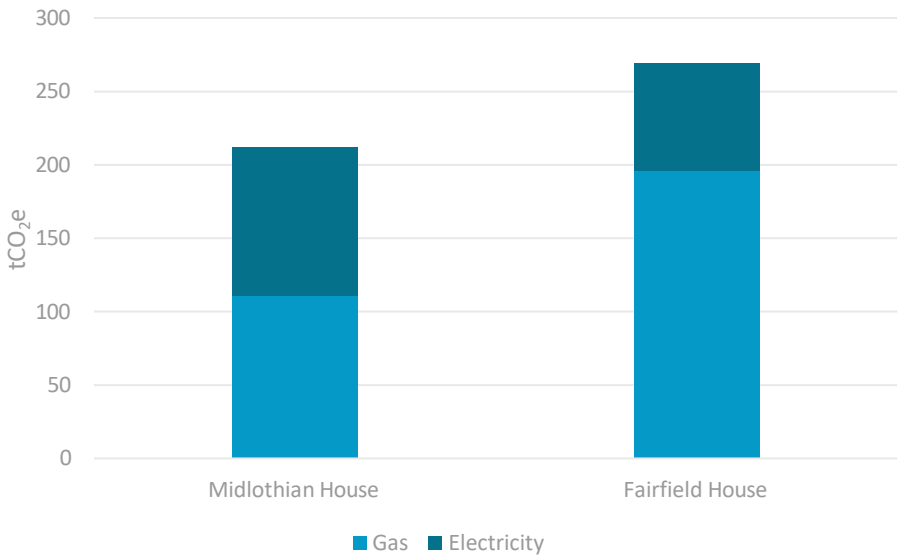


Although Fairfield House uses more energy, it is estimated that energy bills at the two properties may be roughly similar due to differences in the cost of electricity and gas.

GHG emissions: Despite having relatively high energy use, they account for a relatively small proportion of emissions (which is to be expected for any individual building given the breadth of the Council's portfolio). Midlothian House accounts for around 1.1% of the Council's quantified GHG emissions (212 tCO_2e), whereas Fairfield House accounts for around 1.4% (269 tCO_2e).

[12] https://www.architecture.com/about/policy/climate-action/2030-climate-challenge

Figure 6. Emissions: Midlothian House vs Fairfield House



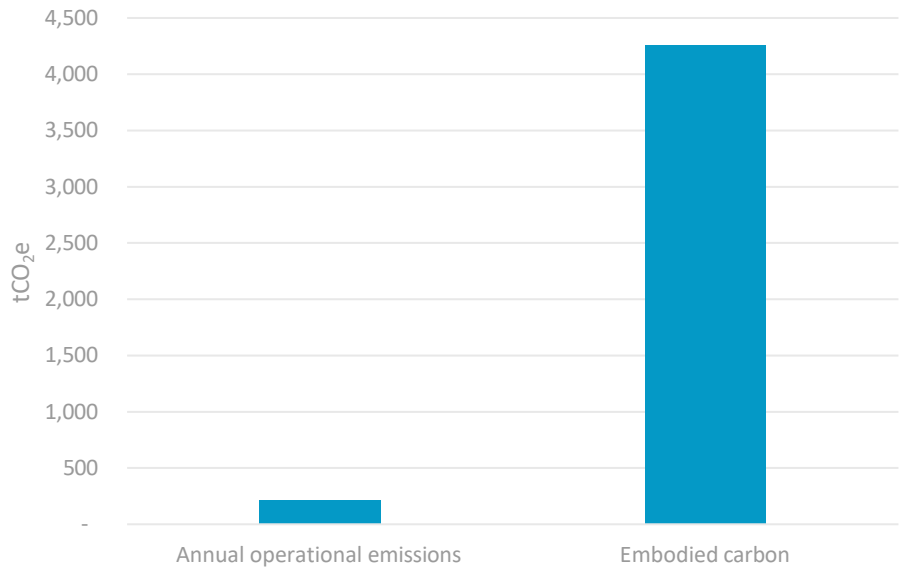
Indirect impacts on emissions: It is understood that, if sold, the buildings might be demolished and replaced. Those emissions would not fall within the Council's GHG inventory once the asset is sold. However, the Council does have the ability to influence – and potentially avoid – those emissions through careful decision-making. This is important to consider because embodied carbon emissions will be many times higher than the annual operational emissions.

The chart below illustrates the difference, assuming that Midlothian House is replaced with another office building of the same floor area that meets good practice energy efficiency standards.

- Operational emissions from the current building are 212 tCO_2e per year.
- A new building with a heat pump that uses 65 kWh/m^2 of electricity per year would have roughly 65% lower emissions, saving around 140tCO_2e per year.
- Using the RIBA 2025 good practice benchmark for new build offices (970 $kgCO_2e/m^2$), the embodied carbon of a replacement building would be more than 4,500 tCO_2e.

So, even if the replacement building was highly energy efficient, it would take 30 years to make up for the upfront embodied carbon through operational carbon savings.

Figure 7. Midlothian House: Annual operational emissions vs. embodied carbon



The key take-home point from this analysis is that the decision to sell one building versus the other would not have a significant impact on Midlothian Council's emissions – on paper. Their operational emissions are small compared with the Midlothian Council's total operational emissions. However, if the Council has reason to believe that one building would be demolished and rebuilt, while the other could be refurbished, this *would* result in a significant difference in GHG emissions between the two options, due to the embodied carbon.

3.4 Embedding GHG reductions into operations and maintenance strategies

For the Council's own assets, it is important to make sure that decarbonisation is embedded within the operations and maintenance strategy. This is absolutely critical to prevent money being spent on new fossil fuel systems if it can possibly be avoided.

Any new gas boiler that might be installed between now and 2030 would either have to be replaced again in a few years' time for the Council to meet its net zero target. Or – as is more likely – they will continue to operate in 2030 and beyond, which will mean that the net zero target is missed.

This issue can be complicated depending on the ownership and tenancy/leasing arrangements of Council-owned buildings. The table below highlights the different approaches that apply in different circumstances.

Table 6. Approach for buildings under different ownership and operational models

Type of building	Recommended steps
 All buildings that the Council either owns or operates	Acknowledge that you have levers of influence over these emissions, directly or indirectly Assess which sources of emissions are likely to be most significant – this might involve a qualitative screening assessment at first, before examining important sources in more detail Work with landlords/tenants/other stakeholders to collect relevant data Ensure that plans align with Government regulations e.g. minimum EPC ratings Regularly report and track progress
 Buildings that the Council owns, but doesn't operate	Make tenants aware of your longer-term plans and targets Work with tenants to identify steps that they can take (and how you, as the landlord, can facilitate this) Make sure that relevant works/upgrades are integrated into the maintenance strategy Where relevant, introduce 'green lease agreements'
 Buildings that the Council operates, but doesn't own	Make the landlord aware of your longer-term plans and targets Work with the landlord to understand steps that you can take (and what permissions are needed) Identify opportunities to reduce emissions through your own operations, that do not require the landlord's involvement e.g. encouraging staff to recycle more
 Buildings that the Council owns AND operates	All of the above actions, as relevant The Council will have full control over changes and will be able to take advantage of the full benefits of any measures that are implemented

4 Midlothian Council's future emissions

This section shows the potential future GHG emissions trajectory for Midlothian Council, comparing a 'business as usual' scenario against alternative pathways towards net zero.

4.1 How do we model future emissions?

This GHG emission trajectory study for the Council has been undertaken using the Carbon Scenario Model (CSM). Originally developed for use by local authorities (funded by Resource Efficient Scotland and Sustainable Scotland Network[13]), this Excel-based tool has been adapted by the project team to provide a bespoke modelling solution for Midlothian Council.

Within the model, baseline emissions are disaggregated by sector (e.g. buildings, vehicles, waste) and by fuel type (e.g. electricity, gas, petrol). The model is then configured to specify whether each source of emissions will increase or decrease, and by how much.

Changes in the BAU scenario may be due to wider trends (e.g. population and economic growth) or planned and committed projects (e.g. building refurbishment). Changes in the net zero scenario(s) are due to GHG reduction actions and policies.

In each case, the scale of the impact is informed by an evidence base that includes stakeholder engagement, literature and policy reviews. Two of the key sources of information for this study were (1) the technical research underpinning the 6th Carbon Budget and (2) the GHG impact assessment of the Scottish CCPu.[14] We have also drawn on our team's expert knowledge of relevant case studies.

The model is then configured to specify the timeframe over which the changes occur or the actions are implemented. Based on all of this information, the model recalculates emissions for each sector and fuel type for each year up until the target date.

This process allows us to evaluate how close Midlothian Council could get towards achieving its target, assess the scale of impact from individual GHG reduction measures, and identify any sectors where there is a shortfall. The results can then be used as an evidence base to prioritise actions and identify key risks.

However, it is important to understand that these are illustrative scenarios based on assumptions and not projections or predictions. **Any estimates of future emissions – particularly ones that extend decades into the future – are associated with significant uncertainty and subject to adjustments as the evidence base improves and unforeseen technology and behaviour changes arise.**

[13] https://sustainablescotlandnetwork.org/resources/carbon-footprint-and-project-register-tool

[14] https://www.gov.scot/

4.2 The 'Business as Usual' scenario

4.2.1 Modelling approach

The base year GHG inventory is projected forward in time, assuming no further action is taken by the Council, to produce the Business as Usual (BAU) scenario. The changes in the baseline emission profile are therefore as a response to wider-scale pressures and actions from outside of Midlothian.

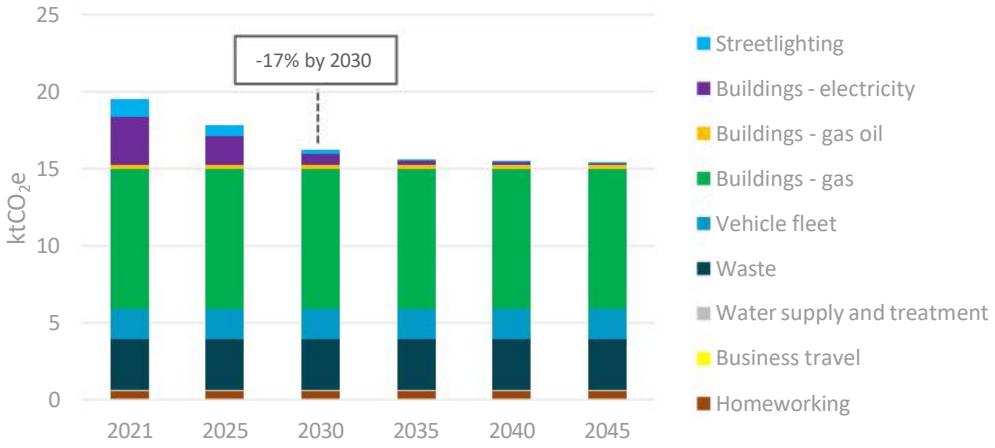
The key change that has been modelled is the decrease in emissions from grid electricity, which is due to a higher proportion of renewables being used to generate power. The future grid electricity factors used in the model are based on the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions.[15]

Note that the Scottish and UK governments have both announced a range of policy initiatives and targets that would impact emissions in Midlothian even if the Council did not introduce new policies of its own. However, Midlothian Council would still be responsible for implementing them, so for the purpose of this exercise these have been included in the net zero scenarios, rather than the BAU scenario.

4.2.2 BAU scenario emissions

Emissions are predicted to reduce steeply in the next few years, decreasing by about 17% by 2030. The pace of change would slow significantly after that, with a total of about 20% reduction by 2040 or 2045.

Figure 8. GHG emissions by source - BAU scenario



The BAU scenario shows that some emissions reductions will take place between now and 2030 due to decarbonisation of the electricity grid. It is important to note that the future emission factors for electricity are *not* forecasts of what will actually happen. The Treasury Green Book figures represent the changes that would need to happen for the UK to meet its carbon targets. Achieving this will require very significant investment in infrastructure and a step change in renewable energy deployment and battery storage.

[15]The year-on-year change in Treasury Green Book values was used to calculate the carbon emission factor for electricity to the year 2045.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794737/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal-2018.pdf

The values cited above are therefore an optimistic estimate of the GHG reduction that would occur in the BAU scenario.

