A Net Zero Carbon Roadmap Analysis for Derry and Strabane District Area

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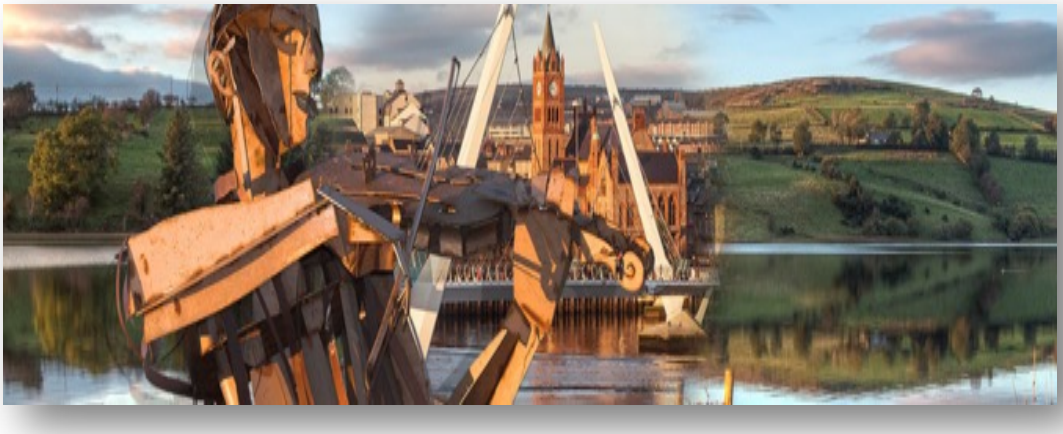


Derry City & Strabane District Council
Comhairle Chathair Dhoire & Cheantar an tSratha Báin
Derry Cittie & Stràbane Destrick Cooncil

Your Climate Strategy

Contents

Please reference as:
Gouldson, A., Sudmant, A., and Higgins-Lavery, R. (2023). A Net-Zero Carbon Roadmap Analysis for Derry and Strabane District Area. www.yourclimatestrategy.com

Glossary

Carbon budget – Maximum cumulative amount of CO_2e able to be emitted while remaining within a certain temperature threshold.
Cold appliances – Refrigerators, freezers.
Cost-Effective – Measures which save more money than they cost over their lifetime.
Cost-Neutral - Measures which are equal in costs and savings over their lifetime.
Technical potential - Measures which cost more money than they save over their lifetime.
Land-use and Management – Refers to the sectors of animal agriculture and LULUCF.
Miscanthus – Bioenergy crop capable of significant carbon sequestration.
Offsets – Balancing carbon emissions in one area/sector by sequestering carbon elsewhere.
Passive Haus – Very highly-efficient building techniques to minimise energy demand.
Peatland restoration – Variety of measures to reverse degradation of peatlands/wetlands, including damming, gripping, seeding, etc.
Silvoarable agroforestry – Integrating arable crops with tree-planting on a parcel of land.
Silvopastoral agroforestry – Integrating tree-planting with grazing land.
Wet appliances – Dishwashers, washing machines.
Whole house retrofit – Comprehensive, in-depth approach to improving energy efficiency in older, more energy-intensive homes.

Acronyms
CO_2 – Carbon Dioxide
CO_2e - Carbon Dioxide Equivalent
DAERA – Department of Agriculture, Environment and Rural Affairs
DEFRA - Department of Environment, Farming and Rural Affairs

EV – Electric Vehicle

ICE – Internal Combustion Vehicles

IPCC – Intergovernmental Panel on Climate Change

Kt – Kilotonne (1,000 tonnes)

LULUCF – Land-Use, Land-Use Change and Forestry

Mt – Megatonne (1,000,000 tonnes)

NI – Northern Ireland

pH – Figure expressing the acidity/alkalinity of a solution or substance

RSPB – Royal Society for the Protection of Birds

SBTs – Science-Based Targets

Executive Summary

Climate change is a global problem that needs local solutions. Every city, town and community has a role to play in helping to address climate change - but what specifically should Derry and Strabane be doing?

As a vibrant and growing region with a population of 151,000 people and home to the second-largest urban area in Northern Ireland, Derry and Strabane could do all sorts of things to reduce its carbon footprint. It could retrofit its existing homes and buildings, minimise energy use and maximise the uptake of renewables in new homes and buildings, promote active travel, public transport and the transition to electric vehicles and enable further improvements in industrial energy efficiency. The fact that there are so many options that could be adopted across every area of the district points to the need for a joined-up and evidence-based approach.

This report sets out the results of analysis that assesses past, present and projected energy use and carbon emissions from the different sectors in Derry and Strabane. It shows how Derry and Strabane's emissions have fallen by 20% since 2000, and it presents data on the split of carbon emissions from housing, other buildings, transport, industry and land-use across the region. Looking forward, it sets out the carbon budgets and targets that Derry and Strabane should work towards in order to do its bit in helping the world to avoid the worst impacts of dangerous climate change.

The report identifies and evaluates over 750 of the different options that Derry and Strabane could adopt in order to reduce its carbon emissions and transition towards net zero. The report takes into account the specific features of Derry and Strabane – for instance in its homes and buildings, its businesses and industry, its vehicle stock and transport systems, as well as its rural areas - and it assesses the scope to deploy each of the different options in the city and district.

On this basis, league tables of the most cost and carbon effective options that could be adopted are presented, investment needs and paybacks are assessed, and the wider social benefits relating to energy bill reduction and employment creation are set out.

The evidence that is presented highlights the scale and significance of energy use in Derry and Strabane – a crucially important issue given the social and economic impacts of recent energy price rises. The analysis shows that as a region Derry and Strabane spends over £300 million a year on energy – this is money that is leaving the area as a whole every year and that is associated with growing levels of fuel poverty in households and cost challenges in businesses.

However, the analysis also shows that Derry and Strabane's annual energy bill could be cut by £100 million a year by 2050 through cost-effective investments alone. Making these investments could cut the region's carbon footprint by 12% whilst also creating nearly 150 20-year jobs in the city and district over the next decade. These investments could also help to cut the average household energy bill in the region by 7% and business energy bills by 27%, thereby helping to alleviate fuel poverty and improve business productivity and resilience.

In the longer term, the analysis shows that Derry and Strabane can meet the target of the regions climate pledge to deliver net zero carbon emissions by 2045. Of course, there are challenges in doing this – relating especially to investment and the need to build political, business and public support and capacities. But the evidence clearly shows that the target can be met and that tackling climate change can absolutely align with Derry and Strabane's desire to be a productive, prosperous and inclusive region.

Strategic Context

The most significant global climate target to date, is the Paris Agreement. The goal is to prevent global average temperature rising above 1.5°C of pre-industrial levels. The Governments set emission targets to keep temperature below 1.5°C known as nationally determined contributions. The agreement also aims to reach net-zero emissions by 2050.

The UK is a signatory to the Paris Agreement and the Climate Change Act 2008 (2050 Target Amendment) Order 2019, commits UK to 100% reduction of emissions by 2050. It is implicit, in the Climate Change Act 2008 that Northern Ireland contributes its fair share of required greenhouse gas emission and the UK Government's 5-yearly carbon budgets. The first NI Climate Change Bill has been passed in 2022 establishing a net-zero emissions target by 2050 and 46% methane reduction target by 2050. NI Departments are required to publish sectoral plans to meet targets with local authorities required to report on climate action, risk, policies and plans.

Derry City & Strabane District Council declared a climate emergency in July 2019 followed by the Climate Emergency Pledge. The Council undertakes to:

> *"Ensure that all strategic and policy decisions and budgets will immediately fall in line with the shift to net zero greenhouse gas emissions by 2045 while also ensuring that the Derry City and Strabane District Council area as far as practically possible is prepared for and resilient to the effects of climate change."*

Derry City and Strabane District have also committed to number of declarations including the UN Race to Zero.

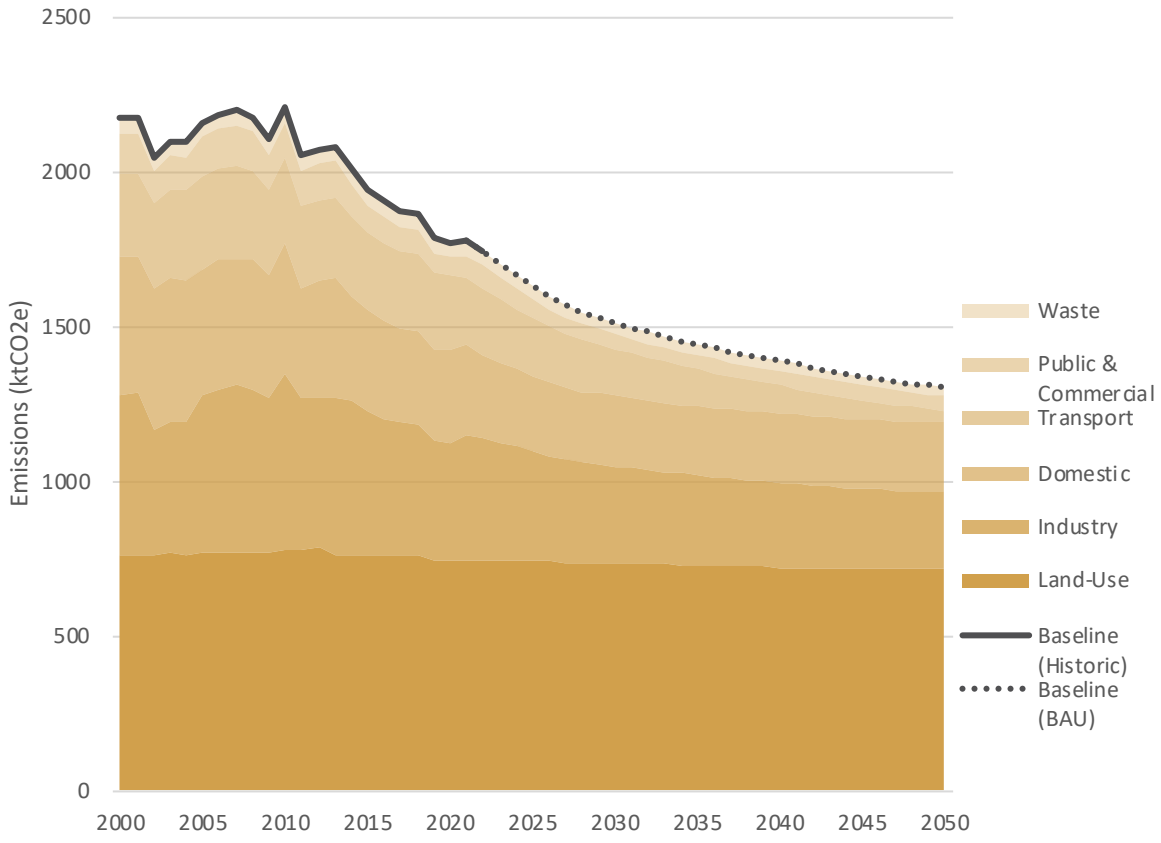
Derry and Strabane's Carbon Footprint

Past and Present Emissions

Derry and Strabane's direct carbon footprint – coming from its use of fuels such as petrol, diesel and gas (also known as Scope 1 emissions) and from its use of electricity (Scope 2 emissions) and other territorial emissions - fell by 20% between 2000 and 2022. In 2022, Derry and Strabane emissions were 1.7 kt CO_2e, compared to 2.2 kt in 2000.

This substantial reduction stems from a mix of electricity decarbonization, gradual improvements in the efficiency of buildings and vehicles and structural changes in the economy, for example linked to the switch from manufacturing to higher-value production and services.

Figure 1: Derry and Strabane's Carbon Footprint - Past, Present and Projected (Direct Emissions - Scope 1 and 2)

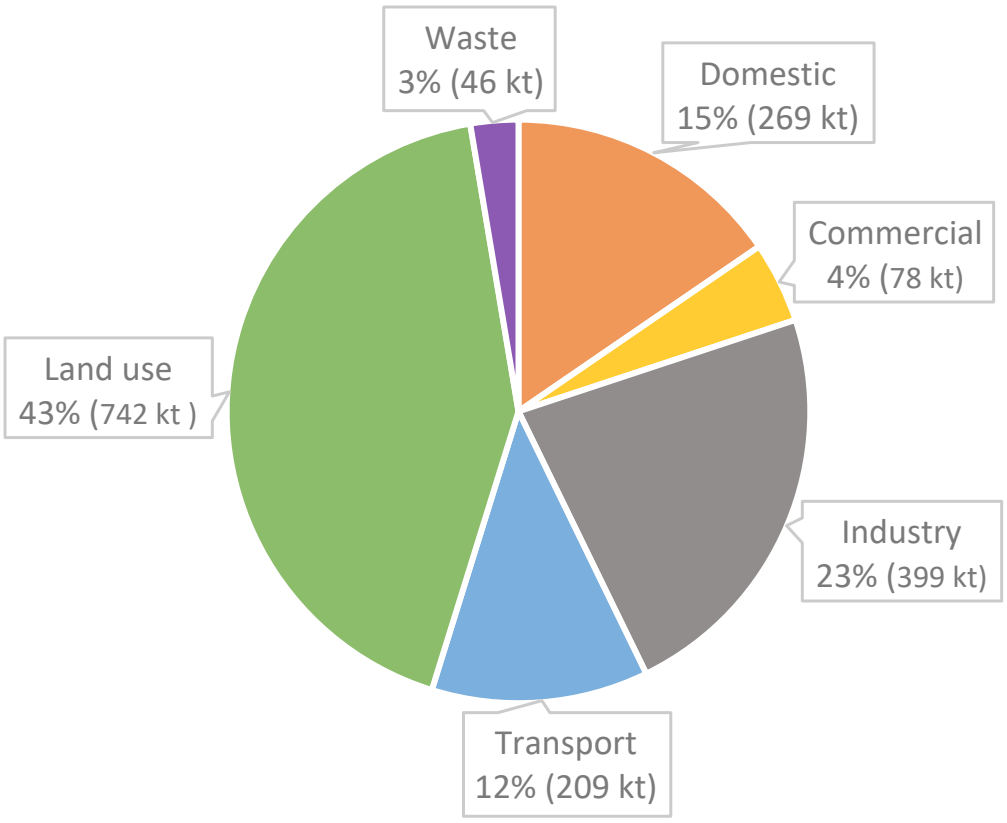


A Sectoral Breakdown of Present Emissions

65% of Derry & Strabane's emissions come from industry and land-use

Currently, 65% of all emissions from the region come from land-use and industry, with homes accounting for 15%, transport 12%, public and commercial buildings contributing 4%, and the waste sector emitting 3% of emissions. It therefore makes sense to focus the region's decarbonisation efforts on the highest-emitting sectors.

Figure 2: Derry and Strabane's Carbon Footprint - Sectoral Breakdown (Direct Emissions (2022) - Scope 1 and 2)



A Projection of Future Emissions

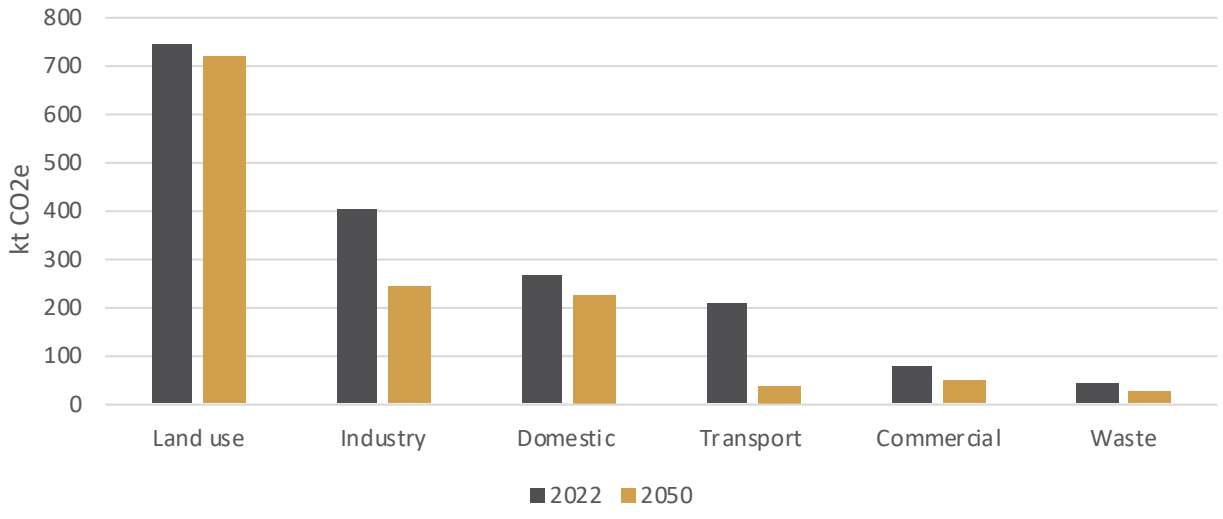
Derry and Strabane's emissions are projected to fall by 38% between 2000 and 2045

All projections are uncertain, but if we take into account on-going economic and population growth in Derry and Strabane, continued efficiency improvements in homes, buildings and transport, the gradual switch to electric vehicles and the continuing decarbonization of grid electricity in the UK, then we predict that by 2045 Derry and Strabane will have cut its direct carbon footprint by 38% based on 2000 levels, and 40% by 2050.

We predict that much of the reduction in Derry and Strabane's emissions in the period through to 2045 will come from the switch to electric vehicles, and improvements in efficiency in public and commercial buildings and industry. We also expect that household emissions are expected to fall on average.

A 38% carbon cut from the region between 2000 and 2045 is a big improvement, but it is still a long way short of reaching net zero carbon emissions, especially if Derry and Strabane wants to meet its target of reaching net zero by 2045.

Figure 3: Derry and Strabane's Carbon Footprint - Present and Projected (Business-As-Usual) Sectoral Emissions (Direct Emissions - Scope 1 and 2)



The Importance of Broader, Consumption-based Emissions

Almost every city or region focuses primarily on these direct (or Scope 1 and 2) emissions. However, it is also important to note that these figures don't account for the carbon footprint of goods and services produced elsewhere but consumed in Derry and Strabane.

These consumption-based (or Scope 3) emissions typically add c.80% onto the current carbon footprint of the area, and over time these emissions are falling more slowly. However, this may not be the case for areas with high agricultural output, such as Derry and Strabane. As well as addressing its fuel and electricity use, Derry and Strabane should also think about the carbon embedded in its consumption, especially of carbon-intensive products like concrete and steel or meat and dairy. However, changing the purchasing patterns of organisations and the buying-habits of individual consumers is a complex task that many governments are only just beginning to grapple with.

Derry and Strabane's Energy Bills

Total Energy Bills

In 2021, Derry and Strabane's total energy bill – covering the cost of all purchases of petrol, diesel, gas and electricity in the region – amounted to an estimated £342.5m. The cost of energy represents a major drain on the city's economy and a strain for many households, businesses and public services.