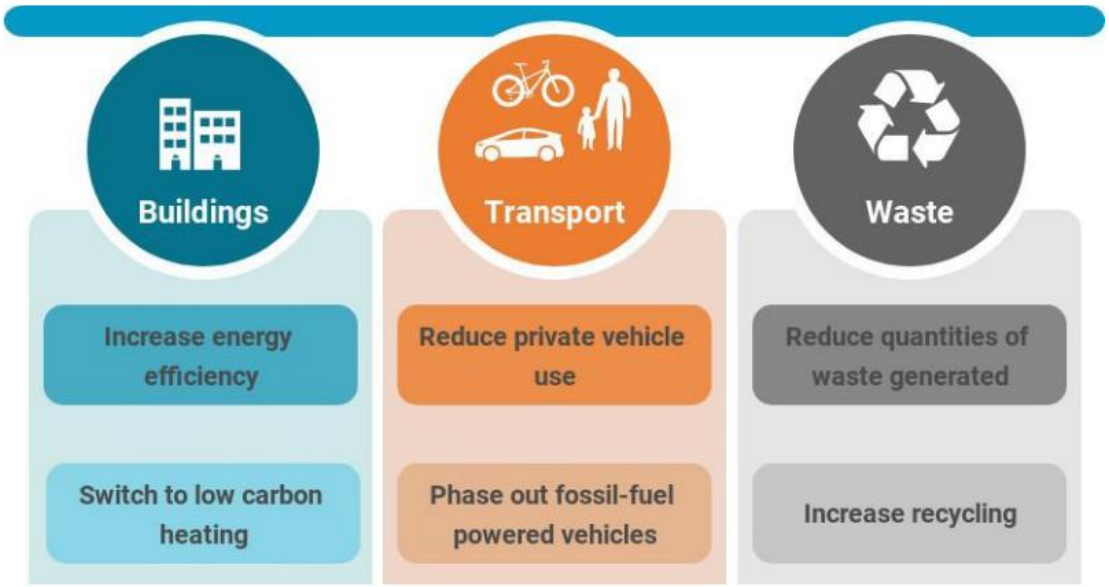
However, the BAU also clearly demonstrates the need for further action from Midlothian Council, to meet the emissions reduction targets. On this point, the Council already has a variety of initiatives underway to reduce emissions, including building retrofits, heating system upgrades, roof-mounted PV, and street lighting replacements. The following sections discuss the potential scale of impact from continuing to deliver these and other types of projects, maximising the level of ambition.

4.3 What additional measures are needed to bridge this gap?

To understand potential pathways to net zero, we need to consider each source of GHG emissions and map out the behavioural and technological solutions that can reduce each of these to zero. This will inform the list of climate actions for Midlothian Council that is presented in Section 5.

Based on the make-up of Midlothian's current GHG inventory, we have grouped actions into three main priority areas: buildings, transport and waste.[16] For each of these, first and second principles are outlined below, which recommend the type of actions that need to be prioritised, and the order in which to do so.

Figure 9. Priority actions for net zero



4.3.1 Buildings

First principle: increase energy efficiency. Reducing the energy demand by increasing energy efficiency is the first step to lowering emissions. Actions to increase energy efficiency of buildings should come before installing low carbon heating appliances. This principle is already recognised by Council stakeholders who take a 'fabric first' approach.

Second principle: switch to zero direct emission heating (ZDEH) systems. The Scottish Government's intention is that no new fossil fuel heating systems will be installed from

[16] The other main source of GHG emissions is streetlighting, but good progress is already being made to install LEDs, so this is not one of the main priority areas. Water supply and treatment, business travel and homeworking are indirect Scope 3 emissions and account for a relatively small proportion of the total.

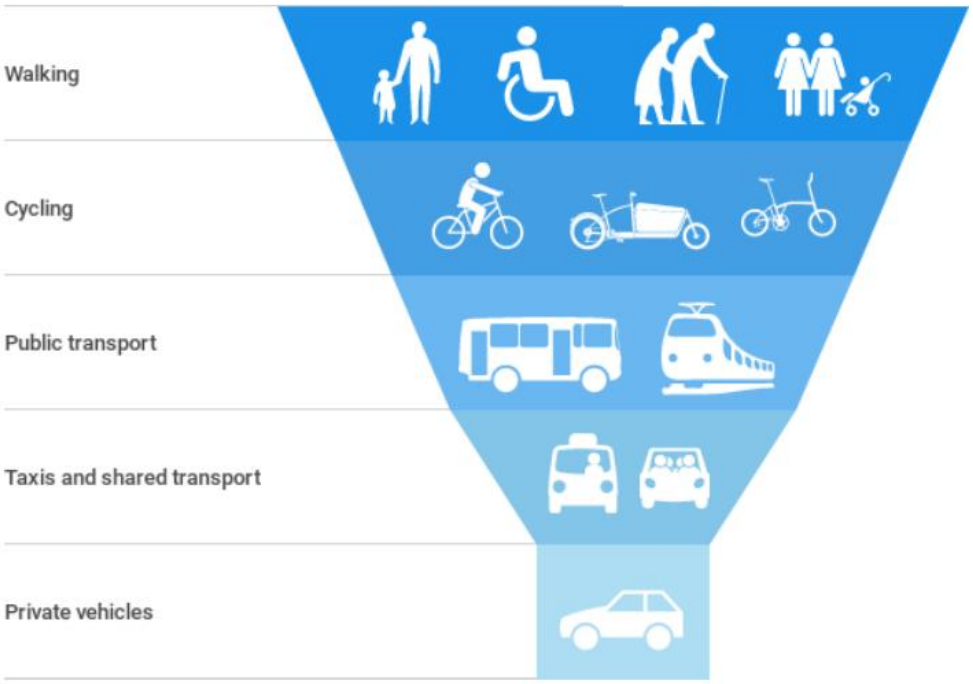
2030 onwards, and that by 2045 all systems will have zero direct emissions at the point of use.[17] These could be individual systems or communal/district heating solutions, and they are likely to run on renewable electricity or another source of waste heat – although the preferred solution will depend on the local context and individual building.

4.3.2 Transport

First principle: reduce vehicle use. Decreasing the number of vehicles on the roads, and the mileage of vehicles, is the essential first step to decarbonising transport, to reduce the energy demand. This could take the form of trip avoidance, consolidating journeys where possible, and undertaking eco driving training. In some cases, it might be possible to shift to public transport, walking and cycling.

Second principle: phase out fossil-fuel powered vehicles. After adopting measures to encourage public transport, walking and cycling, the remaining vehicles on the roads will need to be replaced with non-fossil fuel powered vehicles. The majority of these will be electric vehicles, with hydrogen possibly playing a role for decarbonising freight vehicles. The Council can facilitate this shift to electric vehicles through working with partners to ensure sufficient availability of rapid charging points in the area.

Figure 10 Sustainable travel hierarchy



4.3.3 Waste

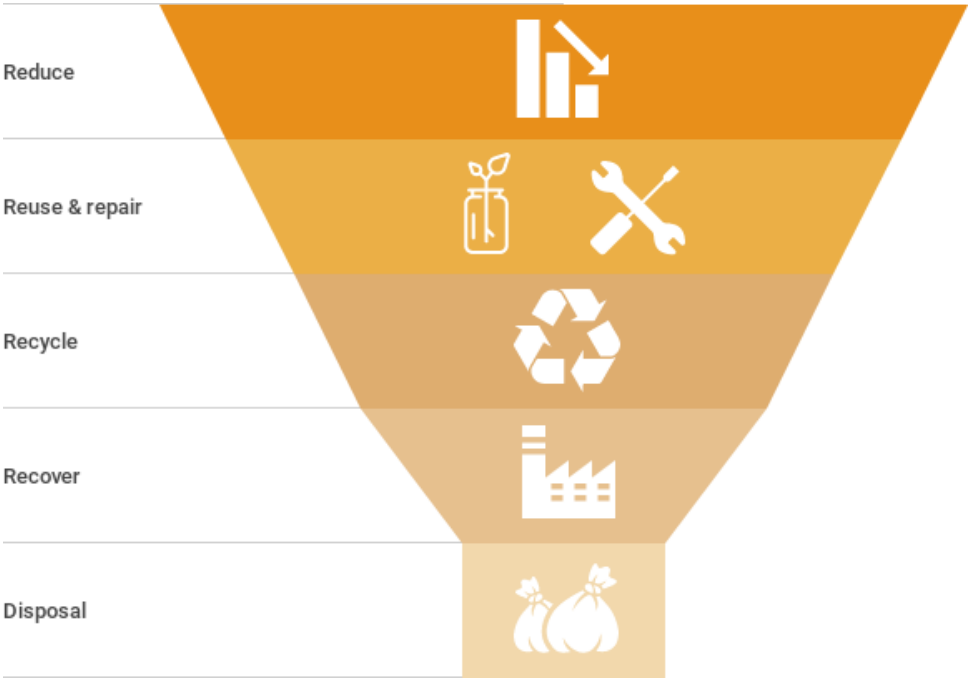
First principle: reduce quantities of waste generated. Reducing the amount of waste generated is the first step to decarbonising the waste stream, as it lowers the energy demand on the process. This is the first level on the waste hierarchy of management options, shown in Figure 11. Waste generation can be reduced through changes in

[17] There will still be some indirect emissions from generating electricity, but over time these will also reduce due to grid decarbonisation.

packaging of goods, reducing the consumption of goods, reusing and repairing goods, and embracing circular economy approaches.

Second principle: increase recycling and composting. The waste that cannot be avoided should be processed through these methods, which avoid waste going to the EfW plant. Increased recycling of plastics will have a particular effect in reducing emissions from their combustion at the EfW plant.

Figure 11 Waste management hierarchy



These principles have been used to define a set of mitigation measures that can be modelled, to quantitatively assess how Midlothian Council can reach its net zero target.

Which measures have been modelled?

Some measures will have a quantifiable impact on Midlothian's GHG inventory, but this is not always the case. In this study, GHG reductions have only been quantified where:

- There is technical evidence or research available to inform the analysis. This provides transparency, and ensures that the estimates are formed based on realistic assumptions.

  AND

- The source of emissions is included in Midlothian Council's GHG inventory. Some actions reduce wider emissions – for instance, switching from a car to cycling might avoid the emissions associated with manufacturing vehicles and supplying fuel – but this would not affect the Council's 'balance sheet'.

4.4 Pathways towards net zero

4.4.1 Modelling approach

The decarbonisation scenarios incorporate the same grid electricity trends as the BAU scenario. Individual GHG reduction actions are added with emissions savings estimated annually from the year of implementation.

The table below summarises the mitigation measures that have been modelled. Measures listed in *grey italics* are not considered to be feasible within the timeframe between now and 2030, but are included in the 2045 pathway. **Appendix C** provides more information about the evidence base used to quantify the emissions impact for each measure.

Category	Mitigation measures
Council fleet	Reduce fuel use where possible through measures such as eco driving training, route optimisation, etc.
	Replace vehicles with EVs, where practical
	Replace diesel in HGVs with green hydrogen or biofuel once this becomes commercially available (mid-2030s onwards)
Streetlights	Continue to replace streetlights with LEDs
Business travel	Use EVs, public transport, walking or cycling, where practical
Buildings	Retrofit buildings to improve fabric efficiency
	Where present, replace gas cookers with electric cookers
	Switch to zero direct emission heating (ZDEH)
Water supply and treatment	Implement water efficiency measures
	Decarbonise water supply system
	Decarbonise water treatment system
Waste	Reduce waste arisings, increase recycling
	Incorporate CCS into the energy from waste plant
Homeworking	Energy saving advice/measures for homeworkers
	Decarbonise home working
Electricity	Deploy up to 17.5MW of ground-mounted PV on Council-owned land, plus roof-mounted PV on suitable buildings

To evaluate different levels of ambition and time periods for implementation, the CSM has been used to model GHG reduction trajectories for:

- 2030 – in line with Midlothian's net zero target
- 2045 – in line with Scotland's net zero target

The 2045 target was included to evaluate the impacts of technologies that are not likely to be available by 2030, but might be at a further stage of development later in that decade or into the 2040s.