With current turbulence in the energy market causing high prices and fluctuation, we estimate that Derry and Strabane could spend a total of £476m on energy this year – meaning that the energy price rises could mean that an extra £133m leaves the area's economy this year. We estimate that energy prices will begin to return to normal levels before rising gradually over time through to 2050. Under this assumption, the total energy bill for the city could reach £475m a year by 2050.

Household Energy Bills and Fuel Poverty

We estimate that in 2021 the average household in Derry and Strabane spent £3,894 a year on energy – including the costs of transport within the city. For individual households, under current energy assumptions the average annual household energy bill (including household heating and energy use and household level transport costs) could increase to £5,197 a year this year and to over £5,269 a year by 2050. These increases in energy bills are obviously a hugely significant issue for the c.31% of households – or in other words the 19,000 homes that house 46,000 people - that are in fuel poverty within Derry and Strabane.[1]

1 https://www.nihe.gov.uk/getattachment/975a319a-9516-4f0b-a095-382332405ff0/HCS-Main-Report-2016.pdf

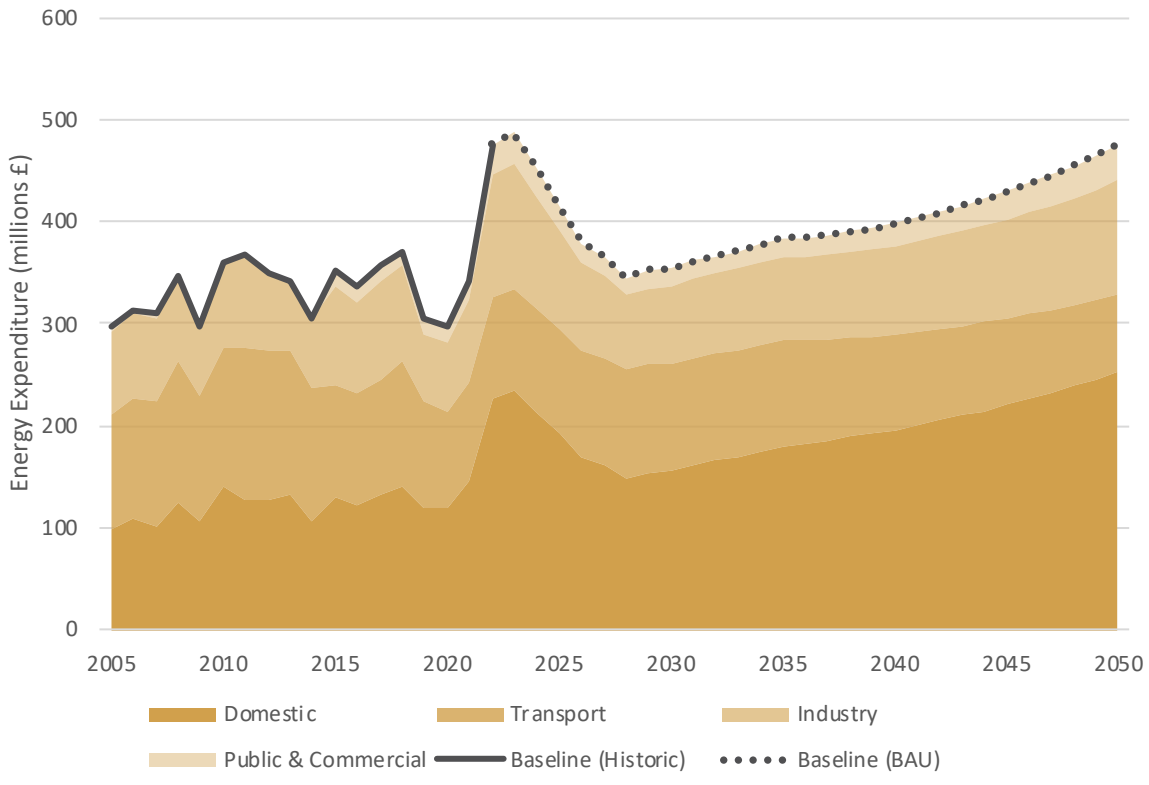
Joining-up Action on Energy Bills and Carbon

Average household energy bills in 2022 were £3627

Whether at the city level or the household level, energy bills represent a huge outgoing – but it is clear that promoting energy efficiency can play a major role in cutting bills, tackling fuel poverty, protecting businesses and public services whilst at the same time cutting carbon emissions.

As will be shown below, Derry and Strabane could cut its carbon emissions by 12% and save nearly £100m a year from its energy bill by investing in measures that would more than pay for themselves over their lifetime through the energy savings that they generate. If it went further to adopt all of the measures that are currently viable, Derry and Strabane could cut its carbon emissions by 80% and save £161m a year from its energy bill.

Figure 4: Derry and Strabane's Total Energy Bill - Past, Present and Projected



Developing an Evidence-Based Routemap for Derry and Strabane

Addressing energy use and carbon emissions in Derry and Strabane will require different actors to engage in multiple actions across diverse sectors over an extended period of time. Designing and delivering an effective place-based approach will be much easier with a strong evidence base and a clear vision of the way forward.

In this report we set out a baseline that predicts what will happen to energy use and carbon emissions in Derry and Strabane under a 'business as usual' scenario where recent trends continue and current commitments are delivered but with no new major initiatives being adopted.

Against this baseline, we assess what Derry and Strabane needs to do to stay within its share of the global carbon budget that is consistent with having a good chance of avoiding dangerous climate change. On this basis, we propose science-based targets for Derry and Strabane, including a longer-term target and 5-yearly carbon budgets that the region can work towards over time.

We then identify and evaluate the performance and scope for deployment of a wide range of different energy-saving or carbon-cutting options that could be adopted across the area. We assess these options and provide evidence on a measure-by-measure and a sector-by-sector basis, but we also aggregate the assessment to show what could or should happen across the region as a whole.

Crucially, we look at the costs and the benefits of different levels of action and ambition. We therefore identify both the investment needs and the paybacks that come from the direct energy savings that could be generated with different forms and levels of action.

We also consider some of the wider co-benefits of action to help show how Derry and Strabane can tackle its contribution to climate change in a way that joins up with its wider social, economic and environmental priorities.

This evidence base and report shows what could be done – and it sets out some indicative actions that highlight the scale and the pace of change that will be required. This should form the basis of a fuller climate action plan for Derry and Strabane that considers the actors and the resources that need to be mobilised, the roles and responsibilities that need to be defined and the capacities (individual, organisational and region-wide) that need to be built.

Science-Based Targets for Derry and Strabane

The UN Inter-governmental Panel on Climate Change (IPCC) has calculated the total level of emissions that could be emitted globally in the period through to 2100 if we are to have a 50% chance of limiting average warming to 1.5°C and so limiting the risks of triggering dangerous levels of climate change.

Dividing this global total by population suggests that Derry and Strabane's total share of the global carbon budget for the period through to 2100, consistent with giving the world a good chance of avoiding dangerous climate change, is 6.5 Mt (mega or million tonnes) of carbon and other greenhouse gases (collectively measured as CO_2e). At present, Derry and Strabane as a whole is emitting 1.7 Mt of CO_2e a year. This means that at current rates it will have used up its share of the global carbon budget consistent with avoiding dangerous climate change within 4 years[2], by the end of 2026.

Derry and Strabane itself has set a target of reaching net zero emissions by 2045. Figure 5 proposes a science-based pathway to reach the 2045 target whilst also enabling Derry and Strabane to stay within its share of the global carbon budget. This gradual pathway indicates that Derry and Strabane's emissions have to fall by 21% a year, every year, if Derry and Strabane is to stay within its share of the global carbon budget.

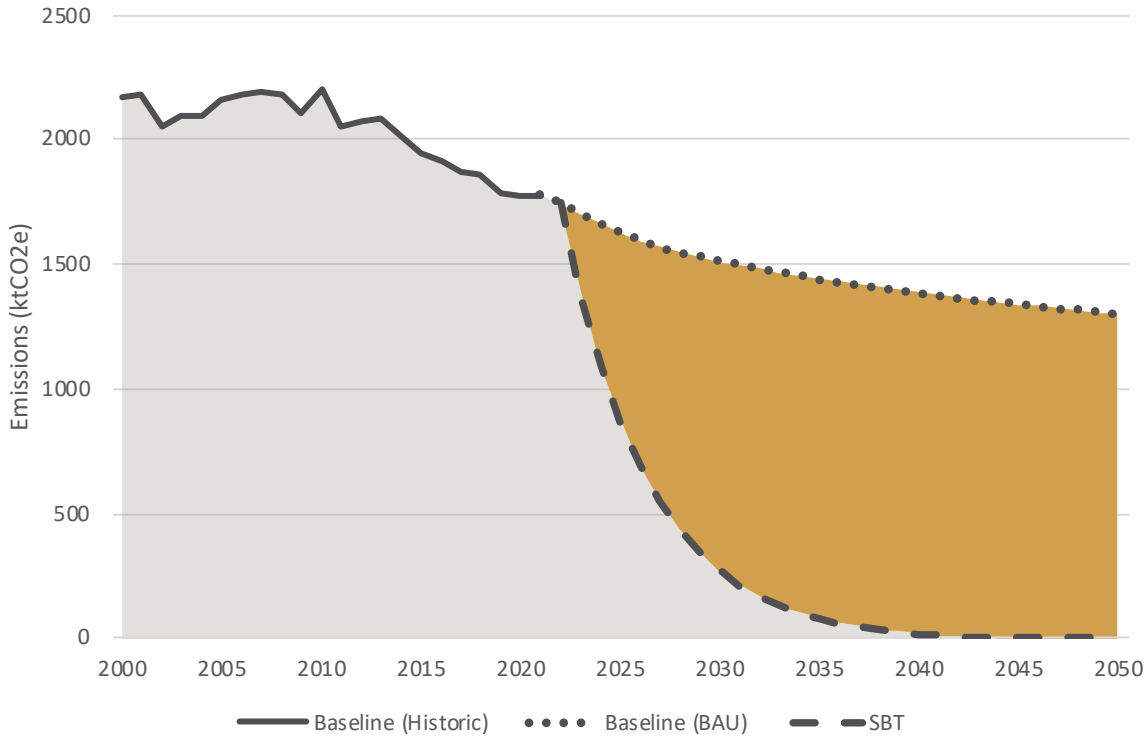
2 If Derry and Strabane reduces its annual rate of emissions, it would take longer to use up its share of the carbon budget.

Derry & Strabane needs to reduce emissions by 21% year on year

Using this gradual pathway as the basis for 5-yearly carbon budgets suggests that Derry and Strabane need to build on the 20% drop in emissions since 2000 already delivered to achieve reductions of (on 2000 level of emissions):

- **60%** by 2025
- **88%** by 2030
- **96%** by 2035
- **92%** by 2040
- **100%** by 2045

Figure 5: A Gradual Emissions Reduction Pathway for Derry and Strabane (Direct Emissions - Scope 1 and 2)



Identifying and Evaluating Carbon Reduction Options for Derry and Strabane

The Scope of the Work

Climate change is a cross-cutting issue. We use energy – and hence generate carbon emissions– in almost everything that we do. As a result, changes are needed in our homes, offices, retail and leisure spaces, businesses, transport systems, waste management systems and so on. There are no silver bullets or big bangs – decarbonisation requires wide ranging and far-reaching change.

In this analysis we evaluate the potential contribution of different energy-saving and carbon-cutting options. In the main, we focus on tried and tested options that are already widely available. However, we also consider the contribution that some more innovative or 'stretch' options could make, and the extent to which any residual emissions could be off-set through measures such as tree-planting.

For homes and public and commercial buildings, we consider both upgrading existing buildings and adopting higher standards for new buildings. For existing buildings, we analyse the impacts of improving insulation in lofts, walls, floors, windows and doors, incorporating renewables such as solar panels or air or ground source heat pumps, upgrading or replacing heating systems and switching to more efficient appliances. For new buildings, we consider the potential to build more efficient and well-insulated buildings that are more comfortable and that require less energy throughout their lifetimes.

For transport, we assess the potential to reduce transport demand – for example through home-working or through the promotion of '15 minute' neighbourhoods – and we consider the potential for more active travel or walking or cycling.

We also look at the scope to promote further use of public transport - especially buses and trains – and for switching the vehicle stock to either electric or more fuel-efficient cars, vans, buses and lorries.

Local and regional data are used to understand the current travel journeys being made by different travel modes (walking, cycling, driving) in Derry and Strabane. Using examples from other parts of the UK, and established transport methodologies, we then make two changes to these trips. First, we shift travel journals from higher to lower carbon travel modes. For example, we shift private vehicle travel to walking and cycling while taking into account that only a portion of trips made by car are possible on foot and by bicycle. We then assess the remaining trips in higher carbon travel modes and improve the efficiency of these trips by calculating the effect of petrol and diesel cars, buses and trucks being replaced by electric versions. Both travel shifts and travel improvements are made gradually over the period from 2023 to 2035 to accommodate the need for new infrastructure and time for changes in travel habits.

In industry, we consider the opportunities to switch to more efficient facilities – for example with enhanced energy management and better lighting, heating and cooling, pumping, condensing and processing.

In land-use, we look at the scope to minimise forms of land-use that give rise to emissions – for example from some animal agricultural practices or wetlands degradation. We also consider the potential to maximise forms of land-use that capture and store carbon – for example through accelerated land restoration, improved soil management or accelerated tree planting schemes.

In all, we consider the potential contribution that roughly 750 options could make – taking into account their purchasing, installation and maintenance costs, their realistic installed performance (adjusted to account for rebound effects) and their expected

lifetimes. We assess the potential rate and extent to which each option could be deployed, taking into account current conditions, background trends and the expected rates of population and economic growth in the region, our analysis factors in forecast energy prices and the on-going decarbonisation of grid electricity over time.

As well as assessing carbon savings, we look at overall investment needs and the extent to which investments payback through the energy savings that they generate. We also consider the extent to which investments could generate new jobs in Derry and Strabane, taking into account the number of jobs per £1m of turnover in each area and the extent to which any jobs created are likely to be retained in Derry and Strabane.

The presentation of the results

To present the aggregated results in a structured and accessible way, we look at five levels of change:

- Level 1 – the cost-effective options. This includes all options where the investment costs would be more than covered through the direct energy savings generated over the lifetime of the measures.
- Level 2 – the cost-neutral options. This includes all options where collectively the investment costs are cancelled out by the direct energy savings generated over the lifetime of the measures.
- Level 3 – the technically viable options. This includes all of the options that could be adopted, including those that generate a return on investment, those that break-even and those that do not cover their costs.
- Level 4 – options for offsetting any residual emissions. This considers the extent to which any emissions remaining after the adoption of all of the options in Levels 1-3 could be offset through UK-based tree planting.

We also present results for each of the key sectors in Derry and Strabane and overall league tables of the most cost and carbon effective options, both in the form of 'top ten' tables and through complete tables of all 750 measures.

Aggregated Results

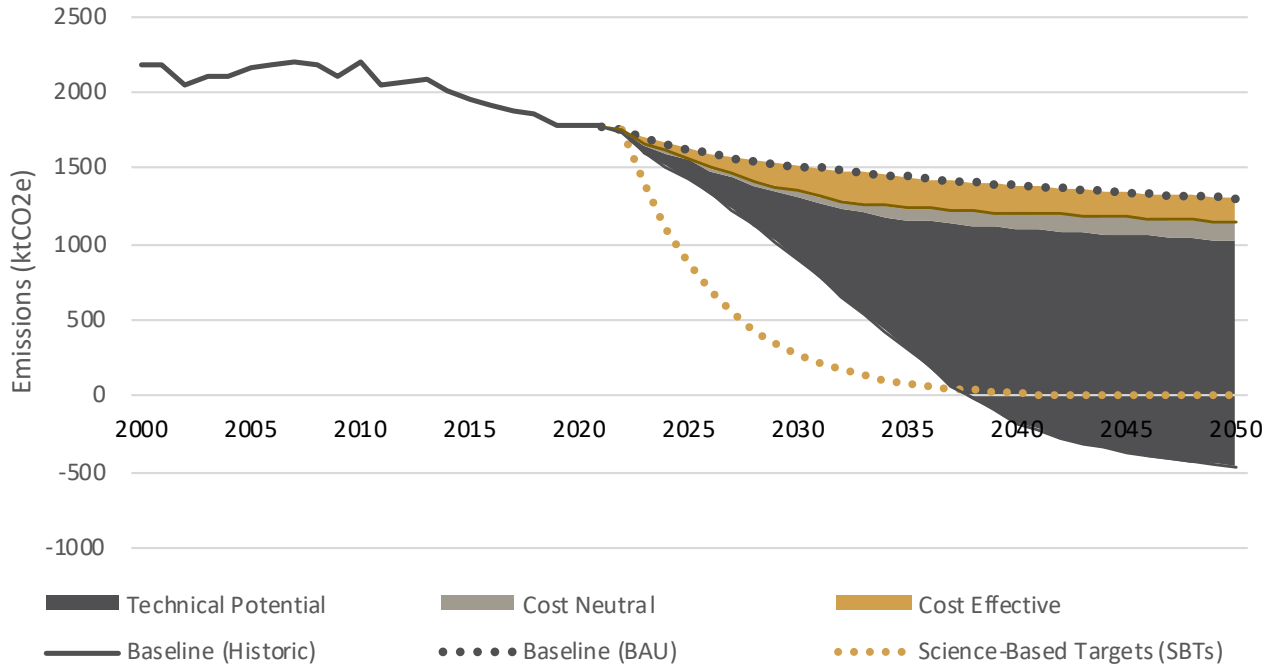
The aggregated results show the contribution that each of the levels of activity could make to cutting Derry and Strabane's carbon footprint.

» Level 1 – the cost-effective options. Adopting all the options in this category would enable Derry and Strabane to close the gap between its projected 'business as usual' emissions in 2045 and net zero by 12%. To exploit these options, £66m a year would need to be invested across Derry and Strabane for the next 15 years, but these investments would cut Derry and Strabane's total energy bill by £62m p.a. by 2030 and create 2,945 years of extra employment (i.e. 147 jobs for 20 years).

» Level 2 - the cost-neutral options. Expanding the scope of decarbonization beyond Level 1 to adopt all of the options in this category would enable Derry and Strabane to close the gap between its projected 'business as usual' emissions in 2045 and net zero by 21%. This would require investments of £134m a year for the next 15 years, but this would cut Derry and Strabane's total energy bill by £77m a year from 2030 whilst creating 5,727 years of extra employment (i.e. 286 jobs for 20 years).