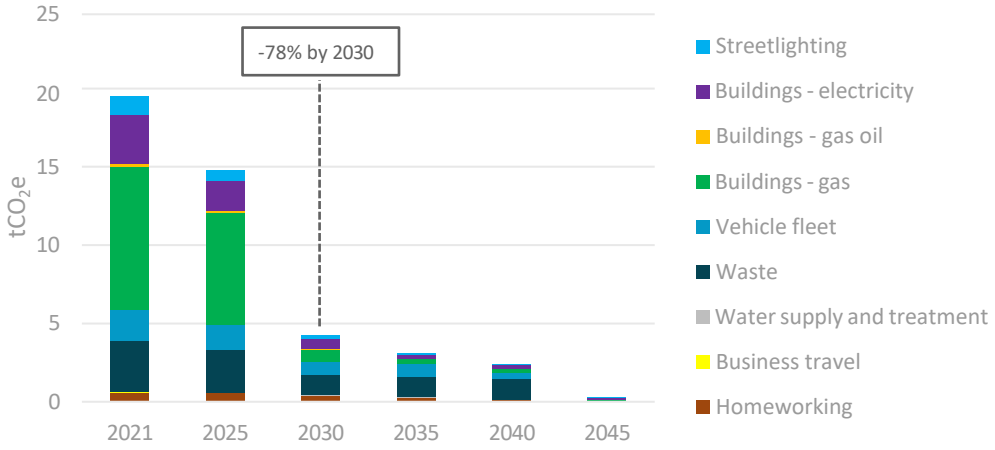
4.4.2 Carbon Reduction Scenario Emission Estimates

Target: 2030

The chart below shows how emissions could change in a 'money no obstacle' scenario where Midlothian Council is able to implement energy, water and waste reduction measures, replace all vehicles with EVs, retrofit all of its buildings and replace all heating

systems by 2030. This would reduce GHG emissions by an estimated 78% compared with a 2021 baseline, potentially increasing to more than 80% if the Council deployed large-scale solar farms on its land and installed roof-mounted PV to meet some of its electricity demands.

Figure 12. GHG emissions by source - 2030 target scenario



In 2030, there would be residual emissions from:

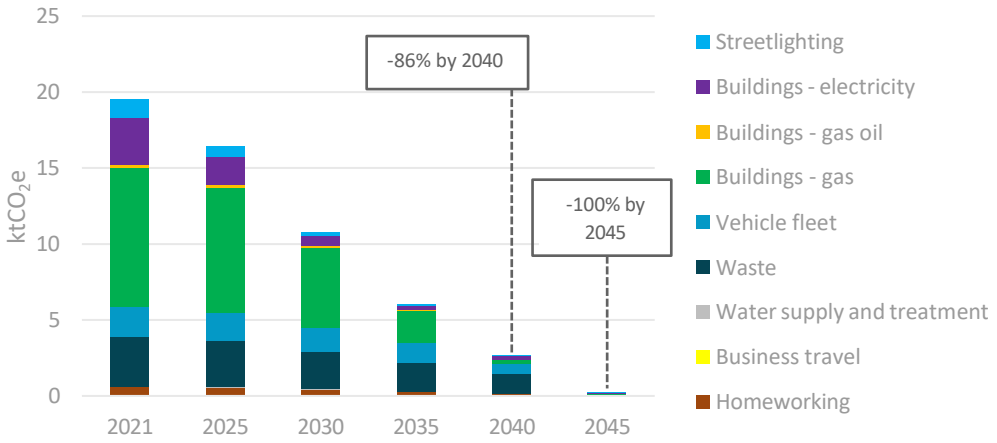
- Vehicles that cannot switch to EV
- Waste, water supply and water treatment systems
- Business travel (unless the Council could utilise active travel or other zero emission vehicles)
- Employee homeworking

As shown on the graph, there would be some further emissions reductions in the 2030s due to electricity grid decarbonisation. However, systems such as energy from waste, water supply and water treatment are not likely to become net zero until the 2040s. If and when this occurs, in principle the Council could achieve net zero by 2045.

Target: 2045

The chart below shows an emissions pathway where the Council aims to retrofit all of its buildings by 2038 (as per the Scottish Government's target), and has adopted all of the other mitigation measures by 2045. By 2040, emissions would have decreased by about 86%. As with the previous scenario, the Council could potentially achieve net zero by 2045, but this relies on external factors and technological change, including the availability of CCS or other forms of carbon offsetting.

Figure 13. GHG emissions by source - 2040 target scenario

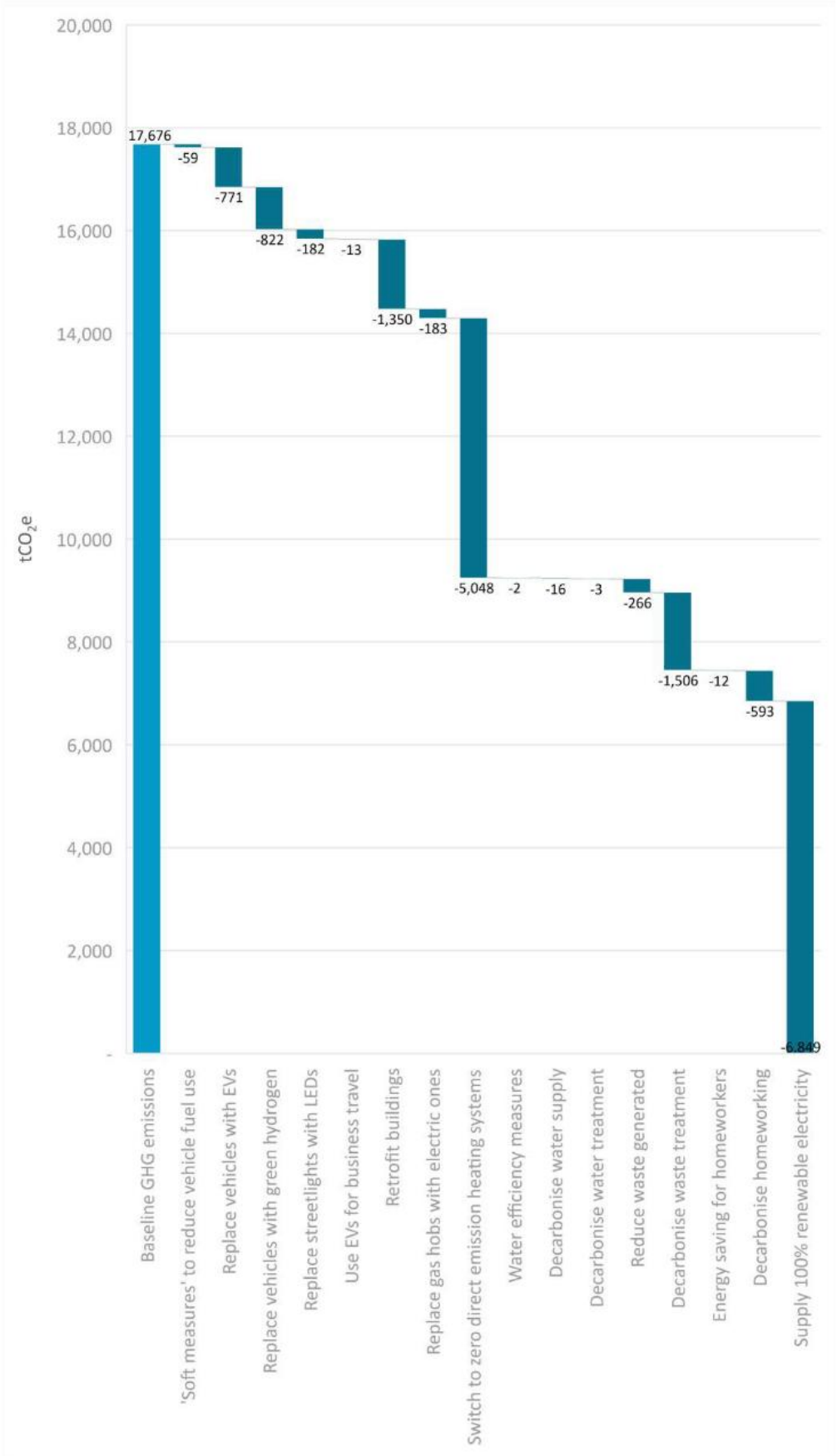


4.4.3 Impacts of mitigation measures

The waterfall chart below illustrates the relative scale of impact from individual mitigation measures. Both of the pathways to net zero assume that each measure is fully implemented – the differences are due to how much progress is made by a given year – so the following results apply to both pathways.

As explained previously, some of these assumptions are based on future technologies, so this is a theoretical pathway towards net zero. However, it is still helpful to visualise the potential effects of different measures, and where any residual emissions are likely to come from. The measures shown on this graph that are essentially hypothetical at present are: replacing diesel HGVs with hydrogen (as these are not yet commercially available), decarbonising the water supply, water treatment and waste sectors (as this relies on CCS), and decarbonising home working (because the Council cannot implement changes in employees' homes).

Figure 14. Required GHG reductions from different measures, including existing & future technologies



Out of the mitigation measures modelled, switching to zero direct emission heating (ZDEH) systems, and then supplying renewable electricity, has the biggest impact. If **emissions from buildings** reach net zero, overall emissions would decrease by up to 64%. Energy use, and associated bills, can be reduced via retrofitting, but this has a much smaller impact on GHG emissions than switching heating systems – and retrofitting alone is not enough to get buildings to net zero.

Note: The percent (%) reduction in emissions cited above reflects the proportion of current emissions that are associated with buildings. If and when Midlothian starts to report on additional sources, then its total quantified emissions will increase, and the percent reduction due to building decarbonisation will get smaller in comparison. The same point applies to all of the GHG reductions described in this section.

Streetlighting currently accounts for 6% of the GHG emissions that have been quantified. As is the case for buildings, supplying these with zero carbon electricity, either from a decarbonised electricity grid or Council-owned renewable energy installation, would mitigate this source of emissions, reducing the total by up to 6%. There will also be energy savings resulting from to the ongoing initiative to switch to LEDs.

The Council's **vehicle fleet** currently comprises 10% of the quantified GHG emissions. Different technological solutions apply for different vehicles, but information on the split of fuel consumption by vehicle type was not available during this study. To provide a conservative estimate, we have assumed that most vehicles switch to an EV alternative, but that 50% of the diesel consumption is used for HGVs or other vehicles that may not be practical or possible to electrify.[18] On that basis, emissions from the vehicle fleet would decrease by around 57% once they are replaced with EVs and supplied with renewable energy, which equates to about a 6% reduction in the Council's quantified GHG emissions.

Vehicles that cannot switch to electricity would need to rely on another fuel such as green hydrogen or sustainably sourced biodiesel. Whether the vehicle fleet can get to net zero emissions would depend on exactly which alternative fuel is used; emissions from hydrogen and biodiesel depend on the source so it is difficult to specify an exact figure. Emissions reductions from those vehicles would depend on other measures such as waste reduction (so that more households and businesses can be served by the same collection vehicles), route optimisation, and eco driver training. However, we have made a conservative estimate, recognising that the scope for improvement without a change in technology might be small; those measures are estimated to provide a <1% reduction in the Council's quantified GHG emissions.

Business travel only makes up a very small proportion of emissions (0.1% of those quantified). It is assumed that this could be mitigated by switching to electric vehicles or (where practical) public transport walking or cycling.

Emissions from **waste** account for roughly 17% of the total (although this is highly uncertain; refer to Section 2.2.3 for an explanation of how this figure was calculated).

[18] This is based on a very rough estimate of the split of fuel consumption, drawing from a fleet list published by Midlothian Council in response to a Freedom of Information Act request in 2018, and typical conversion efficiencies for vehicles as per the DESNZ GHG Conversion Factors for Company Reporting.

This is one of the most challenging sources of emissions for Midlothian (and other local authorities) to address. The key issues are:

- In the long term, the Scottish Government's expectation is that energy from waste plant will need to be fitted with CCS technology to prevent GHG emissions being released to the atmosphere. However, that technology is not yet commercially available.
- Furthermore, the energy from waste plant is operated by a separate company on a 25-year contract which runs until the early 2040s. As a result, Midlothian Council has limited influence over the emissions from that plant in the short to medium term.

Recognising these technical and practical barriers, the Council's options for reducing its waste emissions are:

- Reducing the amount of waste that is generated in the first place;
- Increasing recycling and composting rates; and
- No longer sending waste to landfill.

Note: We understand that the Council has stopped sending waste to landfill in recent years, although according to their Public Sector Bodies Reporting, this was still taking place as of 2021/22.