» Level 3 – the technically viable options. Going beyond Levels 2 and 3 to include all of the technically viable options would enable Derry and Strabane to close the gap between its projected 'business as usual' emissions in 2045 and net zero by 128%. This step-change in the level of decarbonization would require investments of £320m a year for the next 15 years, but this would cut Derry and Strabane's energy bill by £103m a year from 2030 whilst creating 12,304 years of extra employment (i.e. 615 jobs for 20 years).

Figure 6: Derry and Strabane's Carbon Reduction Potential - Available Options



» Level 4 - options for offsetting any residual emissions. The technical potential scenario in figure 6 represents the CCC's target of 50% reduction in meat and dairy consumption, and therefore agriculture, by 2050. A less ambitious shift of 30% of animal agricultural land would enable DSDC to reach its target of net-zero emissions by 2045. This would reduce the need for DSDC to rely on unproven low-carbon methods such as CCS or green hydrogen, as well as bringing huge benefits from afforestation to biodiversity, air quality and soil health.

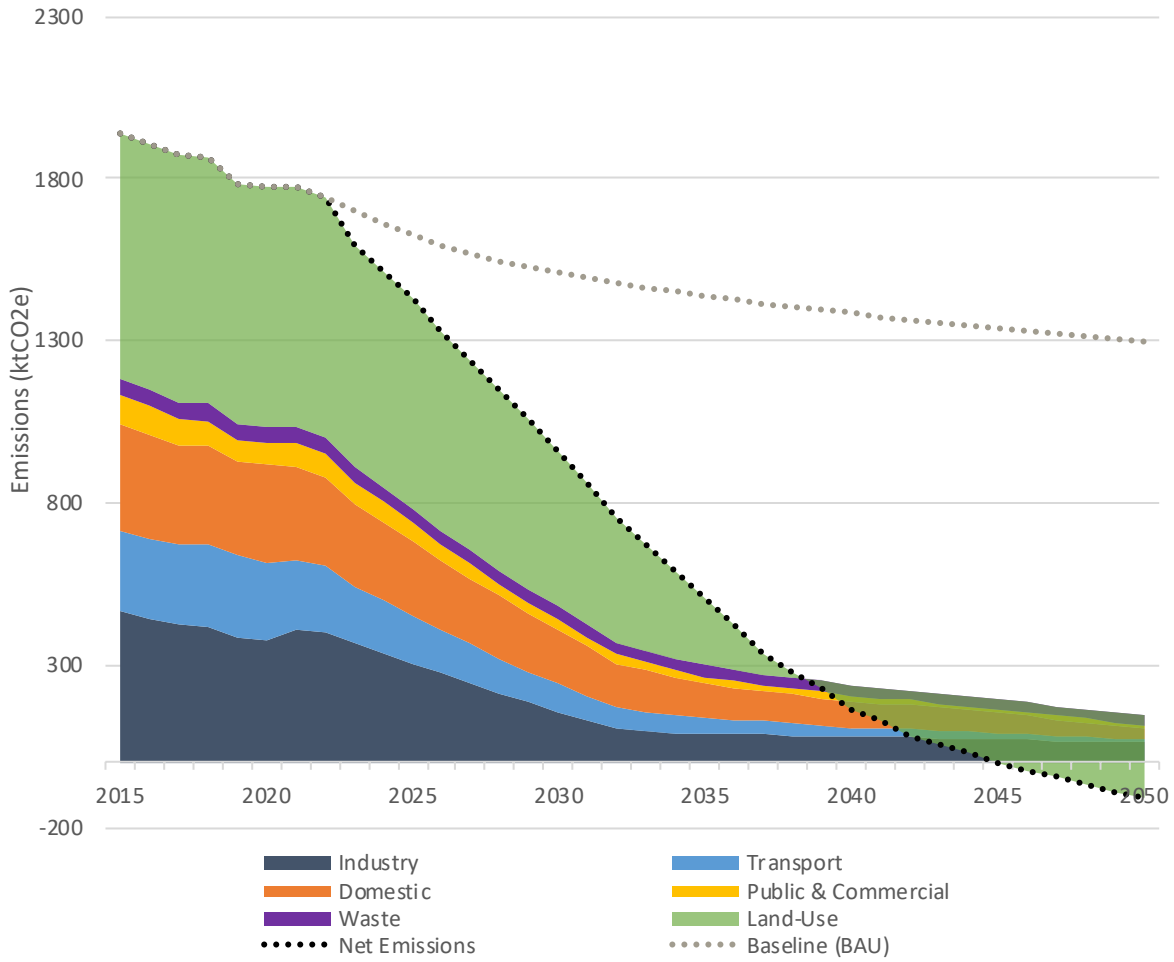
This 30% shift from animal agriculture to forestry (including pre-existing forest) equates to 27% of Derry and Strabane's total land area. For context, the EU's average forestry cover is 38%[3]. This means that it is possible for Derry and Strabane to reach net-zero even without matching the current EU average for forest cover.

3 https://www.europarl.europa.eu/factsheets/en/sheet/105/the-european-union-and-forests

Investing in all existing options could cut Derry & Strabane's energy bill by £161m a year

The 50% shift in Figure 6 equates to an overall increase in forest cover from 13% to 36% - still slightly lower than the EU average.

Figure 7: Derry and Strabane's Carbon Reduction Potential - Stretch Options and Offsetting Potential



The Most Carbon and Cost-Effective Options for Derry and Strabane

There are multiple options that could be deployed as Derry and Strabane transitions towards net zero. In this analysis, we focus on the carbon- and cost-effectiveness of different options, and below we present the 'top ten' league tables of the most carbon- and cost-effective options. We note that the domestic, land-use and industry sectors all have options in the top-ten most carbon-effective league table. This emphasises the need for a cross-cutting, city-wide decarbonisation programme. In Appendices 3 and 4 we present the full league tables extending to over 750 measures.

Of course, decision-making should be guided by a wider range of criteria than just carbon- and cost-effectiveness. Assessing the readiness or capacity of Derry and Strabane to adopt different options – for example considering their political, social, financial and institutional readiness – can provide a more rounded or multi-criteria view of the most suitable options. Whatever criteria are applied, there should be clear social, economic and environmental benefits from having an informed, evidence-based approach.

Table 1: Top Ten List of the Most Carbon-Effective Options

Measure	Carbon Abatement (kt CO_2e)
Afforestation of grazing land	15496
Full restoration of peatlands	4534
Partial restoration of peatlands	3380
Condensing and insulation measures to boilers and steam piping in industry	1641
Ban on peat extraction	1395
Oil boilers to heat pumps in domestic buildings	1235
Improving efficiency of boilers and steam piping in industry	1122
Reduce urban encroachment on natural areas	842
Miscanthus planting	580
Pump upgrades, repairs and maintenance in industry	485

Table 2: Top Ten List of the Most Cost-Effective Options

Measure	Cost per tonne (£)
Turn unnecessary lighting off in domestic buildings	-1855
Reduce heating for washing machines in domestic buildings	-1855
Large petrol car journeys to electric bus journeys	-1854
Medium petrol car journeys to electric bus journeys	-1680
Small petrol car journeys to electric bus journeys	-1516
Electrical circuitry efficiency upgrades in retail buildings	-1329
AC upgrades in commercial buildings	-1306
Highly-efficient air cooling system in retail buildings	-1238
Fan efficiency upgrades in retail buildings	-1192
Low energy lighting in domestic buildings	-1142

Results by Sector: Housing

Under a business-as-usual scenario, which includes on-going decarbonisation of grid electricity, a continuation of the background trends that are gradually improving the energy efficiency of the housing stock in Derry and Strabane, and accounting for changes in housing stock and population numbers in Derry and Strabane, we project that the city and district's housing-related carbon emissions will decrease by 17% by 2045. Predicted energy prices suggest that the average household energy bill in 2050 (excluding transport) will be £4,040 a year.

The potential for decarbonisation:

» Level 1 – the cost-effective options: With investments of £5 million a year for the next 15 years, overall emissions from Derry and Strabane's housing stock could be reduced by 15% by 2045. This would also reduce the average household energy bill (excluding transport) by £285 a year in 2050, for a total of £18 million in annual energy savings across Derry and Strabane.

» Level 2 – the cost-neutral options: With investments of £39 million a year for the next 15 years, overall emissions from Derry and Strabane's housing stock could be reduced by 45% by 2045. This would also reduce the average household energy bill (excluding transport) by £542 a year in 2050, for a total of £34 million in annual energy savings across Derry and Strabane.

» Level 3 – the technical potential options: With investments of £111 million a year for the next 15 years, overall emissions from Derry and Strabane's growing housing stock could be reduced by 73% by 2045. This would also reduce the average household energy bill (excluding transport) by £959 a year in 2050, for a total of £60 million in annual energy savings across Derry and Strabane.

Case studies from the Leeds PIPES network and Cosy Homes Oxfordshire offer insight into the ways the measures presented below can be turned into action by the council and partners in Derry and Strabane.

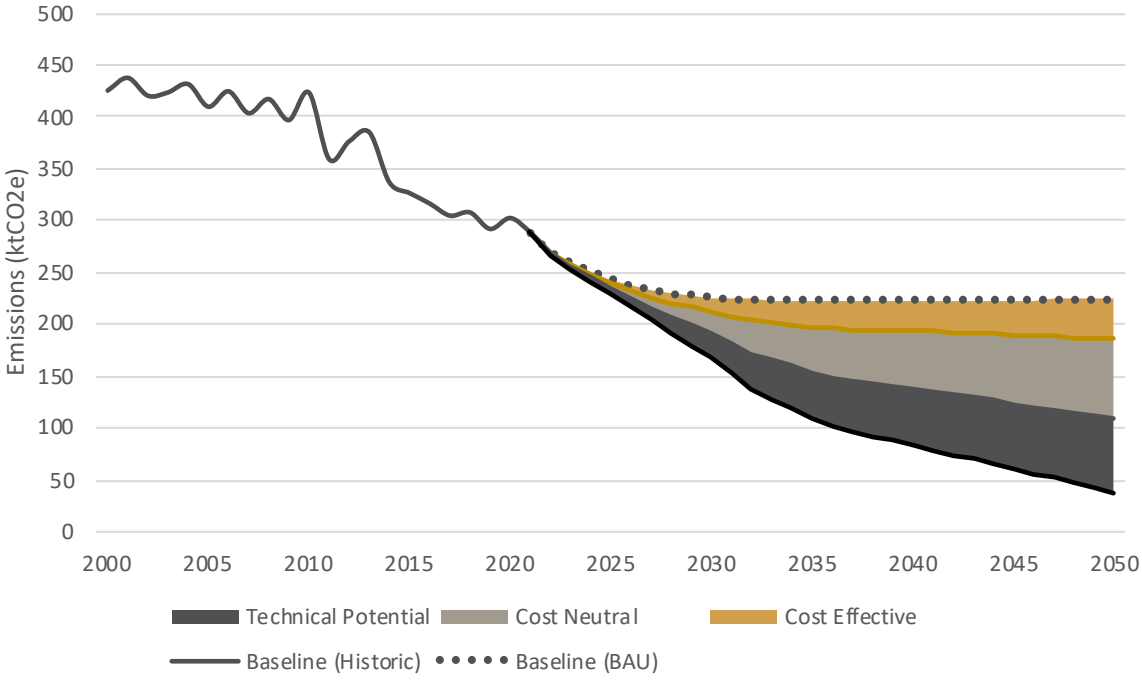
Table 3: Most Carbon-Effective Options in Homes

Domestic Sector	Carbon Abatement (kt CO_2e)
Oil boilers to heat pumps in domestic buildings	1235
Whole house retrofits in domestic buildings	454
Solar PV in domestic buildings	286
Loft insulation in domestic buildings	225
Heat pumps in domestic buildings	135
Cavity wall insulation in domestic buildings	126
External wall insulation in domestic buildings	109
Gas combi-boilers in domestic buildings	105
Reduce household heating by 1 C in domestic buildings	102
Internal wall insulation in domestic buildings	74

Table 4: Most Cost-Effective in Homes

Domestic Sector	Cost per tonne (£)
A rated ovens in domestic buildings	-3227
Integrated digital TVs in domestic buildings	-1974
A+ rated wet appliances in domestic buildings	-1924
Turn unnecessary lighting off in domestic buildings	-1855
Reduce heating for washing machines in domestic buildings	-1855
Induction hobs in domestic buildings	-1783
Low energy lighting in domestic buildings	-1142
District heating networks in domestic buildings	-706
Tank insulation in domestic buildings	-510
Biomass boilers in domestic buildings	-487

Figure 8: Derry and Strabane's Carbon Reduction Potential: Housing



Domestic Case Study 1 - Leeds PIPES Heat Network (led by local authority)

The Leeds PIPES district heating network has successfully delivered a network of super-insulated underground pipes. The network is bringing lower costs and carbon heating and hot water to 1,800 residential properties, eight public buildings, and two commercial building, reusing heat generated at the nearby Recycling and Energy Recovery Facility (RERF).

Leeds City Council led the project with support from private sector partner Vital Energi. Construction was commenced on the assumption that new customers would connect once the infrastructure was completed, and by connections to social housing and the public sector. The council's ambition to become the UK's first net zero major city is supported by this project which recognises and delivers on the potential of heat networks.

The project received £4m of funding through the Leeds City Region Growth Deal, £5.8 from European Regional Development Funding (ERDF). The network now stretches around 26 kilometres, and mitigates 22,000 tonnes of CO2 annually and has helped to create local jobs.

Impact:

- Total investment in first phase of £9.8m
- Low carbon, low cost heat supplied to 1,800 homes
- 22,000 tonnes CO2 saved annually

Domestic Case Study 2 - Cosy Homes Oxfordshire (enabled by local authority)

Cosy Homes Oxfordshire is a private sector one-stop-shop home retrofit service, set up to make it simple for homeowners in Oxfordshire to improve the energy efficiency of their homes. The scheme was launched as a pilot in 2019 with support from BEIS as one of six supply chain demonstrators, bringing together customers and contractors to simplify the customer journey.

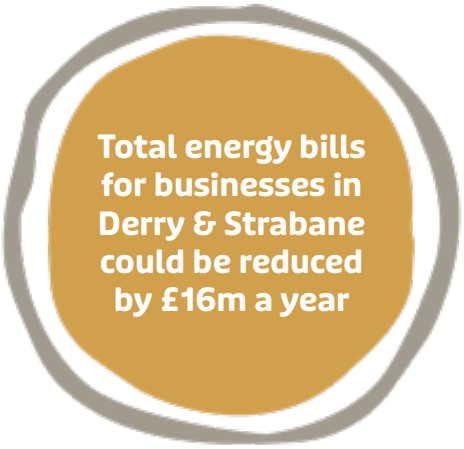
The scheme was developed using the RetrofitWorks co-operative model, and has been supported by organisations such as the Low Carbon Hub and Oxford City Council, who help with raising awareness among homeowners and building connections into communities.

As a one-stop-shop seeking to provide an end to end service for homeowners, Cosy Homes Oxfordshire takes a whole house approach to retrofit, having delivered 233 home assessments and 220 whole house plans since its launch. Interest from homeowners has been high but the scheme has run into issues with delivery due to supply chain limitations.

Impact:

- 548 homes registered
- 220 whole house plans completed
- 23 retrofits in progress

Results by Sector: Public and Commercial Buildings



Under a business-as-usual scenario, which includes on-going decarbonisation of grid electricity, a continuation of background trends that are gradually improving the energy efficiency of the public and commercial building stock in Derry and Strabane, and forecast growth in the floorspace of public and commercial buildings in Derry and Strabane, we project that this sector's carbon emissions will decrease by 40% by 2045.

- Level 1 – the cost-effective options: With investments of £7 million a year for the next 15 years, emissions from public and commercial buildings in the area could be reduced by 47% by 2045. These investments would reduce the total energy bill for public and commercial buildings in the area by £10 million a year by 2050.
- Level 2 – the cost-neutral options: With investments of £13 million a year for the next 15 years, emissions from public and commercial buildings in the area could be reduced by 50% by 2045. These investments would reduce the total energy bill for public and commercial buildings in the area by £14 million a year by 2050.
- Level 3 – the technically viable options: With investments of £36 million a year for the next 15 years, emissions from public and commercial buildings in the area could be reduced by 73% by 2050. These investments would reduce the total energy bill for public and commercial buildings in the area by £16 million a year by 2050.

Case studies from South Tynside and Brighton demonstrate that councils can play a leading role turning the actions presented below into lower energy bills, new jobs and reduced GHG emissions.

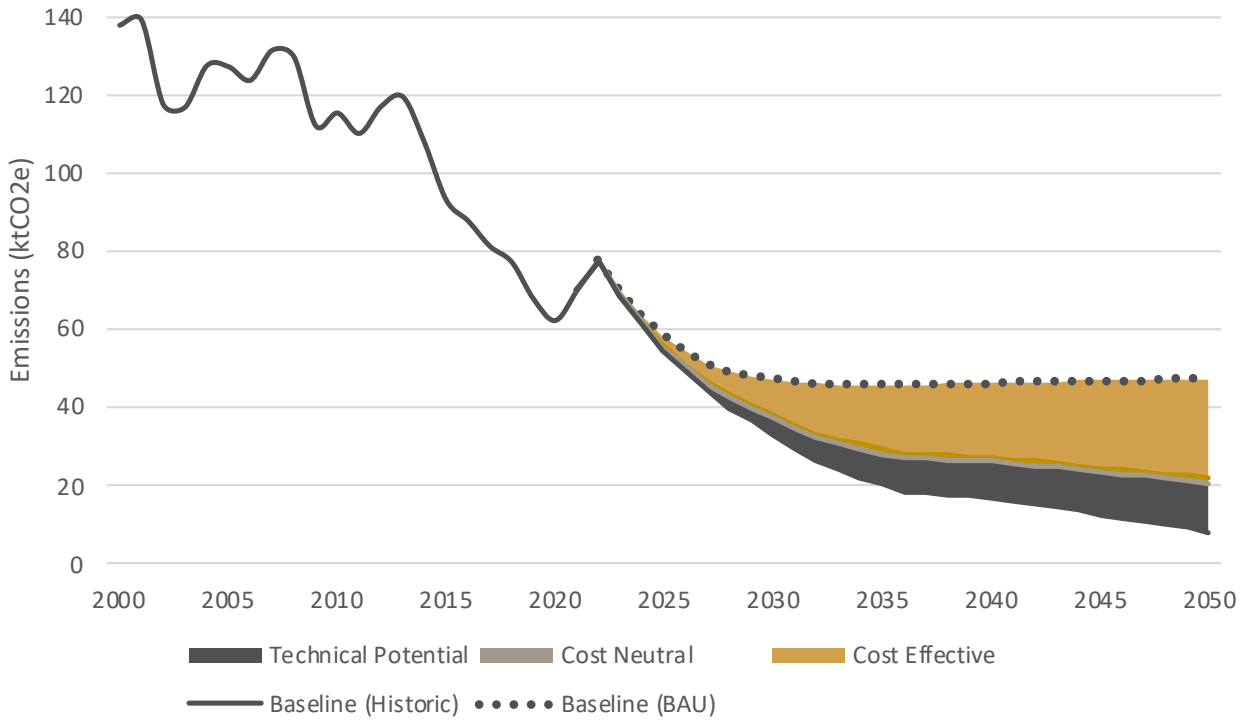
Table 5: Most Carbon-Effective Options in Public and Commercial Buildings

Public & Commercial Sector	Carbon Abatement ($kt\ CO_2e$)
Air tightness in retail buildings	153
Fabric improvements in industrial buildings/warehouses	82
Area-based commercial retrofits in retail buildings	61
Oil boilers to heat pumps in retail buildings	54
Area-based commercial retrofits in industrial buildings/ warehouses	45
Oil boilers to heat pumps in community centres	22
Heat recovery in retail buildings	21
Area-based commercial retrofits in office buildings	18
Oil boilers to heat pumps in hotels	15
Oil boilers to heat pumps in office buildings	13

Table 6: Most Cost-Effective Options in Public and Commercial Buildings

Public & Commercial Sector	Cost per tonne (£)
Electrical circuitry efficiency upgrades in retail buildings	-1329
AC upgrades in community centres	-1306
AC upgrades in healthcare buildings	-1303
AC upgrades in education buildings	-1293
AC upgrades in hotels	-1293
AC upgrades in non-retail buildings	-1283
AC upgrades in office buildings	-1279
Electrical circuitry efficiency upgrades in office buildings	-1279
Highly efficient air-cooling system in retail buildings	-1238
AC upgrades in retail buildings	-1206

Figure 9: Derry and Strabane's Carbon Reduction Potential: Public and Commercial Buildings



Public and Commercial Buildings Case Study 1 – Viking Energy Network Jarrow (VENJ)

The Viking Energy Network Jarrow (VENJ) is the first of three major district heating networks implemented by South Tyneside Council. The energy centre for VENJ will be sited on the bank of the River Tyne, and use water source heat pump (WSHP) technology fed by river water. The project will initially provide low cost, low carbon energy to nine connected commercial buildings.