The CCC indicates that, as a national average, these measures could reduce waste by anywhere from 13%-33% by 2037. Since Midlothian Council is targeting net zero by 2030 we have made the conservative assumption that a 15% reduction could be achievable, equating to a 2-3% reduction in emissions for Midlothian Council. The remainder would need to be mitigated through CCS. On this point, the Council's main options are to keep abreast of technological developments and Government policy initiatives aimed at promoting uptake, to ensure that it is taken into account when the contract is changed or renewed.

A similar challenge applies to decarbonising **water supply and treatment**, which is outside of the Council's ability to control. CCS might be an option for mitigating these emissions n future; however, since these account for only 0.1% of emissions, we have assumed that this could potentially be offset in the meantime.

The remaining 3% of quantified GHG emissions is associated with **homeworking**. Again, this is an area where the Council only has an indirect influence, although it would be impacted by grid decarbonisation and other Government policies such as the anticipated ban on installing new fossil fuel heating systems. In the meantime, the Council's main options are to make sure that their employees receive energy efficiency advice that they can implement themselves, such as draughtproofing and behaviour changes, which we have assumed could reduce home energy use by around 1-2%. However, this would have a very small impact on total emissions.

In theory, all of these measures combined would reduce Midlothian Council's quantified GHG emissions to net zero.

In reality, some form of offsetting will be required.

4.5 Carbon offsetting

Achieving net zero is likely to involve both a combination of deep carbon emissions reductions and the offsetting of any remaining 'unavoidable' carbon emissions**.** To satisfy the net zero target, emissions that remain for the Council by 2030 would need to be offset for every year that emissions remain.

Carbon offsetting must always be considered a last resort within the GHG mitigation hierarchy. Carbon offsetting enables individuals and organisations to compensate for any emissions they cannot avoid or reduce, by paying for a carbon credit i.e. to pay for an equivalent amount of emissions to be reduced or removed elsewhere. Because climate change is a global issue and greenhouse gases mix in the atmosphere, in practical terms it does not matter precisely where the GHGs are reduced.

These emissions savings are generated through the implementation of a wide variety of projects across a wide range of locations and might range from planting trees, to installing solar panels, to cancelling industrial carbon credit allowances. The Climate Change Committee warns that offsetting is not a panacea and that to reach net zero, "most sectors will need to reduce emissions close to zero without offsetting; the target cannot be met by simply adding mass removal of CO_2 onto existing plans."[19]

Key considerations in weighing up offsetting options include:

- **Carbon Price:** Current offsetting costs are relatively low, sometimes under £10/tCO_2e, although various UK-based schemes have prices in the region of £20-70/tCO_2e. However, it is expected that offsetting costs will increase by a factor of 10 or more, partly due to rising demand but also because of increasing costs of abatement through time.[20]
- **Location**. Most carbon offsets available for purchase are generated by activities taking place in countries other than the UK. However, offsetting internationally has previously had negative consequences for local communities, for example where forests are valued only as a carbon store rather than a complex ecosystem with high cultural value. Domestic schemes can provide homegrown environmental and economic benefits (literally, in the case of tree planting) and may be a preferable option.
- **Budget and ownership**: The Council will need to think carefully about the potential costs of offsetting borough-wide emissions, particularly if the aim is to offset all scopes (i.e. including scope 3 emissions). The costs of doing this could be prohibitive. And who should be responsible for offsetting? One option could be for the Council to choose to commit to offsetting all emissions from its own operations, and then encourage individuals and organisations to offset their own emissions (direct and indirect).
- **Scopes:** Should emissions from all scopes be offset? As highlighted above, costs of offsetting all indirect emissions could be prohibitive. And given they are difficult to

[19] Committee on Climate Change (2019), Net Zero – The UK's contribution to stopping global warming, 2 May 2019

[20] The Woodland Carbon Code typical prices are around £10-20/tCO_2e: https://www.woodlandcarboncode.org.uk/buy-carbon/how-to-buy
Carbon prices for the UK Emissions Trading Scheme are around £70/tCO_2e but projected to rise to up to £172/tCO_2e by 2050: https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023
This scale of increase is supported by modelling by other organisations such as PwC: https://www.pwc.co.uk/who-we-are/purpose/pdf/considerations-accessing-high-quality-carbon-offsets-part-net-zero-transition.pdf

quantify; it may not be possible to robustly measure how much carbon needs to be offset. Limiting the scope of what should be offset (e.g. Scopes 1 and 2) may be a pragmatic option and might also help avoid double-counting.

- **Quality and verification**: Whichever option or scheme(s) the Council opt for, it will be important to select an offset strategy that involves the purchase of robust, verifiable carbon offsets to ensure that any carbon offset:
  - Is additional
  - Avoids carbon "leakage"
  - Is not double-counted
  - Is permanent
  - Does not overestimate the GHG reduction
  - Does not cause the buyer to postpone its own mitigation actions
  - Does not cause other environmental or social damage
  - Is not claimed by other entities[21].

In practice, it is very difficult to find carbon offset purchases that truly meet all of the quality criteria listed above[22]. For example, the majority of renewable energy projects are unlikely to be additional; they would have gone ahead regardless of the offset revenue. Tree planting may not be permanent or sustainable. Projects for the purchase of cook stoves in developing countries have a tendency to overestimate GHG savings and should be thought of as development projects instead of credible offsetting projects. With these concepts in mind, it is imperative that GHG emissions are reduced as close to zero as possible to limit the level of offsetting required by the Council.

4.6 What are the potential costs of actions?

Comment for Midlothian Council: We would welcome any further feedback on costs of measures – assumptions are in Appendix D.

In addition to the GHG emissions savings, we have sought to quantify the potential scale of upfront capital costs for different measures, where published data were available to support an estimate. These are based on the typical cost of a measure, multiplied by the number of times it would need to occur (e.g. based on the current number of fleet vehicles owned by Midlothian Council). This gives the estimated average cost of the measure, not accounting for the expenditure that would occur anyway.

So, for example, the cost of replacing petrol cars with EVs includes the whole upfront cost of purchasing the EV, without subtracting the cost of the petrol car that might have been purchased if a like-for-like replacement was made. In other words, some of these costs would be incurred regardless of whether the Council takes additional measures to reduce its emissions.

This is not a detailed costing exercise; the Council will need to undertake separate feasibility studies to confirm the actual costs of each measure.

The table below summarises the results for individual measures. Overall, the total scale of investment for the costed measures is in the range of £60-100M.

[21] Broekhoff, D., Gillenwater, M., Colbert-Sangree, T., and Cage, P. (2019) Securing Climate Benefit: A Guide to Using Carbon Offsets. Stockholm Environment Institute & Greenhouse Gas Management Institute. http://www.offsetguide.org/wp-content/uploads/2019/11/11.15.19.pdf

[22] https://www.theguardian.com/environment/2023/sep/19/do-carbon-credit-reduce-emissions-greenhouse-gases

Table 7 Mitigation measures and indicative costs

Category	Mitigation measures	Indicative cost
Council fleet	Reduce fuel consumption through measures such as eco driving training, route optimisation, etc.	Up to £40K
	Replace vehicles with EVs, where practical	£13M-20M
Streetlights	Continue to replace streetlights with LEDs	£3.2M
Business travel	Use EVs or public transport, where practical	Not costed
Buildings	Retrofit buildings	£27M-40M
	Replace gas cookers with electric cookers	£200K-300K
	Switch to ZDEH systems	£6M-10M
Water supply and treatment	Implement water efficiency measures	Included in costs of retrofitting (see above)
Waste	Reduce waste arisings, increase recycling	Not costed
Renewables	Install ground- and roof-mounted solar PV on Council-owned land and buildings	Up to £25M

Although these numbers are very large, it is worth noting that a portion of this money would be spent anyway. Some has already been allocated for ongoing initiatives such as building fabric upgrades, air source heat pump trials, and streetlighting replacements. Even without those projects, the Council would still be paying for like-for-like replacement of vehicles, heating systems, etc. Therefore, the extra-over costs of some measures will be lower than the figures given below.

These calculations do not account for:

- Bill savings
- Ongoing maintenance costs
- Changes in costs over time
- Supporting infrastructure, e.g. EV charging points and electricity grid upgrades
- Administration costs to deliver the required projects

Appendix D provides more details of the assumptions underpinning these cost estimates.

4.7 What does this mean for Midlothian Council?

The headline outcome of the analysis of the carbon emissions scenarios is that achieving net zero carbon by 2030 would require a radical overhaul of the Council's operations, changes in its maintenance and fleet replacement strategy, and a significant investment

in renewable energy. Due to technological constraints, in 2030 there would inevitably be some residual emissions that would have to be dealt with via offsetting.

The cost figures provided above only give a rough indication of the scale of investment that would be required. However, broadly speaking, if these measures were implemented today, the capital costs would be in the range of £60M-100M. In practice, some of that money would need to be spent anyway due to routine maintenance and fleet replacement, but it highlights the major challenge involved in reaching net zero.

Extending the timeframe into the 2040s, towards 2045, has a few implications and would reduce some practical barriers:

- The amount of annual spending needed to reach the net zero target is lower, because it is spread out over a longer period of time.
- Actions would increasingly be backed up by Scottish and UK Government policies, such as phasing out fossil fuel heating systems. This might mean that more funding is available, and that there are stronger supply chains in place to deliver low carbon solutions like heat pumps.
- The cost of some technologies might come down. Solar PV, for example, has reduced in cost by more than 80% in the past decade.
- Some technologies that are not commercially available today could become viable, such as hydrogen HGVs or CCS for the waste incinerator.

On the other hand, delaying the target date would mean watering down Midlothian Council's ambitions on climate change. With that in mind, there are some potential responses that the Council can take, that balances the urgent need for climate action against the practical and financial considerations described above.

- Maintain a high level of ambition for mitigating all sources of emissions, initially perhaps focusing on ones that are more within the Council's ability to control and can be addressed using existing technologies. These would include (a) behavioural changes and other measures to reduce demand for energy, private vehicle use, and waste and (b) switching from fossil fuels to electric alternatives where possible.
- Keep abreast of technological developments such as CCS and green hydrogen and, where possible, work with stakeholders to bring these solutions forward.
- Make sure that the Council's own policies, internal processes and funded programmes align with a net zero future and do not continue to promote dependence on fossil fuels, private vehicles, etc. Where these do not align, there should be a clear reason for doing so, and a strategy for changing practices in future, as in the case of replacing gas boilers like-for-like when these break down. In simple terms, it is important to avoid making the decarbonisation challenge even harder than it already is.
- Look at ways that the Council can facilitate wider emissions reductions, both in Midlothian and elsewhere. For example, reviewing planning policy to facilitate uptake of renewable technologies and energy efficiency measures.

5 Climate Action Planning

This section sets out a long list of actions that the Council could take to mitigate its GHG emissions, including timescales, potential costs, co-benefits, and other practical considerations. It includes the actions that were included in the modelling in Section 4, along with other supporting measures for which the GHG impact has not been calculated.

5.1 How was the list of options developed?

First, we reviewed existing national, regional and local policy documents and climate change strategies, and developed a long list of actions for consideration. This was supplemented with suggestions from an independent team of climate change experts within Aether.

Then, the list was presented to key stakeholders within the Council, for discussion and validation. This included one-on-one discussions as well as a workshop, attended by about 20 staff from across different Council departments. Stakeholders were asked to:

- Provide information on the current status of actions within the Midlothian Climate Change Plan, indicating which person or department is responsible, and what the key opportunities and challenges have been
- Review the additional actions proposed by the Aether team to provide their views on whether it would be feasible for Midlothian Council to pursue
- Comment on the anticipated timeframes, funding availability, and overall governance approach that would be required to implement actions.

5.2 Climate actions for Midlothian Council

Table 8 sets out the actions that Midlothian can take to reduce its current GHG emissions, in line with the priorities set out in Section 4.3. Some of these are already reflected in the Council's Climate Change Strategy and ongoing initiatives, such as replacing street lighting with LEDs.

Some of the measures are shown as being time-dependent but others could potentially be undertaken at any time. It is acknowledged that this is subject to logistical, financial and practical considerations.

The **GHG impact** of actions is discussed in more detail in Section 4.4.3 and assumptions are presented in Appendix C. The **indicative costs** are discussed in more detail in Section 4.6 and assumptions are presented in Appendix D.

Table 8 Climate actions for Midlothian Council

Action Name	Action Description	Key Actors	% overall emissions reduction	Indicative Cost	Timescales and key decision points	Co-benefits and opportunities
Council fleet						
Reduce fuel consumption through measures such as eco-driver training, consolidating and avoiding journeys where possible.	This action would involve developing an awareness campaign to promote stricter adherence to a travel hierarchy, plus avoiding and consolidating journeys wherever possible	MC, Council Staff	<1%	Up to £40K	N/a – can be undertaken at any time	Changing behaviour, improving air quality, improving health and wellbeing, reduce vehicle kilometres travelled
Replace fossil fuel vehicles with electric alternatives, where practical	Following the travel hierarchy, action to reduce travel should be prioritised. After these actions have been taken, the remaining mileage should be moved towards EVs	Roads and transport	4%	£13M-20M	N/a – can be undertaken at any time, but must be in fleet replacement strategy	Improving air quality, improving health and wellbeing, reduce vehicle kilometres travelled, building a green, low carbon economy
Replace larger fleet vehicles with other alternatives (e.g. green hydrogen)	Vehicles such as HGVs that cannot currently utilise EV technology should be replaced with other low or zero carbon fuels, such as green hydrogen, where possible.	Roads and transport	4%	Not costed	Not likely to be available until mid-2030s onwards	Improving air quality, improving health and wellbeing, reduce vehicle kilometres travelled, building a green, low carbon economy
Install electric charging points	Install electric charging points on all council owned non-residential properties and car parks.	Property and Facilities Management (Energy)	Supporting measure	Not costed	N/a – can be undertaken at any time	Supporting the transition to a zero emission vehicle fleet, improving air quality
Streetlighting						
LED conversion of all remaining non-LED lighting columns	This action replaces all remaining non-LED streetlights with LEDs. It is understood that an LED conversion programme has already commenced, so	Roads and transport	1%	£3.2M	Ongoing	Reducing energy use, providing skills and green jobs

Action Name	Action Description	Key Actors	% overall emissions reduction	Indicative Cost	Timescales and key decision points	Co-benefits and opportunities
	this action represents a continuation and completion of this work.					
Business travel						
Avoid journey where possible (digital-by-default), or utilise Active travel/public transport alternative	Following COVID-19, MC should look to maintain some of the shift to online meetings where possible. Where journeys cannot be avoided, again MC could look to conduct an awareness campaign about the travel hierarchy and promotion of alternative travel modes	Council Staff	<1%	N/A	N/a – can be undertaken at any time	Changing behaviour, improving air quality, improving health and wellbeing, reduce vehicle kilometres
Electrification of remaining business travel mileage	Where possible, the Council should support staff in the uptake and use of electric vehicles for the remaining necessary mileage. However, it is noted that this action is largely outside the Council's control and will rely on electrification of other vehicles e.g. taxis.	Council Staff, External	<1%	Not costed	N/a – can be undertaken at any time	Improving air quality, improving health and wellbeing, reduce vehicle kilometres, building a green, low carbon economy
Buildings						
Heating systems and insulation upgrades	Upgrade heating and insulation to reduce gas consumption, through: zonal heating, cavity wall or solid wall insulation, double glazing where lacking, roof insulation, insulation of heating pipes, and draft-proofing.	Property and Facilities Management (Energy)	7%	£27M-40M	Can be undertaken at any time, but particularly if carrying out any other repair or maintenance work Can be included as part of an aesthetic upgrade to the property Requirement to meet minimum	Providing skills and green jobs, building a green, low carbon economy, improving health and wellbeing

Action Name	Action Description	Key Actors	% overall emissions reduction	Indicative Cost	Timescales and key decision points	Co-benefits and opportunities
					EPC standards for new tenancies	
Replace gas cookers with electric cookers	Reduce gas consumption through the use of electric cookers instead of gas cookers.	Property and Facilities Management (Energy)	1%	£200K-300K	N/a – can be undertaken at any time	Improving air quality
Switch heating from gas to zero direct emission heating (ZDEH) systems	Switch heating from gas boilers to heat pumps - air source, ground source, district heat networks or electric heating. It is essential that fabric measures - heating and insulation upgrades - are delivered first for heat pumps to be effective. While the loss of gas boilers reduces gas consumption, the installation of heat pumps will increase electricity consumption. Heat pumps are, however, more efficient, meaning overall energy consumption will decrease.	Property and Facilities Management (Energy)	26%	£6M-10M	Ongoing Heating systems are usually replaced on a like-for-like basis when they break, so it's important to develop an overarching strategy to undertake pre-emptive upgrades	Providing skills and green jobs, building a green, low carbon economy
Increase deployment of renewables on council buildings	This action assumes that there is capacity for (additional) renewable installation, with the electricity generated directly replacing grid electricity consumption. The GHG impacts of this measure depend on the carbon intensity of the grid electricity that is being displaced. However, as a rough estimate, roof-mounted PV could potentially meet the equivalent of 2-3% of the Council's current electricity use.	Property and Facilities Management (Energy), Housing Services	Varies depending on the carbon intensity of grid electricity	Not costed	N/a – can be undertaken at any time	Providing skills and green jobs, building a green, low carbon economy

Action Name	Action Description	Key Actors	% overall emissions reduction	Indica-tive Cost	Timescales and key decision points	Co-benefits and opportunities
LHEES Strategy	Draft and implement a Local Heat and Energy Efficiency Strategy	LHEES team	Supporting measure	Not costed	Ongoing	Providing skills and green jobs, linking to wider community
Water supply and treatment						
Water efficiency measures	Demand side measures including raising awareness of water-saving methods and behaviour change, fitting water-saving devices to showers and toilets, and using water efficient appliances.	Midlothian Council, Council staff	<1%	Included in the costs for building retrofits (see above)	Can be undertaken at any time, but particularly if carrying out any other repairs, maintenance or retrofitting work	Changing behaviour, minimising resource use
Decarbonisation of water supply and water treatment systems	Note, this measure would not be the Council's responsibility but has been included here for completeness. This would include a range of measures ranging from reducing leaks in the supply systems to converting wastewater treatment plants to increase the amount of biogas extracted and reducing methane emissions.	Water supplier	<1%	Not costed	N/a - Long-term plans under control of other stakeholders	Changing behaviour, minimising waste, providing skills and green jobs, improving health and wellbeing, improving air quality
Waste						
Reduce waste arisings, facilitate recycling and composting	Reduce the waste produced by Midlothian Council through resource efficiency and staff awareness schemes. Increase awareness of recycling policies amongst Council staff and encourage the use of recyclable materials.	Waste Services	<1%	Up to £1,000 for an awarene ss scheme, posters, etc.	N/a – can be undertaken at any time	Changing behaviour, minimising waste

Action Name	Action Description	Key Actors	% overall emissions reduction	Indicative Cost	Timescales and key decision points	Co-benefits and opportunities
Install CCS on the energy from waste plant	Installing CCS technology means that CO_2 is captured and stored rather than emitted.	EfW plant management	Up to 17% although some of this could be achieved through waste reduction	Not costed	Depends on the contractual arrangements with the operator – not likely to be implemented until late 2030s but needs to be considered before then	Providing skills and green jobs
Develop a Council Waste Strategy	Draft a centralised strategy that will set out measures and policies to reduce waste and promote a circular economy.	Waste Services	Supporting measure	Not costed	N/a – can be undertaken at any time	Changing behaviour, building a green, low carbon economy
Integrate waste disposal measures into council contracts	Ensuring that waste disposal is agreed at the contract stage of procurement can ensure that waste is reduced and recycled where possible.	Procurement Services	Supporting measure	Not costed	N/a – can be undertaken at any time	Changing behaviour, minimising waste
Homeworking						
Energy saving awareness raising among council staff	Energy saving awareness schemes encourage staff to reduce energy consumption where possible. A scheme could include information for staff on energy costs, advice on reducing consumption and avoiding waste, and incentives for adopting energy-saving behaviours.	MC, Council staff	<1%	Up to £1,000 for an awareness scheme, posters, etc.	N/a – can be undertaken at any time	Changing behaviour, minimising resource use
Renewables						
Explore options for using 100% renewable electricity	Change to renewable electricity through either the installation of renewable energy systems or adoption of a renewable tariff.	MC	This depends on how	Up to £25M	N/a – can be undertaken at any time	Providing skills and green jobs, building a green, low carbon economy, potential for

Action Name	Action Description	Key Actors	% overall emissions reduction	Indicative Cost	Timescales and key decision points	Co-benefits and opportunities
	This could be achieved in various ways, with different costs to the Council: • In future, if the electricity grid is net zero, this will be achieved by default. However, the timing of this is uncertain. • A 100% renewable tariff might be available at no additional cost (and in some circumstances could provide cost savings if combined with energy management systems). However, not all carbon accounting methodologies accept this as a solution. • Deliver additional renewables on Council-owned buildings and land or other nearby locations. See notes below this table.		many systems switch to electricity as part of other mitigation measures. The estimated reduction would be in the region of 40%.			energy projects that benefit the local community directly
Total			**Up to 100%**	£60M-100M or more		

Note: Large-scale renewable energy opportunities

A report from 2015 found that there was potential for up to 17.5 MWp of PV to be delivered on Council-owned bings (former waste sites). Some additional PV could be installed on suitable buildings. Based on typical PV outputs in Midlothian, in theory this could supply the equivalent of almost all of the Council's current annual electricity use. The economics of PV have changed significantly since 2015, with prices dropping by more than 80%, and there are now Local Authorities who have successfully delivered subsidy-free solar farms. This is an opportunity that the Council should revisit as it would provide financial benefits, reduce emissions, and make good use of Council-owned land.

6 Governance and monitoring

This section describes governance arrangements for reducing emissions, and provides recommendations on how to monitor emissions in future, including data collection.

6.1 Governance requirements

The Midlothian Carbon Neutral by 2030 Board is driving the progress of actions within the Climate Change Strategy and it was extremely encouraging during our engagement with the different council departments to see how engaged they are and that they are acting on many different emission reduction actions. This section highlights a few of the ways that the governance arrangements for climate change initiatives could be strengthened.

6.1.1 Making sure that the Climate Change Action Plan captures all relevant initiatives

The stakeholder engagement workshop highlighted that there are some policies and actions underway, that would contribute towards the Council's net zero ambition, which are not currently included in the Climate Change Action Plan. Examples include plans to support home working and estate rationalisation.

Council plans for net zero would be strengthened by better reporting on all actions or further co-ordination through the Climate Change Action Plan.

6.1.2 Ensuring that internal decision-making accounts for climate change

Develop a process for prioritising spending and resource allocation so that it aligns with the Council's environmental goals, considering the quantified GHG impacts alongside other topics. As a first step, referring to the discussion in Section 4.3 and 4.4 can potentially help the Council take an initial view on whether a project is likely to have a significant impact or not. Including GHG emissions estimates when preparing an outline business case would help to ensure that environmental factors are considered alongside economic ones.

6.1.3 Supporting wider emissions reductions in the local area

More broadly, the Council has additional powers at its disposal in reviewing travel, energy, council tax and planning policies that could support the transition to net zero in the local area, even though this would not have an impact on the Council's corporate emissions. We would encourage the Council to think holistically about its levers of influence and make sure that these provide a supportive framework for wider change.

Some key examples within the planning system include:

- Reducing barriers to deliver **large-scale wind and solar farms**. One of the most significant ways that local authorities can enable decarbonisation at a regional and national scale is to give support for large-scale renewables in their area. For the UK to meet its targets, there needs to be a step-change in deployment in the coming years

and decades. Carrying out a spatial assessment of suitable locations that takes a "presumption in favour" of renewables (subject to environmental, technical and safety constraints) is recommended.

The landscape and visual impacts of renewables should be weighed against the anticipated landscape and visual impacts of climate change itself – the latter will potentially be far more severe.

- Removing planning restrictions on **energy efficiency measures** (e.g. external wall insulation, double or triple glazing, and roof-mounted PV panels). This might include reviewing permitted development rights and/or modifying policies that affect conservation areas.
- Ensuring that **site allocations** for new developments include a suitable mix of uses and density that will reduce reliance on private vehicles and allow residents to access a wide range of services within an easy walking distance.
- Introducing specific, measurable policies aimed at **improving climate adaptation and resilience in new and existing buildings**.