Led by South Tyneside Council, VENJ will make a significant contribution to the city's pledged actions resulting from its climate emergency declaration and net zero 2030 target. The project is funded with a £3.5m grant provided by the European Regional Development Fund (ERDF), with additional management support provided by central government.

Once up and running, it is predicted that VENJ will save around £0.5m in fuel costs, and mitigate 1,035 tonnes of CO2 annually. As an ERDF-funded project, it will also strive to stimulate local economic development through innovation and job creation.

Impact:

- £3.5m grant funding from ERDF for its implementation
- £0.5m saved in fuel costs per year
- 1,035 tonnes of CO2 mitigated per year

Public and Commercial Buildings Case Study 2 – One Brighton

One Brighton is a sustainable housing development and community, built in line with Bioregional's One Planet Living sustainability framework which envisions a world where we live within the limits of the Earth's resources. The complex of 172 apartments is saving its residents money, while significantly reducing their resource consumption and carbon emissions.

The scheme was developed by Bioregional, building on learnings from BedZed, their first residential development. Bioregional has received endorsement from Brighton & Hove

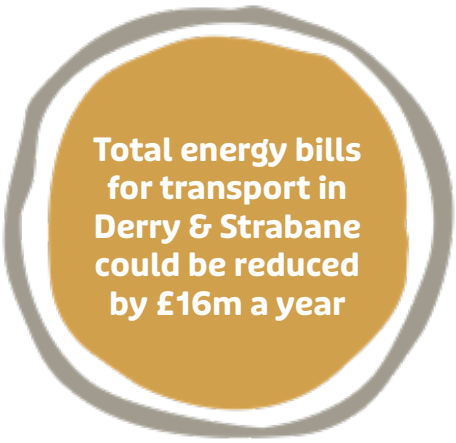
City Council and the Greater South East net zero Hub, but was delivered by private sector partners including architects Feilden Clegg Bradley Studios and contractors Denne.

One Bioregional achieved a 67% reduction in operational CO2 emissions when compared to the UK's existing housing stock, with predictions that this would reach 89% by 2020. The scheme is also the UK's largest private car-free development, and implements nature into its design.

Impact:

- 67% reduction in operational CO2 compared to UK's existing housing stock
- Expected for this reduction to increase to 89% by 2020
- 31% of apartments are social or shared equity housing

Results by Sector: Transport



Under a business-as-usual scenario, which includes on-going decarbonisation of grid electricity, a continuation of background trends that are gradually improving the energy efficiency of the transport sector in Derry and Strabane, we project that this sector's carbon emissions will decrease by 70% by 2045.

» Level 1 – the cost-effective options: With investments of £15 million a year for the next 15 years, emissions from the transport sector in the area could be reduced by 43% by 2045. These investments would reduce the total energy bill for the transport sector by £12 million a year by 2050.

» Level 2 – As transport includes some measures that over their lifetimes are highly cost-effective (e.g. mode shift and EVs) and some that generate significant wider benefits but are not directly cost-effective (e.g. public transport), there are no cost-neutral measures included in the analysis.

» Level 3 – the technically viable options: With investments of £21 million a year for the next 15 years, emissions from the transport sector in the area could be reduced by 71% by 2050. These investments would reduce the total energy bill for the transport sector by £16 million a year by 2050.

Examples from Nottingham and Oxford provide examples that Derry and Strabane can draw upon to accelerate transport decarbonisation.

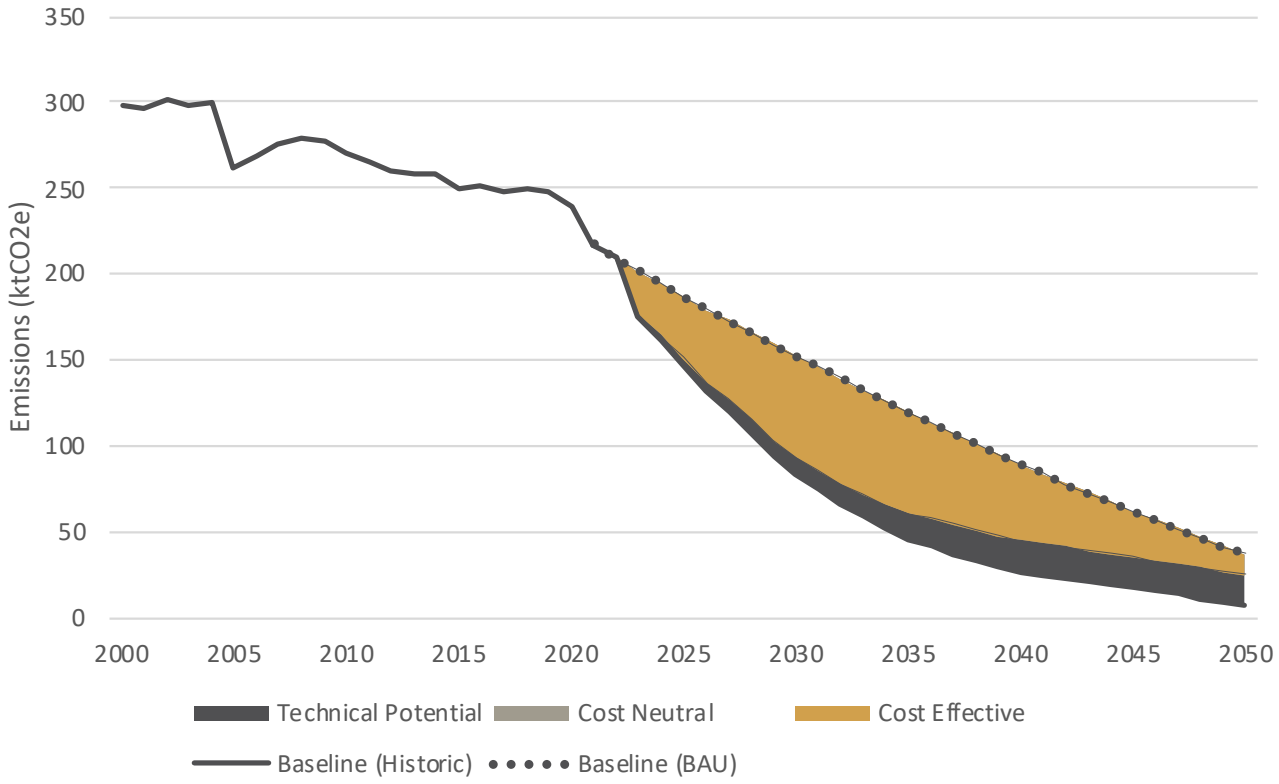
Table 7: Most Carbon-Effective Options for the Transport Sector

Transport Sector	Carbon Abatement (kt CO_2e)
Diesel light ordinary goods vehicle to electric ordinary goods vehicle	146
Diesel bus journeys to electric bus journeys	146
Diesel heavy ordinary goods vehicle to electric ordinary goods vehicle	132
Small petrol car journeys to bicycle journeys	105
Large petrol car journeys to bicycle journeys	98
Medium petrol car journeys to bicycle journeys	96
Diesel light goods vehicles to electric light goods vehicles	88
Small diesel car journeys to bicycle journeys	75
Large diesel car journeys to bicycle journeys	70
Medium diesel car journeys to bicycle journeys	69

Table 8: Most Cost-Effective Options for the Transport Sector

Transport Sector	Cost per tonne (£)
Large petrol car journeys to electric bus journeys	-1854
Medium petrol car journeys to electric bus journeys	-1680
Small petrol car journeys to electric bus journeys	-1516
Large petrol car journeys to diesel bus journeys	-1243
Medium petrol car journeys to diesel bus journeys	-1028
Medium diesel car journeys to bicycle journeys	-658
Small diesel car journeys to bicycle journeys	-630
Large diesel car journeys to bicycle journeys	-614
Medium diesel car journeys to walking journeys	-577
Small diesel car journeys to walking journeys	-562

Figure 10: Derry and Strabane's Carbon Reduction Potential: Transport



Transport Case Study 1 - Nottingham Workplace Parking Levy (led by local authority)

Nottingham City Council led this trailblazing example of a Workplace Parking Levy (WPL) which charges employers that provide workplace parking. The levy tackles congestion two-fold by incentivising employers to reduce provision for parking and promote other modes of commuting, while also helping to fund infrastructure projects such as improved public transport.

This initiative received significant funding support from central government, but was pioneered by Nottingham City Council, who set up a dedicated consultancy to handle the development and implementation of the levy. Because it was the first of its kind in the western hemisphere, the development of the levy faced high upfront costs and took twelve years to implement, but levies elsewhere would benefit from the new ground broken by this initiative.

The WPL generates £9m revenue annually for the city, and its running costs are less than 5% of this figure. A total of £83m in revenue has been generated since its launch in 2011, much of which has funded public transport upgrades including part-funding a 17.5km tram extension.

Impact:

- £1.8m invested in its development and implementation
- £83m revenue generated by the levy
- 7840 tonnes CO2 saved from public transport investment
- 40% of commutes now made by public transport

Transport Case Study 2 - Energy Superhub Oxford (enabled by local authority)

As one of three demonstrator projects part-funded by central government to showcase an integrated and innovative approach to developing smart local energy systems, Energy Superhub Oxford (ESO) will be a blueprint for other cities to follow in the net zero transition. The project combines technologies and business models to decarbonise power, transport and heat.

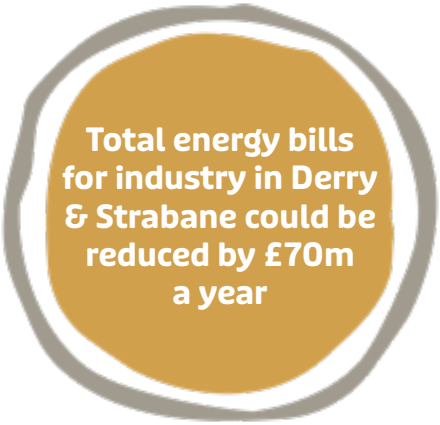
ESO is a private-public consortium of six partners led by Pivot Power, along with business, public, and academic organisations. Oxford City Council is a key partner and supports the project as a critical means of delivering the city's net zero target for 2040.

Oxford City Council has received £1.6m for its role in the project as part of the £10m funding provided by the government's Prospering from the Energy Revolution (PFER) programme. In total, ESO is a £41m project, aiming to mitigate 10,000 tonnes of CO2 emissions annually, which is roughly equivalent to taking 2,000 cars off the road.

Impact:

- £41m total invested in the project
- £10m funding from the government's PFER challenge
- 50MW hybrid battery, 8km EV charging network, 100 ground source heat pumps
- Aims to eliminate 10,000 tonnes of CO2 annually

Results by Sector: Industry



Under a business-as-usual scenario, which includes on-going decarbonisation of grid electricity, a continuation of background trends that are gradually improving the energy efficiency of the industrial sector in Derry and Strabane, and forecasted growth in the sector, we project that this sector's carbon emissions will decrease by 35% by 2045.

- Level 1 – the cost-effective options: With investments of £39 million a year for the next 15 years, emissions from the industrial sector in the area could be reduced by 31% by 2045. These investments would reduce the total energy bill for the industrial sector by £60 million a year by 2050.

- Level 2 – the cost-neutral options: With investments of £60 million a year for the next 15 years, emissions from the industrial sector in the area could be reduced by 42% by 2045. These investments would reduce the total energy bill for the industrial sector by £68 million a year by 2050.

- Level 3 – the technically viable options: With investments of £112 million a year for the next 15 years, emissions from the industrial sector in the area could be reduced by 72% by 2045. These investments would reduce the total energy bill for the industrial sector by £70 million a year by 2050.

Case studies from Trafford and Devon demonstrate that local governments can play a leading role supporting decarbonisation of the industry sector.

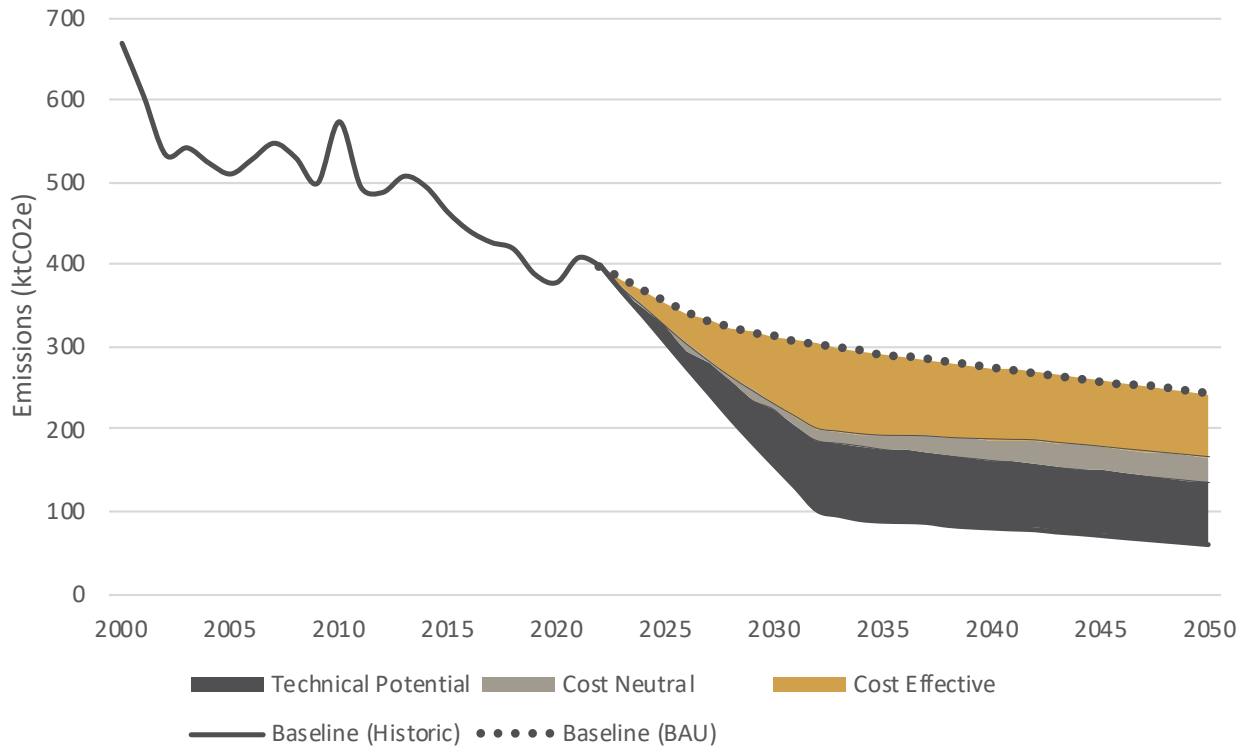
Table 9: Most Carbon-Effective Options in Industry

Industrial Sector	Carbon Abatement (kt CO_2e)
Condensing and insulation measures to boilers and steam piping in industry	1641
Improving efficiency of boilers and steam piping in industry	1122
Pump upgrades, repairs and maintenance in industry	485
Fan correction, repairs, and upgrades in industry	346
Compressed air systems in industry	325
Compressors and variable speed systems in industry	250
Furnace efficiency and heat recovery mechanisms in industry	206
Refrigeration efficiency and technical upgrades in Industry	104

Table 10: Most Cost-Effective Options in Industry

Industrial Sector	Cost per tonne (£)
Compressors and variable speed systems in industry	138
Compressed air systems in industry	141
Fan correction, repairs, and upgrades in industry	149
Pump upgrades, repairs and maintenance in industry	155
Condensing and insulation measures to boilers and steam piping in industry	339
Refrigeration efficiency and technical upgrades in Industry	350
Improving efficiency of boilers and steam piping in industry	353
Furnace efficiency and heat recovery mechanisms in industry	363

Figure 11: Derry and Strabane's Carbon Reduction Potential: Industry



Industry Case Study 1 - Trafford Green Hydrogen

Trafford Green Hydrogen is a green hydrogen fuel production facility which will produce fuel for heating, industry and transport using renewable energy. The facility is part of the Trafford Low Carbon Energy Park which is sited on an old industrial power station. This site includes Europe's largest liquid air energy storage scheme and one of the UK's largest battery storage schemes.

A range of partners including Trafford Metropolitan Borough Council and Greater Manchester Combined Authority signed and delivered on a memorandum of understanding, helping the private sector lead Carlton Power to advance the project. In 2022, support was also given by the council through the granting of planning permission for the facility's development.

Once fully up and running, the facility will have a capacity of 200MW, enough to take 8,000 petrol cars off the road per year. Its initial 20MW capacity will mitigate 20,000 tonnes CO2 in the Manchester region and beyond, and support the UK's net zero energy transition. Trafford Green Hydrogen will also help to create and sustain local green job opportunities.

Impact:

- 20,000 tonnes CO2 mitigated annually from initial phase
- 8,000 petrol cars taken off the road annually from ultimate 200MW capacity

Industry Case Study 2 - Devon Commercial Recycling of EV Batteries

Devon is leading the way in the commercial recycling of EV batteries, with Devon County Council supporting a scale-up of the private sector company Altilitech's processes to a commercial scale. The method recovers over 95% of spent batteries' critical metals at a quality which means they can be reused in the production of new batteries, supporting the transition to net zero through sustainable electrification technology and circular processes.

Devon County Council's Green Innovation Fund has provided capital funding for equipment needed for a commercial-scale process, and revenue funding for employing and training new staff. Funding of £169,384 allowed this piloting of the UK's first battery recycling facility.

Altilitech expects to have created 250 new green jobs by 2026, allowing the facility to recycle battery waste from more than 150,000 EVs. In its first year of operation, the facility is forecast to recycle 250 batteries, mitigating 2,737 tonnes of CO2. As a circular model, it will also help to retain value in the local economy while reducing mining emissions and toxic waste creation.

Impact:

- £169,384 of funding from Devon County Council
- 150,000 EV batteries recycled by 2026
- 2,737 tonnes of CO2 mitigated in its first year of operation

Results by Sector: Land-Use and Management

The challenges associated with achieving carbon reductions in agriculture and land-use are unique and complex. While reductions in emissions from buildings, transport and industry generate energy expenditure savings to compensate households and businesses that take action, changes in the farming sector do not always lead to benefits for farmers. Adding to this, across the UK - and particularly in Northern Ireland - ways of life and consumption patterns connected to farming and agriculture represent additional hurdles for climate action.

The challenges for implementing change in this sector are varied, and will require substantial consideration, public support and political momentum to enact. The protests in several European countries in 2022, around mandated nitrogen emissions reductions for farmers highlight the risk of pushing policy at short notice without proper consultation.

These policy discussions are clearly beyond the remit of Derry and Strabane alone, not least as key policymaking powers sit with DAERA. This report's analysis is therefore a technical assessment of mitigation options, and not a set of policy prescriptions. This modelling serves to highlight the scale, major emission sources and mitigation options available across the land-use sector.

Two key aspects of this technical analysis are worth highlighting:

The first of these concerns the extent farms can reduce emissions without shifting land-use away from animal agriculture. Analysis here finds that through the implementation of a broad set of measures, emissions could be reduced by approximately 21% without reducing number of animals being farmed. This figure aligns with wider research.

A report by Centre for Innovation Excellence in Livestock[4] found that, with 100% uptake across the UK, agricultural emissions could be reduced by 23% with no loss in productivity. The CCC, with slightly less ambitious assumptions, found that the mitigation would likely equate to a total of 15%. Advances in farming techniques and technologies may increase these figures, however, these results suggest that Derry and Strabane's GHG targets are only currently achievable with some degree of shift away from animal agriculture.

A second aspect to highlight concerns the accounting framework used in this analysis and the way it determines responsibility for GHG emissions. Following the UK Climate Change Committee and the UK Government, analysis here includes only Scope 1 and 2 emissions – the direct emissions from fuel use and the indirect emissions from electricity use. As a consequence, all agricultural emissions are attributed to Derry and Strabane even though the majority of food produced is consumed in other parts of the UK and the world. While necessary to align with national government approaches to climate change, this framework obscures the role consumers can play reducing demand for animal products that are emissions intensive.

Under a business-as-usual scenario, using NI-specific forecasts for each sub-sector and re-scaled for Derry and Strabane, we project that this sector's carbon emissions will decrease by 3% by 2050.

» Low ambition scenario: This scenario consists of improvements to cropland and farming practices, alongside a ban on peat extraction. With investments of £23 million a year for the next 15 years, emissions from the land-use sector across the area could be reduced by 21% by 2045.

» Medium ambition scenario: This scenario includes improvements from the low ambition scenario, as well as a 24% shift to forestry from agriculture, and the partial restoration of peatlands. With investments of £30 million a year for the next 15 years, emissions from the land-use sector across the area could be net-zero by 2045.

4 https://cielivestock.co.uk/expertise/net-zero-carbon-uk-livestock/report-april-2022/

» To put this scenario in context, this equates to an additional 11% of forestry across Derry and Strabane to offset remaining emissions from animal agriculture and cropland.

» High ambition scenario: This scenario includes improvements from the low ambition scenario, the full restoration of peatlands, and follows CCC guidance on a 50% reduction in animal products by 2050. With investments of £39 million a year for the next 15 years, emissions from the land-use sector across the area could be reduced by 179% by 2045.

Case studies from County Antrim and NI Arc-Zero Farming demonstrate the wide range of interventions available to mitigate carbon from this sector.

Table 9: Most Carbon-Effective Options in Land-Use

Land-Use Sector	Carbon Abatement (kt CO_2e)
Afforestation of grazing land	15496
Full restoration of peatlands	4534
Partial restoration of peatlands	3380
Ban on peat extraction	1395
Reduce urban encroachment on natural areas	842
Miscanthus planting	580
Methane inhibitors in animal feed for dairy cows	469
Nitrate supplements in animal feed for sheep	233
Methane inhibitors in animal feed for beef cows	171
Silvopastoral agroforestry	95

Table 10: Most Cost-Effective Options in Land-Use

Land-Use Sector	Cost per tonne (£)
Optimal pH lining	-2
Manure spreading on farmland	-1
Low tilling practices	0
Miscanthus planting	5
Afforestation of grazing land	9
Cover crops	17
Partial restoration of peatlands	19
Full restoration of peatlands	24
Methane inhibitors in animal feed for dairy cows	31
Ban on peat extraction	32

Figure 12: Derry and Strabane's Carbon Reduction Potential: Land-Use and Management

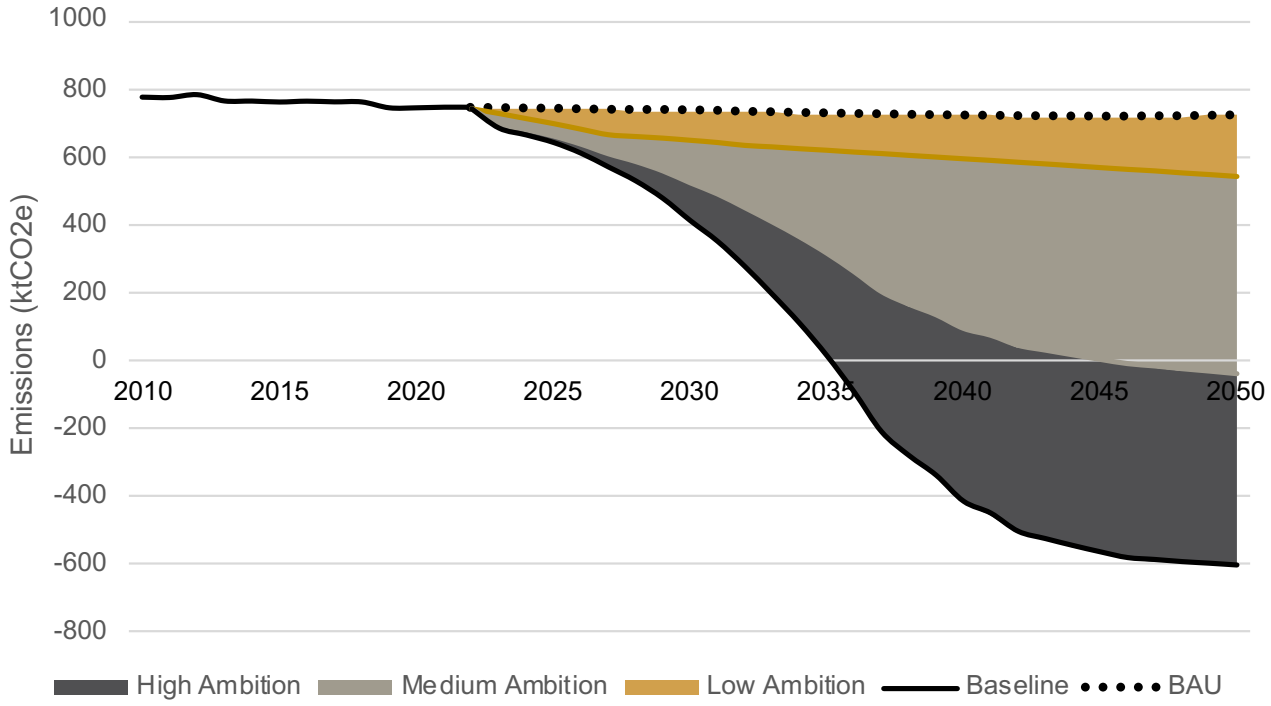


Figure 13: Derry and Strabane's Estimated Land-Use Breakdown

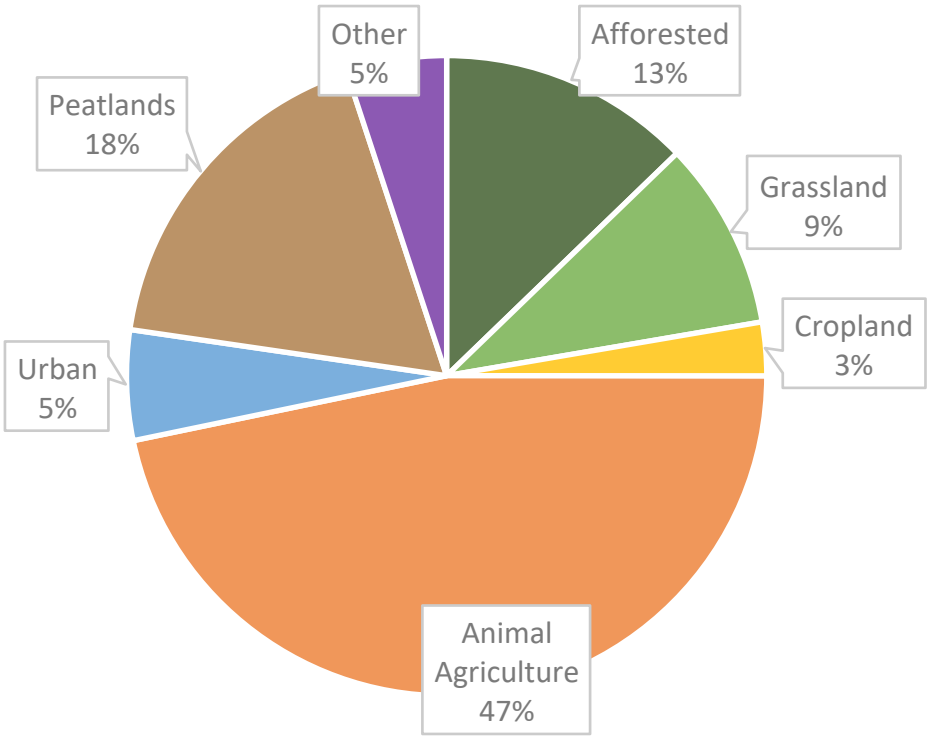


Figure 14: Derry and Strabane's Wetlands Emissions Mitigation

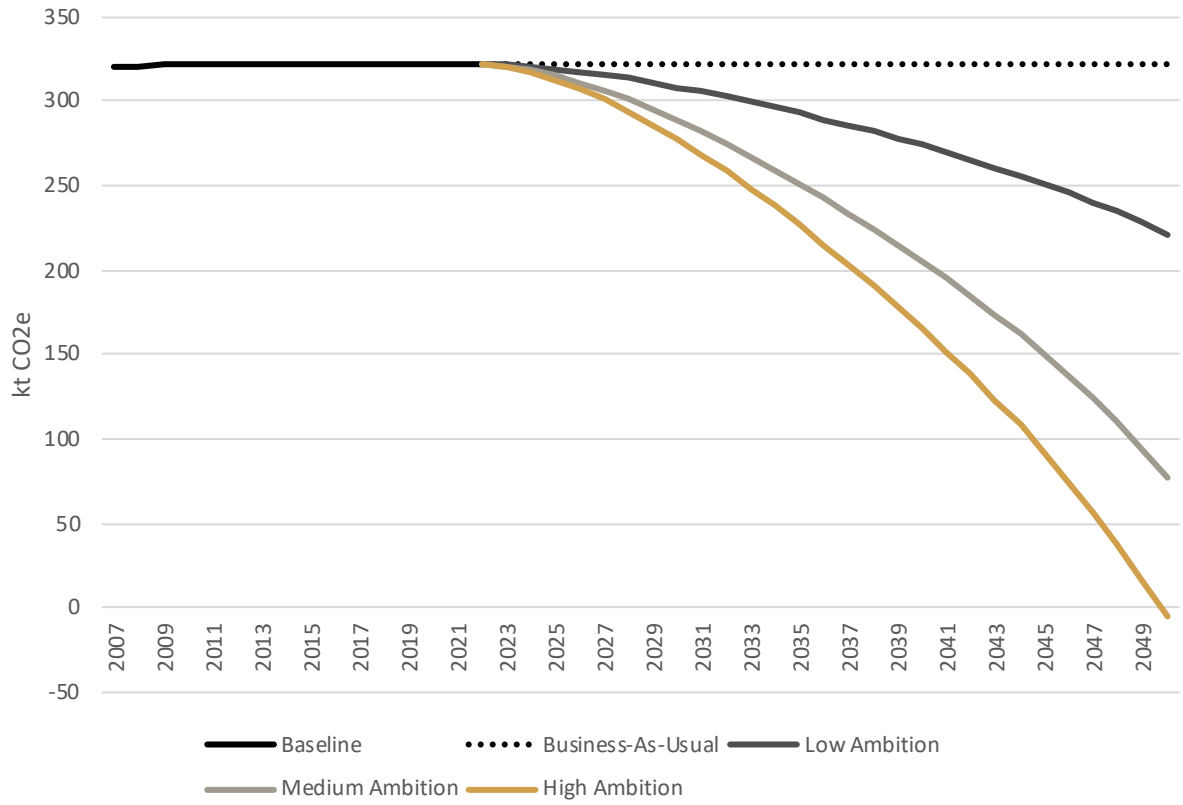
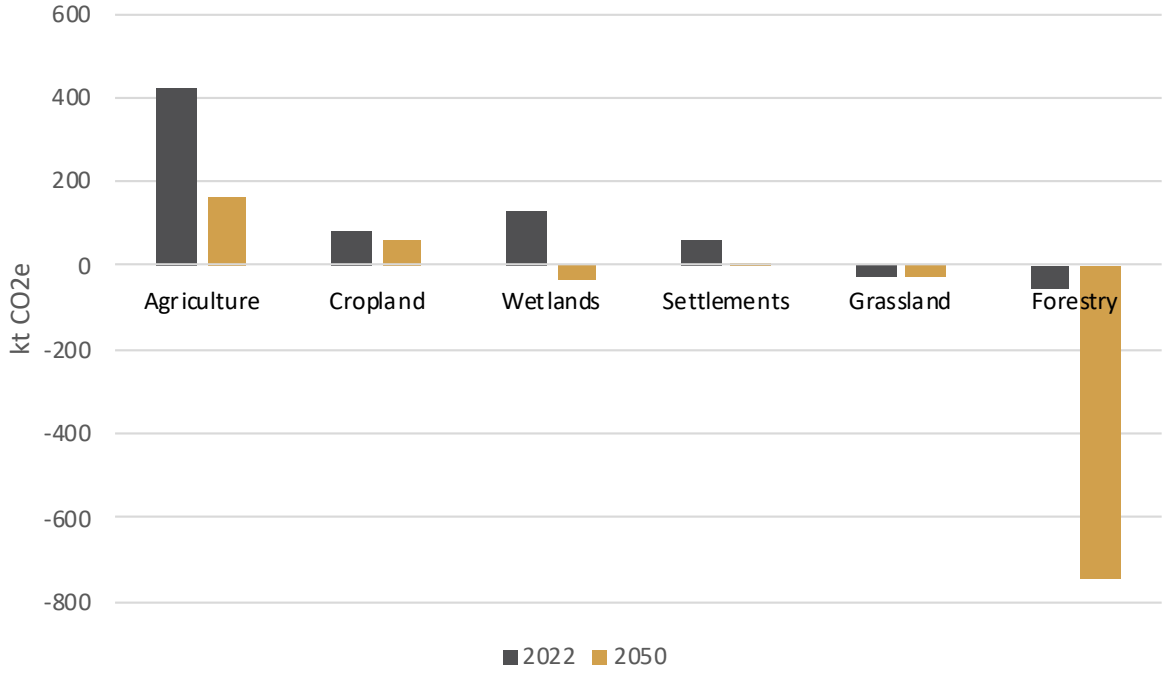


Figure 15: Derry and Strabane's Land-Use Baseline and High Ambition Scenario Carbon Emissions by sub-sector



Land-Use Case Study 1 - Garron Peatland Restoration

The Garron Plateau in County Antrim contains the largest area of intact blanket bog in Northern Ireland. Significant restoration efforts have been carried out by the Royal Society for the Protection of Birds (RSPB) and NI Water on roughly 500 ha of peat from 2010. These peatlands were in a damaged condition due to general degradation and grazing. The area is particularly important as it provides drinking water for an estimated 14,000 homes in Ballymena and the surrounding area, and is a designated Special Area of Conservation (SAC).

The RSPB, NI Water, and the NI Environment Agency have been supported by the Northern Irish Department of Agriculture, Environment and Rural Affairs (DAERA), the Republic of Ireland's Department of Housing, Planning and Local Government, and the Special EU Programme's Body. Restoration efforts have been successful, with large areas of peat now classified as rewetted or restored, due to interventions such as deforestation, damming and rewetting.

Impact:

- 10,034 t CO_2e mitigated annually from 2016
- Projected 17,918 t CO_2e mitigated annually from 2045
- Reduction in water treatment costs due to improvements in water quality
- Increased employment opportunities

Land-Use Case Study 2 - ArcZero Farming

Accelerating Ruminant Carbon Zero (ARCZero) is a farmer-led, European Innovation Partnership Project in Northern Ireland which aims to promote the measuring and management of carbon flows, to empower farmers to reduce emissions at the farm level. It aims to accurately estimate total carbon flux through the complete assessment of the farm's carbon stocks and sequestration potential. Accurate baseline emissions can be calculated through creating individual, whole-farm carbon balance sheets through the measurement of carbon stocks in soils, hedges and trees.

From accurate baseline emissions estimates, future management practices can be examined and prioritised to increase sequestration and sustainable land-management.

Through partnerships with DAERA, the European Agricultural Fund for Rural Development, the Rural Development Programme, Queen's University Belfast and private-sector organisations such as Devenish Nutrition, 7 farms are currently analysing their whole-farm carbon footprint and enacting a series of low-carbon measures on an individualised basis.