Where the Council provides funding to businesses and community groups, it should undertake a review to consider whether that funding is supporting continued reliance on fossil fuels or other GHG-emitting activities. Where possible, the Council should seek to reallocate funding to activities that align with the net zero transition, although this may not be possible due to the Council's duties to deliver certain types of services.

6.1.4 Dedicated staff to support decarbonisation

Discussions with Midlothian Council have indicated that there is currently insufficient staff time allocated to carbon reduction projects. Designate responsibility to different departments: Some of the actions listed above are likely to cut across multiple departments. Active travel initiatives, for instance, might link to planning and transport functions. If lines of responsibility for different actions are not already clear, these should be agreed internally.

A dedicated sustainability resource (as listed as an action in the Climate Change Action Plan) would be beneficial to support this process, as well as all the other actions. Similarly, a dedicated resource for energy and carbon management to monitor buildings and energy usage would not only help to meet net zero ambitions but also potentially save the Council money as energy use could be tightly controlled and adjusted/reduced whenever possible.

6.1.5 Awareness-raising

There are further areas for improvement that could be implemented in the short term that may not have a large impact on GHG emissions, but would help raise the profile of the council's net zero ambitions. An example would be to make sure that there is an internal strategy on issues such as sustainable travel (for employee commuting and business travel) and waste reduction, and then making sure to publicise these to staff.

6.2 Data collection

The data collection process undertaken for this study highlighted several areas where additional data could be collected, and existing collection procedures could be improved. These are summarised in the following sections. Before focusing on details,

however, it is worth considering the internationally-recognised best practice principles on carbon accounting[23]:

- **Transparency:** Explaining the data sources, methods and assumptions so that results can be duplicated, and users can assess their validity.
- **Relevance:** Ensuring that the sources of emissions that are included in the inventory reflect the activities of the organisation in question.
- **Accuracy:** Working to reduce uncertainties and make sure that information is systematically neither over nor under estimated.
- **Consistency:** Using a method and format that is internally coherent, to enable meaningful comparisons over time.
- **Comparability:** Where possible, using common methodologies, units and categories so that the estimated emissions for one entity (e.g. a local council) can be meaningfully compared against others.
- **Completeness:** Including emissions estimates for all emissions sources within the inventory boundary – highlighting and explaining any gaps.

In practical terms, we recognise that organisations are often working with limited data, staff and financial resources, making it difficult to produce a GHG inventory that meets the 'completeness' requirement. We therefore recommend that Midlothian Council take a proportionate approach, initially focusing more effort on sources of emissions that are larger and/or where data are more easily available, and seeking to expand the inventory over time.

6.2.1 Buildings

Compared with the metered energy data that was reviewed as part of this study, the Public Body Climate Change Report for Midlothian Council indicated that both gas and electricity consumption were significantly higher (59% and 30%, respectively). This could be due to a number of issues, such as:

- Gaps or inconsistencies in data collection, which could also relate to how the data is labelled or stored
- Discrepancies or errors in meter readings or transcriptions

Our team also received different information on different properties – for example, EPC records for which no energy data was received, and vice-versa – which made it difficult to produce a consolidated list of all of Midlothian Council's assets.

To make sure that the GHG inventory is complete, accurate, and comparable over time, ideally there would be a consolidated list of asset that includes:

- Energy consumption by fuel type
- Where relevant, indicate whether the meter readings include more than one building on the same site
- Owner and tenant(s) if any
- Who is responsible for paying the bills
- Building type and size (m^2 floor area)
- Links to the EPC and DEC records associated with each property. *Note: EPC and DEC records can be downloaded online. In future, it would be easier to analyse the*

[23] As per the intergovernmental Panel on Climate Change (IPCC), international standards set out in ISO 14064, and the World Resources Institute GHG Protocol.

performance of Midlothian's building stock as a whole if this information was held in spreadsheet form rather than PDF scans.

The list needs to be in a format that enables someone to see sales and acquisitions over time, so that when the GHG emissions inventory is updated in future, the Council can be assured that they are comparing like-with-like. This could be achieved, for example, by clearly stating which year the list was compiled (to use as the baseline) and then having a column that indicates the date that a building was sold or purchased.

6.2.2 Waste

Data on the amount of waste generated by Midlothian Council was not available and waste data was therefore estimated from waste data reported by the City of Edinburgh.

Information on the amount of waste generated (tonnes) by disposal route should be collected to track waste generation for all Council operated buildings. This data will enable a more accurate estimation of the council's waste emissions when the emissions inventory is next updated.

It is understood that the council will introduce SEPA's Digital Waste Tracking project in 2024 which will require waste weight data to be recorded for all commercial properties.

6.2.3 Employee travel

Emissions from council staff commuting are not included in the baseline as data were unavailable. In order to include emissions in future inventories, it is recommended that the council develops a staff travel survey. This can be done by collecting the distance travelled by each staff member across the financial year through the staff expenses system. This, at a minimum, would need to be categorised by vehicle type – car, bus, train etc with assumptions made on the size and fuel type used within each vehicle. A more detailed approach would use vehicle registration numbers and a spreadsheet-based table to look up the vehicle size (small/medium/large) and fuel type (petrol/diesel/hybrid). Additional categorisation allows for a more accurate estimate that accounts for variation in fuel efficiency across different vehicle sizes.

6.2.1 Purchased goods and services

Calculating emissions from purchased goods and services is highly uncertain. Although not included in the scope of this study, for some organisations they can represent a very high proportion of total emissions. One area of uncertainty is regarding the expense categories provided within the council's expense transaction reports. A brief description associated with each category would assist in assigning spend to relevant carbon factors and aid in identifying which categories are related to the procurement of goods and services, as opposed to financial transactions.

To gain a more accurate representation of emissions from purchased goods and services it is recommended that the council engage with their highest spend sectors to enable suppliers to perform their own carbon baselines. The council may also consider it appropriate to make carbon reporting a requirement as part of supplier contracts, and calculate the anticipated GHG impacts of contracted activities as part of the procurement process.

6.2.2 Other emissions

Scopes 1 and 2: Refrigerants and fertiliser use, which are classified as direct ('scope 1') emissions, have been excluded from this inventory due to lack of data. These are likely to comprise a small portion of total emissions, compared with buildings, waste, transport, and indirect (scope 3) emissions. However, where resources allow, we recommend the Council seek to obtain this data from relevant departments in future.

Scope 3: When it comes to including indirect ('scope 3') emissions, the guidance for the Scottish Public Body Reporting acknowledges that different organisations will report different categories. In many cases there will be no data available to support a numerical estimate.

To understand which sources of emissions an organisation should focus on, the GHG Protocol Corporate Standard for Carbon Accounting recommends that a 'materiality assessment' should be undertaken. Essentially, this would involve stakeholders from Midlothian Council reviewing a list of potential sources of emissions, and undertaking a screening exercise to identify which ones are most relevant to their own operations. Then, the Council can decide which areas to prioritise for analysis.

Please refer to the GHG Protocol Scope 3 Standard for further guidance on how to evaluate Scope 3 emissions.[24]

Even if a source of GHG emissions cannot be quantified, ideally it should still be included in the council's climate action plan. After all, to reduce the impacts of climate change, all sources of emissions globally need to be reduced to net zero.

[24] https://ghgprotocol.org/corporate-value-chain-scope-3-standard

7 Conclusions and Recommendations

This section summarises key conclusions and recommendations from this study.

7.1 Conclusions

Current emissions

Midlothian Council's emissions are estimated to be 18.9 ktCO_2e in 2021/22. A more detailed breakdown of the Council's emissions is presented in **Section 2**.

Operational buildings are a highly significant source of emissions for Midlothian Council, and account for 68% of the GHG emissions that have been quantified in this study, at 12,455 tCO_2e. The use of natural gas in the Council's buildings accounts for just under half of total emissions. The second largest contributor to Midlothian's quantified GHG emissions is electricity consumption in buildings.

In order to maximise emission reduction, priority should be given to projects to reduce emissions across the Council building estate.

Modelling future GHG emissions scenarios

In a business as usual (BAU) scenario, the Council's emissions would be expected to decrease by around 17% by 2030 due to grid decarbonisation alone. The Council would need to implement additional measures to achieve further reductions.

Under a 'money no obstacle' scenario where all of the actions set out in Section 5 across energy, water, waste and travel were implemented, then Midlothian Council could expect to reduce GHG emissions by up to 80% compared against a 2021 baseline. The remaining emissions as of 2030 would need to be addressed through some form of carbon offsetting, because they cannot be mitigated using currently available technologies.

As a rough estimate, if the Council were to upgrade all of its buildings, replace all heating systems with zero emission alternatives, and purchase electric vehicles for all applications where this is practical, the capital costs of these measures would be in the range of **£60-100m**, possibly higher. Note that these figures refer solely to the capital costs and do not account for bill savings. Furthermore, some of this expenditure would take place anyway, due to routine building maintenance, fleet replacement, etc.

Looking farther into the future, if and when CCS technology becomes available, it is expected to be possible for Midlothian to reduce its emissions to net zero. Reliance on CCS and offsetting will be lower if the Council can achieve larger emissions savings through energy efficiency measures, behavioural change, reducing demand for transport, and so on. Those actions will also reduce the amount of renewable energy that is needed to power buildings and vehicles, which in turn will reduce energy bills.

Conclusion

Based on the results of this analysis, there are some overarching implications for Midlothian Council as it continues in its climate change mitigation journey:

- Maintain a high level of ambition for mitigating all sources of emissions, initially perhaps focusing on ones that are more within the Council's ability to control and can be addressed using existing technologies. These would include (a) behavioural changes and other measures to reduce demand for energy, private vehicle use, and waste and (b) switching from fossil fuels to electric alternatives where possible.
- Keep abreast of technological developments such as CCS and green hydrogen and, where possible, work with stakeholders to bring these solutions forward.
- Make sure that the Council's own policies, internal processes and funded programmes align with a net zero future and do not continue to promote dependence on fossil fuels, private vehicles, etc. Where these do not align, there should be a clear reason for doing so, and a strategy for changing practices in future, as in the case of replacing gas boilers like-for-like when these break down. In simple terms, it is important to avoid making the decarbonisation challenge even harder than it already is.
- Look at ways that the Council can facilitate wider emissions reductions, both in Midlothian and elsewhere. For example, reviewing planning policy to facilitate uptake of renewable technologies and energy efficiency measures.

Midlothian has made great progress in monitoring, measuring and reducing emissions including work on their Local Heat and Energy Efficiency Strategy, Salix carbon reduction projects and the formation of Midlothian Energy Ltd to drive investment and development of renewable energy technologies in the area. This should be celebrated and recognised. With continued commitment, increased investment and co-ordination then Midlothian Council will continue to be at the forefront of local authority emission reduction leaders in Scotland.

7.2 Recommendations

Following our analysis of Midlothian Council operations and our engagement with Council departments, we have drafted the following recommendations.

The recommendations are structured around three topics: Governance and Organisation, Reporting and Data, and Policies and Actions and are presented to support the Council in their ambition to achieve net zero for its own emissions by 2030.

7.2.1 Governance and Organisation

- Make sure that the Climate Change Action Plan captures all relevant ongoing initiatives.
- Develop a process for prioritising spending and resource allocation so that these aligns with the Council's environmental goals, considering the quantified GHG impacts alongside other topics.
- Support wider emissions reductions in the local area -- reviewing travel, energy, council tax and planning policies that could support the transition to net zero. Two key examples would be removing barriers to large-scale renewable energy developments and energy efficiency measures.
- Designate responsibility for GHG reduction projects to relevant departments and provide dedicated staff/resources to support this. Similarly, a dedicated resource for energy and carbon management to monitor buildings and energy usage is recommended.
- Awareness-raising among staff -- make sure that there is an internal strategy on issues such as sustainable travel (for employee commuting and business travel) and waste reduction, and then publicise these to staff.

7.2.2 Reporting and Data

- Data collection and reporting activities should follow the best practice principles of GHG accounting: transparency, relevance, accuracy, consistency, comparability and completeness. These are defined in Section 6.2.
- Bearing those principles in mind, from a practical standpoint we recommend that Midlothian Council take a proportionate approach, initially focusing more effort on sources of emissions that are larger and/or where data are more easily available, and seeking to expand the inventory over time. This should be informed by a materiality assessment of which sources are likely to be most significant (see Section 6.2.2 for more information).

More specific recommendations on data collection across different categories are set out below.

- **Energy**: Ensure that complete and consistent energy data are recorded. In particular, develop a list of assets that contains the information set out in Section 6.2.1. Complete energy audits for buildings with the highest energy use or energy use intensity and looks into the potential reasons for this. It is recommended that audits for buildings with high energy use and high energy intensities are prioritised.
- **Waste**: Information on the amount of waste generated (tonnes) by disposal route should be collected to track waste generation for all Council operated buildings. This may be carried out as part of SEPA's Digital Waste Tracking project.
- **Employee commuting**: develop a commuting travel survey through HR.
- **Supply chain emissions**: Engage with suppliers, potentially focusing at first on highest spend sectors, to encourage and enable them to perform their own carbon baselines and provide this data to Midlothian Council.
- **Council assets:** When considering which buildings to retain, refurbish, sell, etc. the Council should account for the potential embodied carbon impacts of different options. If the Council is aware that a building is likely to be demolished after it is sold, there is an opportunity to influence – and avoid – those emissions if they are considered as part of the decision-making process. Although those emissions may not appear on the Council's GHG inventory, they are still important in a wider context.
- **Miscellaneous**: Where possible, seek to collect data on quantities of refrigerant re-gassing, medical gases and fertiliser use. Note that these are expected to account for a small portion of total emissions and therefore are likely to be a lower priority than the other items listed above, but they have been included in the interest of completeness.

7.2.3 Policies and Actions

Readers should refer to the detailed list of actions in Section 5, along with Sections 4.3 and 4.4.3 which describe priority measures and their potential scale of impact. In short, these are aimed at the following:

- **First, reducing demand for energy, water and vehicle usage, and reducing the amount of waste that is generated**, through behaviour changes, awareness raising, and other efficiency measures. There is an ongoing initiative to replace streetlights with LEDs which will reduce their energy demands.
- **Then, phasing out the use of fossil fuels in buildings and transportation.** This will involve switching to electric systems where possible, and then supplying these with renewable electricity or another zero emission fuel.

  - For buildings, this will typically include individual or communal/district heating systems that utilise heat pumps, although in some cases it may be more appropriate to use another form of heating (e.g. infrared or direct electric). Any other fossil fuel systems such as gas cookers will also need to be replaced.
  - For vehicles, this will typically include switching away from petrol and diesel cars and vans to electric ones. Where electrically powered alternatives are not yet commercially available, as in the case of HGVs, ultimately these will need to use another fuel such as green hydrogen or biodiesel; the Council should keep abreast of technological developments and adopt these when possible. A key enabling measure will also be to install sufficient charging points and support electricity network upgrades where necessary.
- Reviewing opportunities to **source renewable energy**, either via a renewable tariff or by installing renewables on Council-owned buildings and sites. A report from 2015 found that there was potential for up to 17.5 MWp of PV to be delivered on Council-owned bings (former waste sites). Some additional PV could be installed on suitable buildings. This is an opportunity that the Council should revisit as it would provide financial benefits, reduce emissions, and make good use of Council-owned land.
- Once those measures are adopted, most of the remaining emissions will come from **waste**. Continue with initiatives aimed at reducing waste and increasing rates of recycling and composting within the area. Residual emissions will require some form of technological solution, such as carbon capture and storage (CCS) being fitted to the energy from waste plant. Recognising that (a) this is not yet commercially available and (b) the energy from waste plant is operated by a separate company on a 25-year contract which runs until the early 2040s Therefore, the Council should keep abreast of technological developments and Government policy initiatives aimed at promoting uptake, and work with relevant stakeholders to ensure that this is taken into account when the contract is changed or renewed.
- Finally, seek to reduce **other indirect emissions** from business travel by choosing sustainable travel options and EVs where possible, and signpost employees to initiatives that can support them to reduce their energy use while home working.

Appendix A: Activity data used for emissions calculations

Category	Source	Units	Data	Source
Council Fleet	Petrol (average biofuel blend)	Litres	16,891	Midlothian 2020/21 climate duties report
Council Fleet	Diesel (average biofuel blend)	Litres	674,473	Midlothian 2020/21 climate duties report
Council Fleet	Gas Oil	Litres	90,638	Midlothian 2020/21 climate duties report
Street Lighting	Electricity	kWh	5,152,254	Midlothian 2020/21 climate duties report
Council Business Travel	Unknown	Km	107,018	Midlothian 2020/21 climate duties report
Council Buildings	Electricity	kWh	13,279,175	Midlothian 2020/21 climate duties report
Council Buildings	Gas	kWh	49,920,955	Midlothian 2020/21 climate duties report
Council Buildings	Gas oil	kWh	860,586	Midlothian 2020/21 climate duties report
Council Buildings	Water supply	m^3	121,217	Midlothian 2020/21 climate duties report
Council Buildings	Water treatment	m^3	11,515	Midlothian 2020/21 climate duties report
Waste	Landfill	tonnes	5,428	SEPA, Scottish Household Waste generated and managed in 2021 – Table 1 (Midlothian)
Waste	Recycling	tonnes	20,761	SEPA, Scottish Household Waste generated and managed in 2021 – Table 1 (Midlothian)
Waste	EfW	tonnes	17,651	SEPA, Scottish Household Waste generated and managed in 2021 – Table 1 (Midlothian)
Homeworking	Homeworking	FTEs	2,016	Midlothian 2020/21 climate duties report

Appendix B: Highest energy users

The tables below list the buildings with the highest consumption of gas (**Table A.1**) and electricity (**Table A.2**), based on data provided by Midlothian Council.

Table A.1 25 buildings with the highest annual gas consumption in 2022/23, ordered from highest energy consumption to lowest

Building	Annual Gas Consumption (kWh/yr)
LASSWADE CAMPUS	2,736,286
PENICUIK HIGH SCHOOL	2,732,503
LOANHEAD CENTRE	2,582,278
PENICUIK POOL & LIBRARY	2,252,575
NEWBATTLE COMMUNITY CAMPUS	1,954,336
BEESLACK HIGH SCHOOL	1,867,563
DANDERHALL COMMUNITY HUB & PRIMARY SCHOOL	1,085,409
FAIRFIELD HOUSE-MAIN BUILDING	1,065,956
STOBHILL DEPOT	774,038
NEWTONGRANGE PRIMARY SCHOOL	756,707
WOODBURN PRIMARY SCHOOL	694,691
KINGS PARK PRIMARY SCHOOL	677,940
CUIKEN PRIMARY SCHOOL	649,436
BONNYRIGG PRIMARY SCHOOL	638,533
MIDLOTHIAN HOUSE	604,306
COWAN COURT	601,738
GORE GLEN PRIMARY SCHOOL	577,865
MAURICEWOOD PRIMARY SCHOOL	526,497
LASSWADE PRIMARY SCHOOL	518,296
HIGHBANK H.E.P	510,461
SACRED HEART RC PRIMARY SCHOOL	502,399
HAWTHORNDEN PRIMARY SCHOOL	501,058
CORNBANK ST JAMES PRIMARY SCH	473,701
HOPEFIELD PRIMARY SCHOOL (NEW ST MARY'S)	456,376
BILSTON PRIMARY SCHOOL	402,412

Table A.2 20 buildings with the highest annual electricity consumption in 2022-23, ordered from highest consumption to lowest

Building	Annual electricity consumption (kWh/yr)
NEWBATTLE COMMUNITY CAMPUS	1,355,306
LOANHEAD CENTRE	702,278
LASSWADE CAMPUS	594,225
BEESLACK HIGH SCHOOL	486,473
PENICUIK POOL & LIBRARY	459,887
MIDLOTHIAN HOUSE	395,589
PENICUIK HIGH SCHOOL	305,036
FAIRFIELD HOUSE-MAIN BUILDING	287,175
DANDERHALL COMMUNITY HUB & PRIMARY SCHOOL	271,746
NEWBYRES VILLAGE CARE HOME	247,148
WOODBURN PRIMARY SCHOOL	228,540
PENTLAND HOUSE H.E.P	213,173
CUIKEN PRIMARY SCHOOL	204,111
BURNBRAE PRIMARY SCHOOL	200,712
STOBHILL DEPOT	191,151
BONNYRIGG PRIMARY SCHOOL	180,484
COWAN COURT	171,168
GORE GLEN PRIMARY SCHOOL	164,893
KINGS PARK PRIMARY SCHOOL	155,451
HIGHBANK H.E.P	154,181

Appendix B: Scope of this assessment

The Public Bodies Climate Change Duties Report for Midlothian Council (2021/22) reports emissions from the following activities.

> *"During the reporting year, Midlothian Council was responsible for the utility/fuel costs of:*

- *A building portfolio of around 200 premises that includes:*
  - *3 major administration offices (all located in Dalkeith)*
  - *4 works depots*
  - *9 libraries*
  - *39 schools*
  - *7 leisure centres and swimming pools (some of which are co-located on school premises)*
- *9,895 street lighting points*
- *948 signs*
- *709 street lighting control cabinets*
- *626 bollards*
- *43 CCTV cameras and associated equipment*
- *34 sets of traffic signal crossings and associated equipment*
- *76 sets of traffic signals and associated equipment*
- *275 vehicles, including those on a long-term lease. 21 of these are electric, of which 11 are leased. These include taking delivery in 2021/22 of four electric vans which were part funded by the Scottish Government's "Switched on Fleets" grant.*
- *25 public electric vehicle charging points*
- *2 pool bikes*
- *Various stair lighting and door entry systems, as well as Christmas/festive lighting."*

In addition to the above data, we have presented an estimate of the emissions from all waste collected by Midlothian Council, as reported by SEPA.

Appendix C: GHG mitigation assumptions

The table below describes the evidence base and rationale for the quantified GHG reductions set out in Section 4.

Category	Mitigation measures	Impact	Basis for assumption	Reference(s)
Council fleet	Reduce fuel use where possible through measures such as eco driving training, route optimisation, etc.	3% reduction in vehicle fuel consumption	This is an intentionally conservative estimate which reflects a variety of potential measures. According to the CCC, around 3% of van miles could be avoided through trip consolidation – however that is for the UK as a whole, and opportunities within Midlothian might be much smaller. Eco driving training has been shown to reduce fuel consumption by up to 15%, but again, that figure refers to organisations that are different in character from Midlothian Council.	CCC 6th Carbon Budget Report
	Replace vehicles with EVs, where practical	70% reduction in vehicle fuel consumption for vehicles that switch to EV	This is based on the relative fuel use of petrol and diesel engines (kWh/km) compared with EVs. Note: This measure is applied after the reduction in fuel use due to eco driving and other soft measures (see above).	DESNZ, GHG Conversion Factors for Company Reporting
	Replace diesel in HGVs with green hydrogen once this becomes commercially available (mid-2030s onwards)	100% reduction in emissions for vehicles that switch to green hydrogen	This figure is purely illustrative. It assumes that, in future, a zero direct emission technology such as green hydrogen will	N/a

			become available to decarbonise HGVs.	
Streetlights	Continue to replace streetlights with LEDs	50% reduction in electricity use for lights that switch to LEDs	LEDs offer significant energy savings compared with traditional bulbs. The 50% figure is based on a case study for another local authority. Note that higher reductions could be achievable; this figure has been used as a conservative estimate.	https://www.lbhf.gov.uk/news/2019/05/new-led-streetlights-deliver-huge-energy-savings
Business travel	Use EVs, public transport, walking or cycling, where practical	70% reduction in vehicle fuel consumption for vehicles that switch to EV	For simplicity, since this represents a small proportion of total emissions, we have modelled this as a switch to EVs. In practice, greater reductions could be achieved if there was a reduction in business travel, or if (where practical) staff switched to using public transport, walking and cycling for some additional journeys.	As for Council fleet
Buildings	Retrofit buildings	15% reduction in heat demand on average	The level of reduction depends on the types of retrofitting measures that are applied. This is subject to a range of technical and practical constraints that have not been examined in detail in this study. In theory, it is possible to bring some buildings to near-Passivhaus levels of performance, with savings of 75-90%, but this is not common	[1] Passivhaus Trust https://passipedia.org/certification/enerphit [2] BBP, 'Real Estate Environmental Benchmark: 2019 Energy Snapshot – Chart 6' (2020). Available at: https://www.betterbuildingspartnership.co.uk/sites/default/files/media/attachment/BBP_REEB%202019%20Energy%20Snapshot.pdf