Impact:

- Increased education, engagement and community buy-in from farmers across NI
- Introduction of low-carbon measures such as switching to multi-species sward grazing
- Accurate net emissions mapping at the farm-level of carbon inputs and outputs
- Individualised planning to prioritise and monitor carbon mitigation

Seizing the Opportunity: The Role for Local Government

Bold climate action is an opportunity worth hundreds of millions to Derry and Strabane's economy, but what are the specific actions the local government can take and what examples can they look to?

Drawing on the work of the Centre for Sustainable Energy (CSE)[5], the UK Climate Committee, Local Government Association (LGA)[6], and more than two dozen Roadmaps previously developed the YCS team, the following provides an outline of the different actions the local government can take.

These actions are organised into spheres: In the smallest sphere are actions that can be led solely by the local governments. These actions demonstrate leadership, are frequently relatively straightforward to implement and carry a high certainty of emissions reductions but are unlikely to realise substantial emissions reductions. Towards the outer edges of the sphere actions have the potential to support broad-based emissions reductions, but often require partnership and coordination with wider stakeholders, and the development of technical, financial and governance capacities.

5 https://www.cse.org.uk/news/view/2541

6 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero

Figure 16: Spheres of influence for local government in the UK

1. Direct Control

On average, local authorities only have direct control over 1-2% of their area's emissions. Direct action from local authorities against these emissions, however, can demonstrate what is possible for wider stakeholders, including by de-risking projects, helping to develop supply low carbon supply chains and developing capacities and knowledge for action.

Specific actions:

- Developing a plan for new and existing council owned building stock
- Developing a plan for the council owned vehicle fleet and its renewal
- Conducting a review of waste management practices in the area
- Investing in capacity to incorporate green finance into spending

Examples:

Leeds City Council Fleet Replacement Programme
Leeds has the largest electric vehicle fleet of any local authority in the UK and are leading in this space, creating a positive reputation and institutional expertise on electric vehicles (EVs) which acts as an exemplar for others. This programme identifies the lowest emission vehicle available when a replacement is needed, meaning EVs are the default option so long as appropriate charging is there to support the change[7].

The replacement of the fleet is expected to save at least 1274 tonnes of CO_2 between 2018 and 2025, or 235 tonnes across the entire fleet annually. Part of the programme's success is down to proactivity around opportunities and partnerships, capitalising on

7 https://www.local.gov.uk/case-studies/leeds-city-council-fleet-transition-zero-emission-home-charging

available opportunities for funding, partnerships, and profile raising. An innovative business case and overhaul of the procurement process setup also allowed Leeds to take control of this action[8].

Cheshire West and Chester Council Waste Management

In 2012, Cheshire West and Chester introduced its new 'Recycle First' scheme, a recycling and waste collection service for residents of the borough. This service had the aim of diverting up to 95% of bulky items from landfill[9]. This innovation has been expanded upon in their Waste Management Strategy[10] which sets out the shape and direction for the future of the waste management services delivered by the council up to 2031.

The priorities of this strategy are to reduce overall waste, increase reuse and recycling, and deliver an efficient and cost-effective waste management service. The local authority's ambitions will be delivered through a plan which is co-produced by residents, evidence-based, and democratically informed, allowing action to be taken on minimising emissions from waste.

8 https://ashden.org/news/leeds-city-council-electrifies-its-vehicle-fleet/

9 https://www.local.gov.uk/case-studies/waste-management-case-studies-recycling-cheshire-west-and-chester

10 https://www.cheshirewestandchester.gov.uk/your-council/council-of-the-year/documents/waste-strategy.pdf

2. Procurement, Commissioning and Commercialisation

Local government's deliver more than 800 services, ranging from planning, waste collection, and business support. Collectively the GHG emissions associated with procured services can account for 70-80% of a Council's total GHG footprint. This report considers district-wide decarbonisation interventions; separate analysis of the council's direct carbon footprint and mitigation options would be an immediate and useful next step.

There is significant carbon reduction potential in the commissioning, procurement and management of contracts by local authorities, with local government third party expenditure totalling around £60bn in annual revenue. By supporting suppliers transition to low-carbon processes and supply chains, local governments can help suppliers futureproof themselves for the net zero economy, and deliver on wider metrics including social value[11] .

Specific actions:

- Conducting a review of contracted services and their carbon emissions
- Embedding carbon reduction commitments into procurement processes
- Requiring suppliers to commit to carbon audits, net zero targets and develop climate action plans
- Establishing longer contracts with firms in order to enable carbon reduction plans
- Developing a knowledge network with local suppliers to enable them to include carbon reduction commitments in their bids

Examples:

11 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero

Hackney Council Sustainable Procurement Strategy

In 2018, Hackney London Borough Council published its sustainable procurement strategy which included a key objective of cutting carbon alongside a host of other social values[12]. The council are using their purchasing power to address the impacts of their contracting activities to deliver social, economic and environmental benefits to local communities. Key themes of this strategy are to procure green, to procure for a better society, and to procure for fair and responsible delivery[13].

The delivery of this plan hinges on a holistic approach which provides relevant training for, and working with, a broad range of stakeholders, and awareness raising through information and training on the importance and value of sustainable specification and purchasing. By monitoring and reporting on progress towards objectives, Hackney are playing a leading role in this space while communicating results both within the organisation and externally[14].

Manchester City Council Procurement Criteria

Manchester City Council has recently added a 10% weight for carbon reduction alongside a 20% for social value in its procurement assessment criteria, while all projects coming forward for capital investment have to include an assessment of their carbon impact as part of the financial approval process.

The council's Ethical (Procurement) Policy[15] lays out the context for ethical trade practices and the ethical core objectives that Manchester City Council has agreed to deliver through its commissioning and procurement activities. Guidance is also provided for social value and the environment for suppliers and bidders of council contract opportunities. A key part of Manchester's approach is their commitment to work with organisations and suppliers which share their values and will help to contribute to Manchester's net zero 2038 target[16].

12 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero#references

13 https://hackney.gov.uk/procurement-strategy

14 https://drive.google.com/file/d/1f8TwR7zMRT9MbX2c070gIoD3inrAmw2w/view

15 https://democracy.manchester.gov.uk/documents/s1583/Part%205%20Section%20E.pdf

16 https://www.manchester.gov.uk/download/downloads/id/28158/social_value_and_environment_guidance.pdf

Preston City Council Progressive Procurement

The Preston Model serves as an example of local council leadership in achieving its aims partly through its procurement processes. The council's 'progressive procurement' identifies and prioritises 'anchor institutions' in the local area in an effort to build community wealth and encourage procurement mechanisms to primarily benefit local suppliers. This has been significantly successful in stimulating the local economy, has led to the 'multiplier effect' and has been effective in reaching some of Preston's environmental/decarbonisation objectives[17]. Not only has the council directly improved its procurement, but it has led to larger local institutions like hospitals and universities to identify more sustainable and local solutions to their demands.

17 https://www.centreforpublicimpact.org/case-study/the-preston-model-of-community-wealth-building-in-the-uk

3. Place Shaping

Through their powers over buildings, transport infrastructure, the economy, waste and recycling, and the natural environment, local authorities have tremendous influence over the GHG emissions, not just today but far into the future. Master planning and regeneration work commissioned by local authorities to support place making can develop a foundation for net zero commitments.

Specific actions:

- Testing domestic and business rate incentives for energy efficiency investments
- Developing KPIs for the building stock
- Support the integration of area developments and energy planning, for example through site allocation or requiring evidence of energy mapping on new building projects
- Use planning procedures to set higher standards for new buildings than those stipulated by current regulations
- Develop whole life carbon assessment guidelines for capital projects and implement in council projects
- Consider implementing clean-air zones, traffic restrictions or imposing speed limits to encourage active travel and improve air quality in urban areas

Examples:

YES Energy Solutions

YES Energy Solutions is a registered Community Interest Company which was developed in partnership with Kirklees Council. It now works nationally with local authorities, housing providers and energy companies to deliver ECO and support local suppliers to be ECO compliant[18].

18 https://www.yesenergysolutions.co.uk/about/

Initially, a unique finance package was created to help low-income households improve the energy efficiency of their properties without the large upfront costs, allowing for Kirklees Council to maximise the number of eligible residents who could access a flexible low-cost loan for heating upgrades, insulation improvements and renewable energy systems[19].

Warwickshire County Council Green Shoots Fund

The Warwickshire County Council Green Shoots Community Climate Change Fund provides grant funding to community projects to mitigate against, and adapt to, the impact of climate change. It is aimed at community and voluntary organisations and is designed to support projects which increase the area's resilience to climate change, reduce impacts on the environment, and ensure benefits and accessibility for the wider Warwickshire community[20].

The fund has already supported innovative projects across focus areas including transport, energy, the built environment, waste and the circular economy, sustainable communities, and natural capital and biodiversity[21]. These projects support the local authority's commitments to net zero climate emergency action, while helping to shape sustainable place making in the local area.

East Devon District Council Incentive on Council Tax and Business Rates

A central government funded research project in East Devon which explored whether discounts on council tax and business rates can incentivise residents and businesses to carry out energy efficiency work on their buildings[22]. East Devon District Council declared a climate emergency in 2019 and is working to support residents and businesses to decarbonise in line with wider county objectives to work in partnerships.

The study helped to establish that both council tax and business rate discounts can play

19 https://www.yesenergysolutions.co.uk/schemes/kirklees-energy-help-loan

20 https://www.warwickshire.gov.uk/GreenShootsFund

21 https://www.warwickshireclimateemergency.org.uk/green-shoots-community-climate-change-fund

22 https://eastdevon.gov.uk/news/2020/01/incentivising-energy-efficiency-through-council-tax-and-business-rates-study/

a role in incentivising both households and businesses in investing in energy efficiency and renewable energy measures. It estimated that the total council tax and business rate relief is £11.5m, funding £23m of measures[23].

23 https://www.swenergyhub.org.uk/wp-content/uploads/2021/05/CT-Pilot-East-Devon.pdf.pdf

4. Showcasing

More than 4 in 5 local authorities have declared a climate emergency. Local authorities are well placed to be a role model which inspires transformational change towards net zero in their area, demonstrating how an organisation can achieve the transition through the development and testing of innovative approaches[24].

By leading the way for others, local authorities can showcase, pilot, demonstrate and share good practice, and scale and replicate these approaches to achieving net zero, across the sectors of energy, transport, new build and retrofit, waste, land use, and more. This role allows for the social norming of new approaches, technologies, systems and behaviours[25].

Specific actions:

- Developing and testing innovative approaches to achieving net zero
- Providing a communications platform for sharing best practice
- Providing regular public updates on key climate action projects, both those led by the Council and by local businesses and private actors

Examples:

South Tyneside Council Viking Energy Network Jarrow (VENJ)

The Viking Energy Network Jarrow (VENJ) is the first of three major district heating networks implemented by South Tyneside Council. The energy centre for VENJ will be sited on the bank of the River Tyne, and use water source heat pump (WSHP) technology fed by river water. The project will initially provide low cost, low carbon energy to nine connected commercial buildings[26].

24 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero

25 https://www.cse.org.uk/news/view/2541

26 https://carboncopy.eco/initiatives/viking-energy-network-jarrow

Led by the local authority, VENJ will make a significant contribution to the city's pledged actions resulting from its climate emergency declaration and net zero 2030 target. It is predicted that VENJ will save around £0.5m in fuel costs, and mitigate 1,035 tonnes of CO_2 annually[27]. It will also strive to stimulate local economic development through innovation and job creation, and act as a showcase for innovative approaches for other local authorities.

Nottingham Workplace Parking Levy (WPL)

Nottingham City Council led this example of a WPL which charges employers that provide workplace parking. The levy tackles congestion two-fold by incentivising employers to reduce provision for parking and promote other modes of commuting, while also helping to fund infrastructure projects such as improved public transport provision.

This scheme was supported by the government with significant funding but pioneered by Nottingham City Council, who set up a dedicated consultancy to handle the development and implementation of the levy. As the first of its kind in the western hemisphere, the development of the levy faced high upfront costs and took twelve years to implement, but levies elsewhere would benefit from the legwork tackled by this project[28]. An innovative approach to incentivising behaviour change and leveraging funding for transport improvement work was showcased here, with guidance available to other local authorities[29].

Devon County Council Commercial Recycling of EV Batteries

Devon is leading and showcasing in the area of EV battery commercial recycling, with Devon County Council supporting a scale-up of the private sector company Altilitech's processes to a commercial scale. The method recovers over 95% of spent batteries' critical metals at a quality which means they can be reused in the production of new batteries, supporting the transition to net zero through sustainable electrification technology and circular processes.

27 https://www.southtyneside.gov.uk/article/3772/Overview#:~:text=Viking%20Energy%20Network%20Jarrow,-Contents&text=The%20Viking%20Energy%20Network%20is,estimated%201%2C035%20tonnes%20per%20year

28 https://carboncopy.eco/initiatives/nottingham-workplace-parking-levy

29 https://www.nottinghamcity.gov.uk/wpl

The local authority's Green Innovation Fund has provided capital funding for equipment needed for a commercial-scale process, and revenue funding for employing and training new staff. The facility is forecast to recycle 250 batteries in its first year of operation, mitigating 2,737 tonnes of CO_2. As a circular model, it will also help to retain value in the local economy while reducing mining emissions and toxic waste creation[30].

30 https://www.local.gov.uk/case-studies/devon-county-council-commercially-recycling-ev-batteries

5. Partnerships

Partnership working as a local authority brings a range of benefits when it comes to climate action and achieving net zero. Resources can be shared to accelerate the delivery of necessary work, as can ideas and expertise around innovative processes. Partnerships also provide mutual access to different funding streams that might otherwise be inaccessible. Communication and engagement routes with key stakeholders are also more readily tapped into through partnership working.

These partnerships may be strategic or project-specific, and exist internally and cross-departmentally within local authorities, or externally with other local authorities, public sector organisations, voluntary and community groups, and commercial organisations and businesses via routes such as Local Enterprise Partnerships (LEPs)[31].

Specific actions:

- Developing a plan with neighbouring local authorities to align climate action planning
- Joining a national climate action network
- Working with local health sector organisations to make sure that projects are reaching everyone
- Establish multi agency cross sectoral climate action network in Derry & Strabane

Examples:

Brighton and Hove Cross-party Working Group
In Brighton and Hove Council, Councillors formalised in 2020 a cross-party working group to deliver actions which will tackle the climate crisis and ensure the climate emergency is at the heart of the council's agenda and influences all other policies.

31 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero#references

The working group advises on climate actions, helping to oversee the development and delivery of the area's 203 Carbon Neutral Programme, focusing on actions to highlight the climate emergency and improve local biodiversity[32]. Aligning climate action planning across parties and feeding in learnings from Climate Assemblies helps the local authority to prioritise communities' needs along with climate action priorities.

London Seasonal Health Intervention Network (SHINE)

London's SHINE network brings together local authorities, the NHS, the London Fire Brigade, charities and the private sector to identify and help households who are struggling to heat their homes. The scheme grew from a partnership between the council and frontline health professionals working in Islington[33].

SHINE acts as a fuel poverty referral network and a service for free energy advice for Londoners, offering a dedicated helpline and affordable warmth measures which help to ensure households can get the help they need when it comes to energy bills, energy debt, and staying warm and healthy in their homes. Through partnership working, SHINE is able to reach the most isolated and vulnerable members of the community, and target their support to those who need it most[34].

Suffolk Climate Change Partnership (SCCP)

The SCCP brings together the local authorities in Suffolk with other partners including the Environment Agency, Groundwork, and the University of Suffolk. It aims to help the residents and businesses of Suffolk to decarbonise, realise the economic benefits of reducing energy consumption, and adapt to the future impacts of climate change[35].

32 https://www.brighton-hove.gov.uk/news/2019/working-together-climate-emergency

33 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero#references

34 https://shine-london.org.uk/about-us/

35 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero#references

The vision developed by the SCCP vision is for Suffolk to be an exemplar in tackling climate change and protecting and enhancing its natural environment, and to be the county with the greatest reduction in carbon emissions. In combination with the climate emergency declaration, the Climate Emergency Plan[36] has been agreed by local public sector leaders to deliver on climate action while supporting a green economic recovery for the county[37].

36 https://www.greensuffolk.org/?page_id=8421&preview=true

37 https://www.greensuffolk.org/about/suffolk-climate-change-partnership/

6. Involving, Engaging and Communicating

Local authorities can deliver significant carbon emission reductions through the influence they have over actions that others take. They are well placed to communicate both up and down, effectively translating the global issue to be locally relevant and resonant, helping to inspire action and lead the way.

By setting the standard for others to follow in taking action, local authorities can leverage their reputation as a trusted brand. Demonstrating and communicating their own commitment to the net zero transition is a key opportunity for local authorities, with overlap here into the 'direct control' and 'showcasing' spheres. Effectively communicating and engaging with local communities, businesses and partners on net zero will support their mandate and help to mobilise communities in action[38].

By their nature, the majority of actions modelled in this analysis will only be implemented with the active engagement of a broad base of stakeholders.

Delivery of climate action at a national and local level is currently fragmented, featuring arrangements between levels of government that are complex and methods of communication that are siloed by department. Policy, funding and programmatic action at the national level has changed course more frequently than the Chancellor of the Exchequer (of which there were four in the last year).

Of particular importance, policies on energy, transport, buildings and climate change are often being presented independently, and entire sectors, such as aviation, are remaining unaddressed.

What is needed is a coherent approach. A voice is needed that is regional and that is separate from local government such that it can speak across local stakeholders, including

38 https://www.local.gov.uk/publications/councillor-workbook-local-path-net-zero#references

distribution network operators, and local authorities.

Value of a Climate Commission for Local Authorities:

» Provides a source of leadership on climate action outside of the local government

» An independent voice on climate action - a critical friend

» Can build capacities for action outside of local government

» Can engage in actions that would be too risky or inappropriate for local government

» Provide stability to the governance landscape across policy and government regimes

Specific actions:

- Initiating a Climate Commission through the Place-based Climate Action Network (PCAN)
- Developing KPIs
- Providing updates to the public on emissions reductions projects, policies and progress on a regular basis
- Making information on GHG projects, policies and progress open source
- Lobbying national government/departments on the need for national and ambitious leadership

Examples:

Leeds Climate Commission

The Leeds Climate Commission was established in 2017 to support Leeds in making positive choices around issues relating to energy, carbon, weather and climate. The members of the Commission are drawn from key groups and organisations from across the city of Leeds, from the public, private and civic sectors[39].

39 https://www.leedsclimate.org.uk/sites/default/files/Net-Zero%20Carbon%20Roadmap%20for%20Leeds_0.pdf

Leeds was the first climate commission initiated through PCAN and has helped to provide a blueprint for the growing number of other climate commissions that have developed since. The Commission provides advice on steps towards a net zero and climate resilient future to help inform policy and shape local actions. The structure also monitors the city's progress towards decarbonisation targets, celebrates and shares successes, and makes recommendations for actions which will help to keep the city on track[40] .