			[1]. Case studies from the Better Buildings Partnership showed reductions of up to 26% [2]. 15% has been selected as a more conservative estimate.	
	Replace gas cookers with electric cookers	50% reduction in energy used for cooking	The proportion of gas used for cooking is estimated to be 4%, based on the Energy Consumption in the UK End Use Statistics, Table U5. The amount of natural gas used for cooking in the sectors community/arts/leisure, education and offices, was divided by the amount of gas used for all purposes and the result was c. 4%. The reduction in energy used for cooking is based on the relative efficiencies of gas cookers compared with electric ones. Typical figures would be around 40% and 80% respectively.	Assumption based on typical values ECUK (2022) End Use Tables, Table U5
	Switch to zero direct emission heating (ZDEH)	66% reduction in energy used for heating Note: This measure is applied after the reduction in fuel use due to retrofitting (see above).	This is based on the relative efficiencies of gas boilers compared with heat pumps. We have assumed that boilers are typically 85% efficient, which aligns with the Scottish CCPu GHG Emissions Projections report, and that ZDEH systems will on average be around 250% efficient. The latter could represent a heat	Scottish Government, 'Greenhouse Gas Emissions Projections, Scotland: Results of Phase 1 and Phase 2 modelling' (2023) Scottish Government, 'Update to the Climate Change Plan 2018 – 2032: Securing a Green

			pump with a SCOP of 2.5; this is slightly lower than is assumed in the Scottish CCPu Assessment, but could represent a weighted average efficiency, with some systems being heat pumps and others being direct electric or infrared systems.	Recovery on a Path to Net Zero' (16 Dec 2020)
Water supply and treatment	Implement water efficiency measures	10% reduction in water use	According to Scottish Water, the average consumption is around 150 litres per person per day (lpd). In new buildings, the use of water efficient fittings is intended to reduce this to 110 lpd – a 26% reduction. Those figures compare existing and new domestic properties and do not necessarily reflect public sector buildings, so a more conservative estimate of 10% has been used instead.	https://www.scottishwater.co.uk/-/media/ScottishWater/Document-Hub/Your-Home/Water-Efficiency/270718ScottishWaterWaterEfficiencyJun16.pdf
	Decarbonise water supply system	100% reduction in residual emissions, after water efficiency measures	This figure is purely illustrative. It assumes that, in future, technologies will become available to decarbonise the water supply system and/or that carbon removals will be used to mitigate unavoidable emissions. (Note: the water industry state that there are no technical barriers to carbon neutral water supply by 2050, only financial at present.)	CCC 6th Carbon Budget Report

			According to the CCC, decarbonisation options could include reducing leaks in supply systems, decentralising the water supply, using sustainable drainage systems, and increased deployment of renewables on site.	
	Decarbonise water treatment system	100% reduction in emissions	This figure is purely illustrative. It assumes that, in future, technologies will become available to decarbonise the water treatment system and/or that carbon removals will be used to mitigate unavoidable emissions. According to the CCC, decarbonisation options could include: Conversion of wastewater treatment plants to anaerobic digestion (increasing the amount of biogas extracted and reducing methane emissions) Process optimisation improvements and leak identification using on-site emissions monitoring of CH4 and N2O. More innovative solutions are in development, e.g. membrane aerated biofilm reactors or partial nitrification-Anammox processes.	CCC 6th Carbon Budget Report

Waste	Reduce waste arisings, increase recycling	15% reduction in emissions from waste	The CCC indicates that, as a national average, these measures could reduce waste by anywhere from 13%-33% by 2037. Since Midlothian Council is targeting net zero by 2030 we have made the conservative assumption that a 15% reduction could be achievable.	CCC 6th Carbon Budget Methodology Report, Table 10.1
	Incorporate CCS into the energy from waste plant	100% reduction in residual emissions after waste reduction measures	This figure is purely illustrative. It assumes that, in future, CCS will become commercially available such that residual emissions from waste, specifically the energy from waste plant, are captured. Additional carbon removals would be needed to mitigate emissions from other waste sources such as landfills and composting of food waste.	N/a
Homeworking	Energy saving advice/measures for homeworkers	2% reduction in emissions from homeworking	Rough scale of impact based on measures like smart meters, which save around 1% of energy use according to the Scottish CPPu GHG . Impact Assessment, draughtproofing, and other general energy saving behaviours.	Scottish Government, 'Greenhouse Gas Emissions Projections, Scotland: Results of Phase 1 and Phase 2 modelling' (2023)
	Decarbonise home working	100% reduction in emissions after home energy saving measures are implemented	This figure is purely illustrative. It assumes that, in future, most people's homes will become zero carbon due to Scottish and UK government policies that promote energy performance	N/a

			upgrades and phase out fossil fuel heating systems by 2045. This would reduce residual emissions from homeworking to zero.	
Electricity	Deploy up to 17.5MW of ground-mounted PV on Council-owned land, plus roof-mounted PV on suitable buildings	Could provide an estimated 13 GWh of renewable electricity per year. The emissions impact will depend on the carbon intensity of the grid electricity that is displaced.	Roof-mounted PV: A rough estimate of the potential PV capacity on the Council's non-domestic buildings was made based on rules of thumb set out in the DECC Renewable Energy Capacity Methodology (2010), which is intended for estimating opportunities within a geographic area at a high level. That document assumes that 40% of non-domestic buildings are suitable for PV and that the average system size will be 5 kWp. This was multiplied by the number of buildings (200, according to Midlothian Council's Public Sector Bodies Report) to obtain an estimated. As a rough estimate, this suggests around 400 kWp could be installed. Note, this is probably an underestimate of the typical system size, but in the absence of more detailed information on roof orientation/suitability, this has been used as a conservative estimate. Ground-mounted PV: A report from 2015 found that there	DECC Renewable Energy Capacity Methodology (2010) Midlothian Council Public Sector Bodies Report Regional Renewable Statistics Apse Energy, 'Midlothian Counci: Report on Solar PV Opportunities' (2015)

		was potential for up to 17.5 MWp of PV to be delivered on Council-owned land. The typical output for PV was based on the DESNZ Regional Renewable Statistics for Midlothian. That publication suggests there is 9.39 MW of PV in Midlothian which generates 6926 MWh annually, giving an average output of 738 MWh/MWp for PV in that region. This could provide around 13 GWh of electricity per year, which for context is roughly equivalent to the Council's current electricity use, or around half of future electricity use if it electrifies all buildings and transport.

Appendix D: Cost assumptions

Comment for Midlothian Council: We would welcome any further feedback on costs of measures. In particular we would welcome cost information on:

- *Measures you already implement, e.g. the actual cost of electric vans*
- *What the Council would be spending anyway, so that we can compare e.g. replacing diesel vans like-for-like against replacing them with EVs.*

For some measures this would allow us to report net costs and the overall figures would give a better indication of the additional cost compared with business as usual.

In addition to modelling the GHG impact, we have sought to indicate the potential scale of upfront capital costs for different actions, where published data were available to support an estimate.

These are based on the typical cost of a measure (e.g. replacing a petrol car with an EV), multiplied by the number of times it would need to occur (e.g. based on the current number of fleet vehicles owned by Midlothian Council). This is not a detailed costing exercise; the Council will need to undertake separate feasibility studies to confirm the actual costs of each measure.

As stated in the main report, these calculations do not account for:

- Bill savings
- Ongoing maintenance costs
- Changes in costs over time
- Supporting infrastructure, e.g. EV charging points and electricity grid upgrades
- Administration costs to deliver the required projects

Category	Mitigation measures	Indicative cost	Explanation of cost assumptions
Council fleet	Reduce fuel consumption through measures such as eco driving training, route optimisation, etc.	Up to £40K	Calculation assumes around 10% of Council staff (c. 400 people) receive eco driving training at £100 per head based on market research.
	Replace vehicles with EVs, where practical	£13M-20M	Calculation assumes electric cars cost c. £25,000, electric vans cost c. £30,000 and electric buses around £400,000 based on market research Also assumes that only 50% of diesel

			vehicles switch to EV. The number of vehicles is a rough assumption, informed by a 2018 FOI request for a list of the Council's vehicles.[25]
	Use 100% renewable electricity for EVs	-	See row titled 'Use 100% renewable electricity', below
	Replace vehicles with green hydrogen or other alternatives where EVs are not commercially available or practical	Not costed	No cost data as this technology is not yet commercially available
Streetlights	Continue to replace streetlights with LEDs	£3.2M	Cost information provided by Midlothian Council via email
	Use 100% renewable electricity for streetlights	-	See row titled 'Use 100% renewable electricity', below
Business travel	Use EVs or public transport, where practical	Not costed	EV rental/leasing is available at minimal additional cost; in future, it is assumed that most vehicles (incl. taxis) would be EV and this cost would not be borne by the Council
	Use 100% renewable electricity for EVs	-	See row titled 'Use 100% renewable electricity', below
Buildings	Retrofit buildings	£27M-40M	Calculation assumes that the typical cost to retrofit commercial buildings is around £250 per m^2 of floor area.[26] Data received from Midlothian Council indicates that the average floor area is around 600-700m^2 and there are around 200 buildings.
	Replace gas cookers with electric cookers	£200K-300K	Calculation assumes that commercial cookers are present in around 20% of buildings and that they cost around £6,000-7,000 each based on market research.
	Switch to ZDEH systems	£6M-10M	For simplicity, this calculation is based on individual heat pumps, although in practice these could be delivered as part of a communal or district heating system. Some buildings might also use alternative technologies such as direct electric or infrared heating, green hydrogen, or biofuels. It assumes that commercial ASHPs cost around £20K-40K each.

[25] https://www.whatdotheyknow.com/request/fleet_list_597

[26] https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf

			Note that the actual costs could be significantly lower, for example if heat pumps come down in price, or higher, if more expensive solutions are chosen instead. Determining a cost optimal heating solution is outside the scope of this study.
	Use 100% renewable electricity for buildings	-	See row titled 'Use 100% renewable electricity', below
Water supply and treatment	Implement water efficiency measures	Included elsewhere	Assumed to take place as part of building retrofit programme (see above)
	Decarbonise water supply system	*Not costed*	*Outside of the Council's control*
	Decarbonise water treatment system	*Not costed*	*Outside of the Council's control*
Waste	Reduce waste arisings, increase recycling	Up to £1K for an awareness campaign but other measures have not been costed	Recommendation assumes there is an awareness raising campaign, plus ongoing training and engagement with employees over time. Council has indicated up to £1K for posters etc.
	Incorporate CCS into the energy from waste plant	*Not costed*	*No cost data as this technology is not yet commercially available*
Homeworking	Energy saving advice/measures for homeworkers	Up to £1K	Recommendation assumes there is an awareness raising campaign, plus ongoing training and engagement with employees over time. Council has indicated up to £1K for posters etc.
	Decarbonise home working	*Not costed*	*Outside of the Council's control*
Various	Use 100% renewable electricity [Note: this is the total for all of the previous rows that refer to renewable electricity]	Up to £25M	Could be achieved in various ways, with different costs to the Council. Options include: • In future, if the electricity grid is net zero, this will be achieved by default. However, the timing of this is uncertain and it will not occur by 2030. • A 100% renewable tariff might be available at no additional cost (and in some circumstances could provide cost savings if combined with energy management systems). However, not all carbon accounting methodologies accept this as a solution.

	• The most certain way of achieving this would be to deliver additional renewables locally and use a Power Purchase Agreement. A study from 2015 suggested up to 17.5MW of PV could be delivered on Council-owned sites. Assuming £1M-£1.25M per MW, this is estimated at about £20M. Roof-mouned PV tends to be more expensive, at £1.5-2M per MW. Depending on the amount of roof-mounted PV that is deployed, the capital cost for PV on Council-owned buildings is estimated at roughly £1-1.5M. There would be additional costs due to factors such as grid infrastructure upgrades, building work to reinforce roofs, etc. Also note that although the cost of PV has decreased over the last decade and a half, it has risen in the past few years due to global events and other market factors so there is uncertainty in these estimates.[27]

[27] https://www.gov.uk/government/statistics/solar-pv-cost-data

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