The Leeds Climate Commission has also carried out lobbying around aviation in Leeds, producing a position paper focusing on the expansion of Leeds Bradford Airport and the incorporation of aviation emissions into the Leeds Carbon Roadmap to support informed decision making in the city[41]. As a result of the Leeds Climate Assembly convened by the Commission, Leeds City Council has also lobbied the government for aviation emissions to be included in the national carbon budget[42].

Brent Council Climate Assembly

Brent Council declared a climate emergency in 2019 and convened a Climate Assembly to involve, engage and communicate with local stakeholders as part of their response. The aim of the Assembly was to bring together randomly selected residents to learn about climate change, discuss potential actions for addressing it in Brent, and make recommendations.

In the case of Brent, actions relating to consumption, resources and waste attracted most support, followed by transport. Actions around existing housing and buildings were third most popular. A critical feature of these types of assemblies is that they generate recommendations that local authority decision-makers must commit to consider, providing a valuable level of engagement and involvement for communities in local climate action[43].

40 https://www.leedsclimate.org.uk/about-leeds-climate-commission

41 https://leedsclimate.org.uk/sites/default/files/Leeds%20Climate%20Commission%20Position%20Paper%20on%20Aviation%20FINAL_0.pdf

42 https://democracy.leeds.gov.uk/documents/s210126/Responses%20to%20the%20Citizens%20Jurys%20Recommendations%202%20v0.2.pdf

43 https://legacy.brent.gov.uk/media/16416373/climate_assembly_report2020.pdf

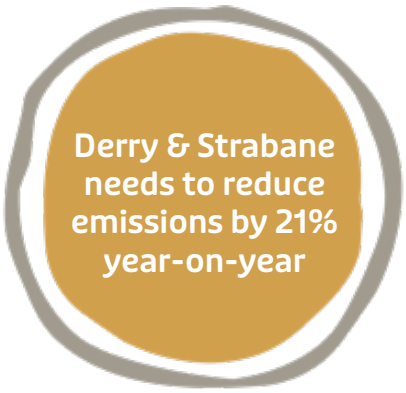
Next Steps for Derry and Strabane

Accept the Need for High Levels of Ambition

Derry and Strabane has to take ambitious actions to reduce its carbon emissions if it is to stay within its share of the global carbon budget consistent with avoiding dangerous climate change. Although Derry and Strabane's emissions have fallen by 20% since 2000, it needs to accelerate and intensify its decarbonisation efforts if it is to meet its science-based targets. The good news is that the analysis shows that it is possible for Derry and Strabane to reach their goal of net zero emissions by 2045.

Across the different sectors, focusing on the Level 1 (cost-effective) and Level 2 (cost-neutral) options will require substantial investment, but the potential is there to cut the area's projected emissions in 2050 by 22% at no net cost to the region. Adopting these options will also create over 500 jobs for the next decade and a range of wide social, economic and environmental co-benefits in the region. However, Derry and Strabane needs to go further to explore the Level 3 (technically viable) options that do not pay for themselves directly, even if they do generate significant co-benefits in the form of reduced fuel poverty, reduced congestion, improved air quality and enhanced comfort. Even then there will still be a need to explore the potential of Level 4 (offsetting) options – such as afforestation of rural land to offset remaining emissions from other sectors.

Focus on the Main Priorities



Although change will be required across the region, it will also be important to focus and to identify priorities for action. Land-use (including agriculture and LULUCF), accounts for 43% of all territorial emissions in Derry and Strabane. A further 19% of the area's carbon footprint comes from buildings (including homes and public and commercial buildings). It therefore makes sense for Derry and Strabane to focus the bulk of its decarbonisation efforts on these areas. Key initiatives in the land-use sector should include clear plans for wetlands restoration, and targeted interventions in the agricultural sector around rewilding and improved animal/soil management techniques. Key initiatives in the buildings sector should be based on ambitious and accelerated retrofit schemes for existing homes and buildings, and the highest energy efficiency standards for new homes and buildings.

Take a Joined-Up Approach to Change

Although it is important to prioritise, the change necessary to deliver Derry and Strabane's climate and wider priorities requires a joined-up or 'whole-system' approach. This recognises the connections that exist between different sectors like housing, transport, and energy, the overlapping barriers to change within and between these sectors, and the opportunity and need to involve all stakeholders in delivering maximum positive outcomes for all. It requires a shift in mindset away from delivering individual projects in isolation, toward understanding the connections between them as a way of driving momentum and increasing value for money. This involves longer-term planning, in parallel with (not at the expense of) getting on with quick wins. Managing this type of change within the Council and across the area will involve deliberate shifts in culture and working arrangements to support capacity building and deeper collaboration.

Understand Roles and Share Responsibilities

Change is required across the area if Derry and Strabane is to realise its ambitions on climate change. Of course, the Council has to be a central part of the process – through its efforts to decarbonise its estate and its vehicle stock, through its use of its powers in policy and planning, and through its ability to convene conversations and catalyse change. Research suggests that local councils can directly affect 2-10% of emissions in their locality, but have clear influence over an additional 30% of emissions, and play an important role encouraging action over a further 30% of emissions. Determining where the Council has leverage to directly and indirectly to affect emissions can help to shape the way Council approaches taking action and maximise the use of Council resources. To extend its influence, the Council should build partnerships with other public sector bodies and with businesses, third sector organisations and communities across the region. Only by building a sense of shared responsibility and collective action can the far reaching and cross-cutting changes required be delivered.

Develop a Positive Vision

It will be very hard to deliver the changes required if they are somehow at odds with the region's broader priorities or with people's own aspirations. As the wider case for climate action is developed it will be important to use that case to develop a positive overarching vision of how cutting carbon can support a thriving region. Ambitious climate actions can also enhance comfort, cut fuel bills, generate jobs, tackle fuel poverty, enhance business productivity and resilience, address congestion and improve air quality. With a positive vision climate change can be mainstreamed into key areas of region development relating to economic development, housing, transport, health, planning and so on.

Build Legitimacy

Cross-cutting climate actions will depend on political, public and business support. Change will be much easier with stable, cross-party political support. More broadly, it is vitally important that the people and businesses of Derry and Strabane feel that they have been involved in the process and will benefit from the outcomes of decisions relating to climate change. Establishing an open, inclusive, cross-community and cross-sectoral climate commission could help to secure active buy-in. Running a Citizens Jury to actively engage with diverse communities and perspectives from across the area can help to ensure that all voices are heard and that a sense of legitimacy is built and maintained.

Assess Readiness and Build a Pipeline

This report has set out an evidence base on the technical and economic viability of a wide range of decarbonisation options for Derry and Strabane. Clearly though the mere presence of the opportunities does not mean that they will actually be taken. Derry and Strabane should assess how ready it is to adopt the different options – considering not only technical but also policy, social, financial and institutional readiness. Where the region is fully ready, action can be initiated immediately – but any blockers preventing progress should be identified so that targeted actions can be introduced to build readiness over time. Where the blockers can be easily addressed then near-term actions can be planned, but where there are more structural barriers to change longer-term processes of capacity building or lobbying of national government may be required. In this way, a pipeline of actions can be developed that can form the basis of a short, medium and longer term action plan.

Explore Business Models and Build Capabilities for Programme Development

As the investment needs associated with especially the more challenging levels of action are significant, it will be important to understand financing options and business models, and to build capacities for innovative approaches that can stimulate investment. Integrating climate change into key policy and planning decisions that incentivise investments that help the region to decarbonise – or that disincentivise decisions that do the opposite – can also reduce the need for climate finance. Mainstreaming climate considerations into existing flows of investment in the area – especially relating to housing, regeneration and transport – will substantially lower the need for explicit climate investment. This is as important for businesses and households across the region as it is for the Council itself.

The relationships between different actors – those financing action, those being paid to take actions or develop projects, and those who are managing projects and procuring work – will be different for different climate actions. In the transport sector, for example, the way projects are developed and financed for public transport, bike lanes and electric vehicle charging will each be unique. Mapping different business model options and carefully considering their merits will be important to determining the best approaches.

Building capacities or platforms for programme and project development will also be crucial. Such a platform should identify innovations and emerging initiatives, consolidate and de-risk them and help to develop appropriate business and delivery models so that they can be turned into investable initiatives. Derry and Strabane is not alone in doing this – there is much to be gained through collaboration and the transfer of best practice from other localities.

Evaluate and Learn from Progress

Having capacity to evaluate and learn from the initiatives already underway within Derry and Strabane – and also more broadly – can help to ensure that best practice develops and spreads across the region. It is vital though that Derry and Strabane monitors and openly presents data charting its progress towards its carbon targets. As important as it is to be positive, actions are often driven by transparency and accountability, and early feedback can help Derry and Strabane to ensure that it stays on track as it moves towards net zero. Regular reviews, for example at 5-year intervals, are useful to measure and track progress towards Derry and Strabane's net-zero goals. These serve not only to ensure continued, proven action on climate targets, but also as a focal point to celebrate wins and maintain momentum.

Celebrate and Build on Success

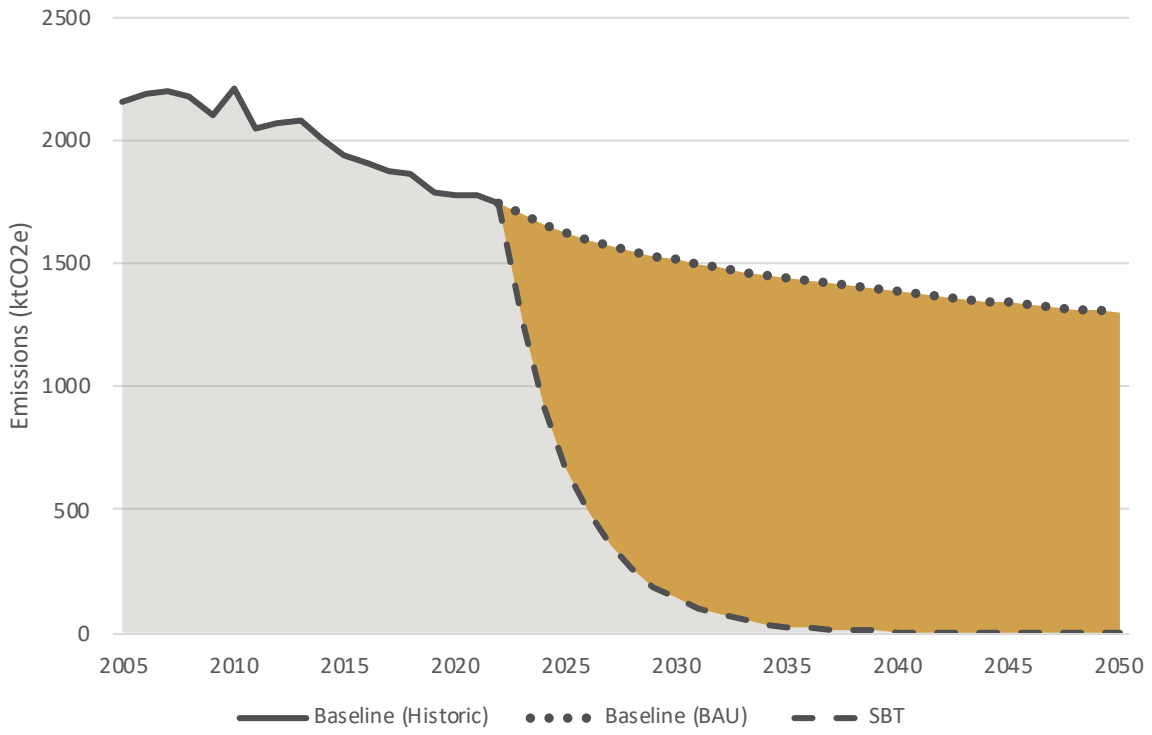
One of the most effective ways of building momentum is to raise awareness of the wide-range of climate-related initiatives that are already underway across the area. Some of these will be explicitly focused on climate and decarbonisation, but many others will have integrated a climate dimension into a broader project or initiative. Collating a suite of case studies and success stories can help to create a sense of positivity. Looking forward, drawing together a list of the range of commitments already made and of the projects and programmes that are planned can be crucial in establishing momentum.

Appendices

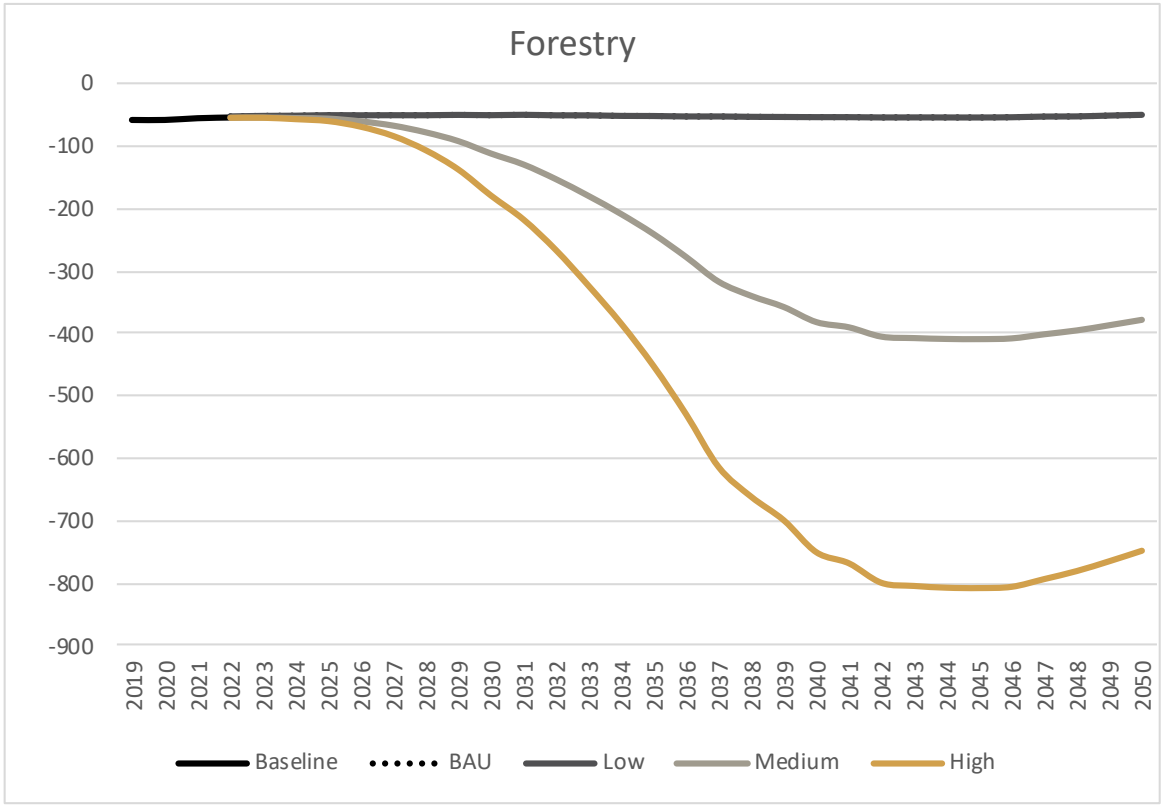
Appendix 1 - Additional SBTs and decarbonisation pathways

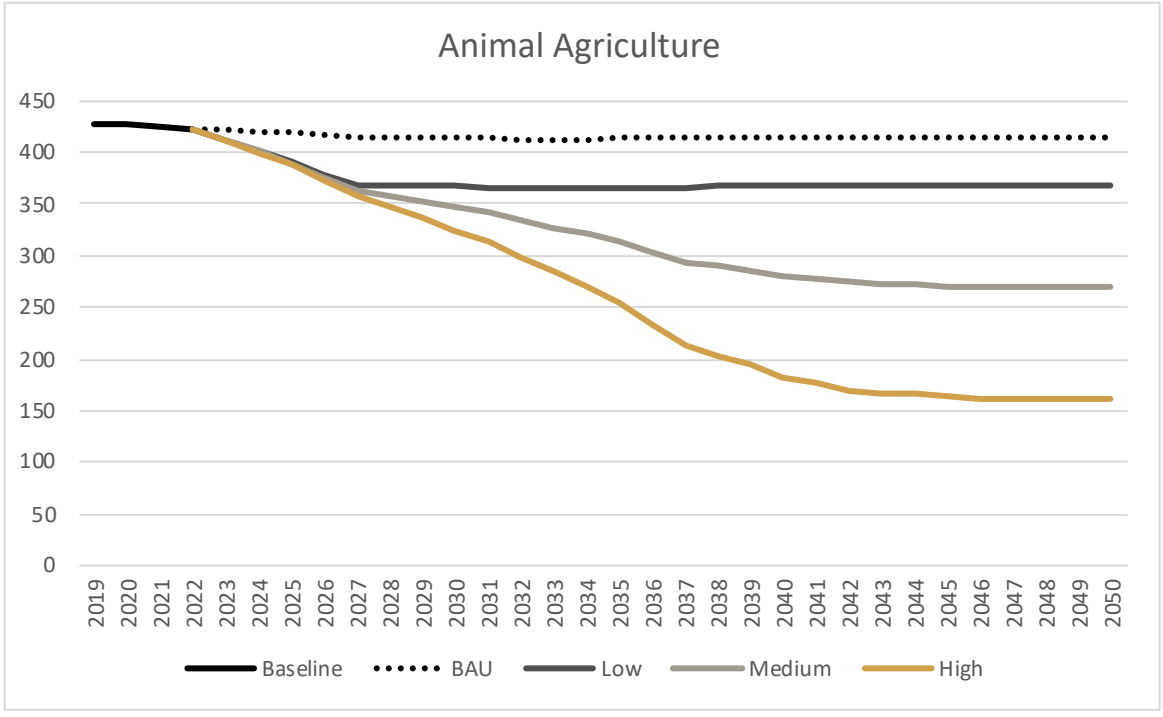
The Science-Based Targets previously identified in this report aligned with the IPCC's carbon budget which gives a 50% chance of limiting global warming to 1.5 C. The most widely-used carbon budget gives a 67% chance of limiting this warming. As it is a stricter budget – and given the scale of emissions reductions needed in Derry and Strabane – the 50% budget has been used throughout this analysis. Below we have also calculated the carbon reductions according to the 67% budget. To keep to their share of this global carbon budget, Derry and Strabane should aim to keep to the following 5-yearly reductions:

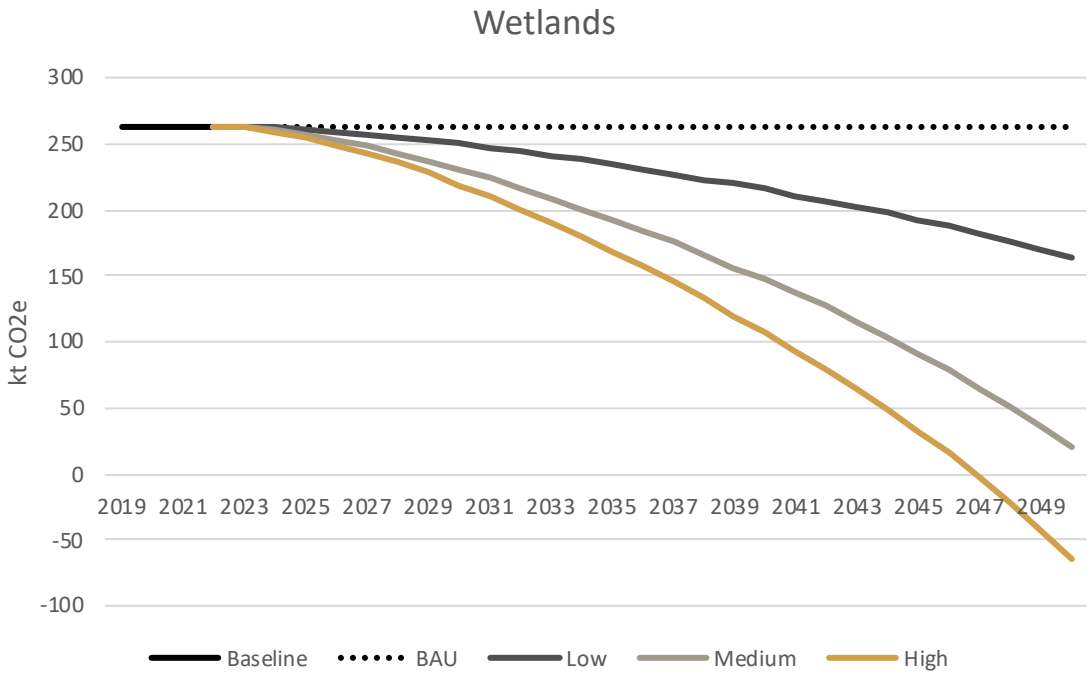
- **2025** - 72%
- **2030** - 94%
- **2035** - 98.8%
- **2040** - 99.8%
- **2045** - 100%



Appendix 2 – Sub-Sector Mitigation Pathways for Land-Use



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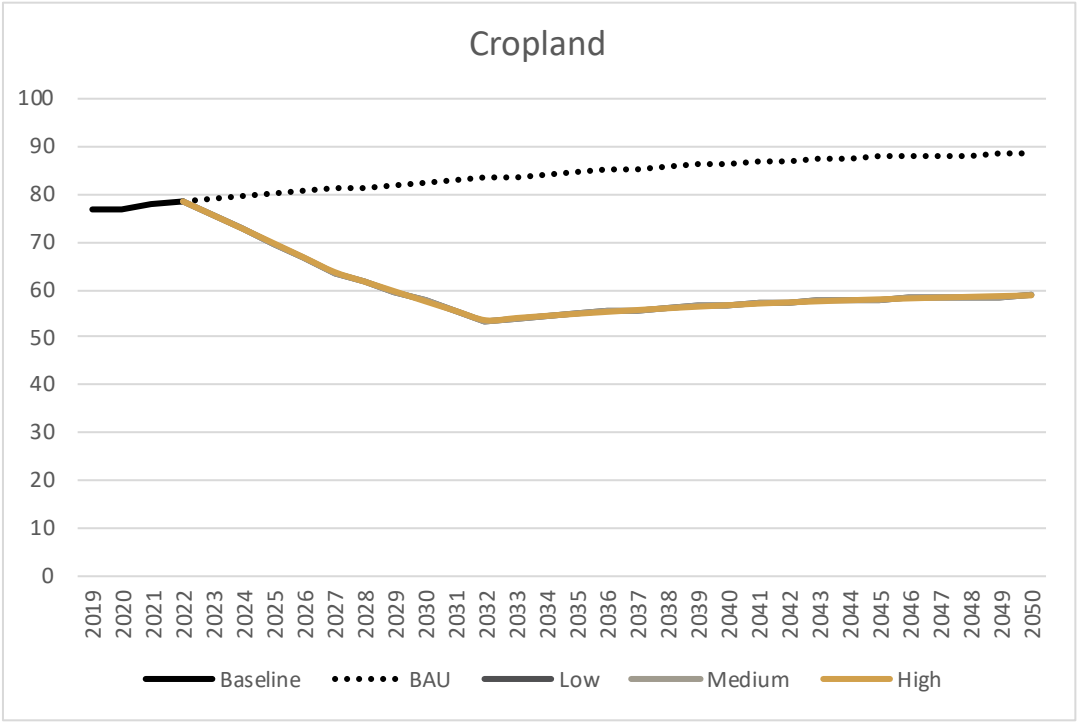
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Baseline
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Low
Medium
High

Appendices 3 & 4 – Overall List of Most Carbon and Cost-Effective Options

Sector	Measure	Carbon Abatement (kt CO_2e)
Land-Use and Management	Afforestation of grazing land	15496
Land-Use and Management	Full restoration of peatlands	4534
Land-Use and Management	Partial restoration of peatlands	3380
Industry	Condensing and insulation measures to boilers and steam piping in industry	1641
Land-Use and Management	Ban on peat extraction	1395
Domestic buildings	Oil boilers to heat pumps in domestic buildings	1235
Industry	Improving efficiency of boilers and steam piping in industry	1122
Land-Use and Management	Reduce urban encroachment on natural areas	842
Land-Use and Management	Miscanthus planting	580
Industry	Pump upgrades, repairs and maintenance in industry	485
Land-Use and Management	Methane inhibitors in animal feed for dairy cows	469
Domestic buildings	Whole house retrofits in domestic buildings	454
Industry	Fan correction, repairs, and upgrades in industry	346
Industry	Compressed air systems in industry	325
Domestic buildings	Solar PV in domestic buildings	286
Industry	Compressors and variable speed systems in industry	250
Land-Use and Management	Nitrate supplements in animal feed for sheep	233

Sector	Measure	Carbon Abatement (kt CO_2e)
Domestic buildings	Loft insulation in domestic buildings	225
Industry	Furnace efficiency and heat recovery mechanisms in industry	206
Land-Use and Management	Methane inhibitors in animal feed for beef cows	171
Public and commercial buildings	Air tightness in retail buildings	153
Transport	Diesel light ordinary goods vehicle to electric ordinary goods vehicle	146
Transport	Diesel bus journeys to electric bus journeys	146
Domestic buildings	Heat pumps in domestic buildings	135
Transport	Diesel heavy ordinary goods vehicle to electric ordinary goods vehicle	132
Domestic buildings	Cavity wall insulation in domestic buildings	126
Domestic buildings	External wall insulation in domestic buildings	109
Domestic buildings	Gas combi-boilers in domestic buildings	105
Transport	Small petrol car journeys to bicycle journeys	105
Industry	Refrigeration efficiency and technical upgrades in Industry	104
Domestic buildings	Reduce household heating by 1 C in domestic buildings	102
Transport	Large petrol car journeys to bicycle journeys	98
Transport	Medium petrol car journeys to bicycle journeys	96
Land-Use and Management	Silvopastoral agroforestry	95
Transport	Diesel light goods vehicles to electric light goods vehicles	88
Public and commercial buildings	Fabric improvements in industrial buildings/warehouses	82
Transport	Small diesel car journeys to bicycle journeys	75

Sector	Measure	Carbon Abatement (kt CO_2e)
Domestic buildings	Internal wall insulation in domestic buildings	74
Transport	Large diesel car journeys to bicycle journeys	70
Transport	Medium diesel car journeys to bicycle journeys	69
Land-Use and Management	Hedgerow expansion	62
Public and commercial buildings	Area-based commercial retrofits in retail buildings	61
Public and commercial buildings	Oil boilers to heat pumps in retail buildings	54
Land-Use and Management	Cover crops	47
Public and commercial buildings	Area-based commercial retrofits in industrial buildings/warehouses	45
Land-Use and Management	Nitrate supplements in animal feed for pigs	44
Domestic buildings	Floor insulation in domestic buildings	41
Land-Use and Management	Manure spreading on farmland	41
Transport	Small petrol car journeys to walking journeys	39
Transport	Large petrol car journeys to walking journeys	37
Transport	Medium petrol car journeys to walking journeys	36
Transport	Small diesel car journeys to walking journeys	35
Transport	Small diesel car journeys to EV journeys	34
Transport	Large diesel car journeys to walking journeys	32
Transport	Medium diesel car journeys to walking journeys	32
Transport	Large diesel car journeys to EV journeys	31

Sector	Measure	Carbon Abatement (kt CO_2e)
Transport	Medium diesel car journeys to EV journeys	31
Domestic buildings	Top-up loft insulation in domestic buildings	30
Transport	Small petrol car journeys to EV journeys	27
Land-Use and Management	Optimal pH lining	26
Transport	Large petrol car journeys to EV journeys	26
Transport	Medium petrol car journeys to EV journeys	25
Transport	Small petrol car journeys to electric train journeys	24
Domestic buildings	Triple glazing in domestic buildings	23
Transport	Large petrol car journeys to electric train journeys	22
Transport	Medium petrol car journeys to electric train journeys	22
Public and commercial buildings	Oil boilers to heat pumps in community centres	22
Public and commercial buildings	Heat recovery in retail buildings	21
Domestic buildings	Lowering thermostats in domestic buildings	18
Public and commercial buildings	Area-based commercial retrofits in office buildings	18
Transport	Small petrol car journeys to electric bus journeys	17
Transport	Small diesel car journeys to electric train journeys	16
Domestic buildings	Solar thermal in domestic buildings	16
Transport	Large petrol car journeys to electric bus journeys	16
Transport	Medium petrol car journeys to electric bus journeys	15
Public and commercial buildings	Oil boilers to heat pumps in hotels	15
Domestic buildings	Low energy lighting in domestic buildings	15

Sector	Measure	Carbon Abatement (kt CO_2e)
Transport	Large diesel car journeys to electric train journeys	15
Transport	Medium diesel car journeys to electric train journeys	15
Transport	Small diesel car journeys to electric bus journeys	13
Public and commercial buildings	Oil boilers to heat pumps in office buildings	13
Transport	Large diesel car journeys to electric bus journeys	12
Transport	Medium diesel car journeys to electric bus journeys	12
Public and commercial buildings	Oil boilers to heat pumps in healthcare buildings	12
Land-Use and Management	Silvoarable agroforestry	11
Public and commercial buildings	Replace single with double glazing in office buildings	11
Land-Use and Management	Low tilling practices	10
Domestic buildings	Tank insulation in domestic buildings	9
Public and commercial buildings	High efficiency boilers in retail buildings	9
Public and commercial buildings	Fabric improvements in retail buildings	7
Public and commercial buildings	Air tightness in office buildings	7
Public and commercial buildings	Oil boilers to heat pumps in non-retail buildings	7
Domestic buildings	Tank thermostats in domestic buildings	6
Public and commercial buildings	Heating controls in retail buildings	5
Public and commercial buildings	LED in non-retail buildings	5
Public and commercial buildings	Area-based commercial PV installations in retail buildings	5
Public and commercial buildings	Area-based commercial retrofits in non-retail buildings	4

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	LED lighting upgrades in hotels	4
Domestic buildings	Draught proofing in domestic buildings	4
Public and commercial buildings	LED conversions in non-retail buildings	4
Public and commercial buildings	Area-based commercial PV installations in non-retail buildings	4
Public and commercial buildings	Heat recovery in non-retail buildings	3
Public and commercial buildings	LED in community centres	3
Public and commercial buildings	Area-based commercial PV installations in industrial buildings/ warehouses	3
Public and commercial buildings	LED lighting upgrades in office buildings	3
Domestic buildings	A++ rated cold appliances in domestic buildings	3
Domestic buildings	Reduce heating for washing machines in domestic buildings	3
Public and commercial buildings	95% efficiency boilers in non-retail buildings	2
Public and commercial buildings	Air tightness in industrial buildings/ warehouses	2
Domestic buildings	Thermostatic radiator valves in domestic buildings	2
Public and commercial buildings	LED conversions in retail buildings	2
Public and commercial buildings	Fan efficiency upgrades in retail buildings	2
Public and commercial buildings	Area-based commercial PV installations in office buildings	2
Public and commercial buildings	Area-based commercial PV installations in hotels	2
Public and commercial buildings	High efficiency boilers in office buildings	2
Public and commercial buildings	Heating controls in office buildings	2
Public and commercial buildings	Area-based commercial PV installations in community centres	2

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	Warm air blowers in industrial buildings/warehouses	2
Public and commercial buildings	High efficiency boilers in industrial buildings/warehouses	2
Public and commercial buildings	LED conversions in office buildings	2
Public and commercial buildings	LED lighting upgrades in healthcare buildings	2
Public and commercial buildings	Area-based commercial PV installations in healthcare buildings	2
Public and commercial buildings	External shading in office buildings	2
Public and commercial buildings	Heat recovery in hotels	2
Public and commercial buildings	LED conversions in healthcare buildings	2
Public and commercial buildings	95% efficiency boilers in hotels	1.4
Public and commercial buildings	LED conversions in community centres	1.4
Public and commercial buildings	New LED system in non-retail buildings	1.4
Public and commercial buildings	Oil boilers to heat pumps in education buildings	1.4
Public and commercial buildings	Electrical circuitry efficiency upgrades in retail buildings	1.3
Public and commercial buildings	Heating controls in industrial buildings/warehouses	1.3
Public and commercial buildings	Heat recovery in community centres	1.3
Public and commercial buildings	Heating controls in non-retail buildings	1.3
Public and commercial buildings	Area-based commercial retrofits in healthcare buildings	1.3
Public and commercial buildings	Solar thermal in retail buildings	1.2
Public and commercial buildings	95% efficiency boilers in community centres	1.2
Public and commercial buildings	Heat recovery in office buildings	1.2

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	Area-based commercial retrofits in community centres	1.1
Domestic buildings	District heating networks in domestic buildings	1.1
Public and commercial buildings	Area-based commercial retrofits in education buildings	1.1
Public and commercial buildings	Highly-efficient air cooling system in retail buildings	1.1
Public and commercial buildings	New LED system in office buildings	1.0
Public and commercial buildings	95% efficiency boilers in healthcare buildings	1.0
Public and commercial buildings	LED lighting upgrades in education buildings	1.0
Public and commercial buildings	Heat recovery in healthcare buildings	0.9
Public and commercial buildings	New LED system in retail buildings	0.9
Public and commercial buildings	Daylight sensing lighting upgrades in office buildings	0.9
Public and commercial buildings	Water-cooling beams in non-retail buildings	0.9
Public and commercial buildings	New LED system in community centres	0.8
Public and commercial buildings	Solar thermal in non-retail buildings	0.8
Public and commercial buildings	New LED system in healthcare buildings	0.7
Public and commercial buildings	Heating controls in community centres	0.7
Public and commercial buildings	New LED system in hotels	0.6
Public and commercial buildings	LED conversions in hotels	0.6
Public and commercial buildings	AC upgrades in non-retail buildings	0.6
Public and commercial buildings	AC upgrades in retail buildings	0.6
Public and commercial buildings	Movement sensing lighting upgrades in retail buildings	0.5

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	Heating controls in healthcare buildings	0.5
Transport	Small petrol car journeys to diesel train journeys	0.5
Public and commercial buildings	Area-based commercial retrofits in hotels	0.5
Public and commercial buildings	Daylight sensing lighting upgrades in non-retail buildings	0.5
Public and commercial buildings	Air-cooling beams in non-retail buildings	0.5
Transport	Large petrol car journeys to diesel train journeys	0.5
Transport	Medium petrol car journeys to diesel train journeys	0.5
Public and commercial buildings	Water-cooling beams in hotels	0.5
Public and commercial buildings	Water-cooling beams in office buildings	0.5
Transport	Small diesel car journeys to diesel train journeys	0.4
Transport	Large diesel car journeys to diesel train journeys	0.4
Public and commercial buildings	Area-based commercial PV installations in education buildings	0.4
Transport	Medium diesel car journeys to diesel train journeys	0.4
Public and commercial buildings	Water-cooling beams in community centres	0.4
Public and commercial buildings	Solar thermal in office buildings	0.4
Public and commercial buildings	AC upgrades in hotels	0.4
Public and commercial buildings	Water-cooling beams in healthcare buildings	0.4
Public and commercial buildings	LED conversions in office buildings	0.4
Domestic buildings	Turn unneccesary lighting off in domestic buildings	0.4
Public and commercial buildings	Heating controls in hotels	0.4

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	Solar thermal in healthcare buildings	0.4
Public and commercial buildings	Heat recovery in education buildings	0.3
Public and commercial buildings	Solar thermal in community centres	0.3
Public and commercial buildings	95% efficiency boilers in education buildings	0.3
Public and commercial buildings	LED conversions in education buildings	0.3
Public and commercial buildings	New LED system in industrial buildings/warehouses	0.3
Public and commercial buildings	LED conversions in industrial buildings/warehouses	0.3
Public and commercial buildings	Daylight sensing lighting upgrades in healthcare buildings	0.3
Public and commercial buildings	Daylight sensing in community centres	0.2
Public and commercial buildings	High efficiency AC system in retail buildings	0.2
Public and commercial buildings	External shading in hotels	0.2
Public and commercial buildings	Air-cooling beams in community centres	0.2
Public and commercial buildings	Air-cooling beams in office buildings	0.2
Public and commercial buildings	Electrical circuitry efficiency upgrades in office buildings	0.2
Public and commercial buildings	Solar thermal in hotels	0.2
Public and commercial buildings	Air-cooling beams in hotels	0.2
Public and commercial buildings	AC upgrades in healthcare buildings	0.2
Public and commercial buildings	Air-cooling beams in healthcare buildings	0.2
Public and commercial buildings	New LED system in education buildings	0.2
Public and commercial buildings	Heating controls in education buildings	0.2

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	External shading in non-retail buildings	0.2
Public and commercial buildings	AC upgrades in community centres	0.2
Public and commercial buildings	Movement sensing lighting upgrades in office buildings	0.2
Public and commercial buildings	Daylight sensing lighting upgrades in hotels	0.2
Public and commercial buildings	AC upgrades in office buildings	0.1
Public and commercial buildings	External shading in community centres	0.1
Public and commercial buildings	Movement sensing lighting upgrades in industrial buildings/warehouses	0.1
Public and commercial buildings	High efficiency AC system in non-retail buildings	0.1
Public and commercial buildings	External shading in healthcare buildings	0.1
Public and commercial buildings	Water-cooling beams in education buildings	0.1
Public and commercial buildings	Electrical circuitry efficiency upgrades in industrial buildings/warehouses	0.1
Public and commercial buildings	Daylight sensing lighting upgrades in education buildings	0.1
Public and commercial buildings	Air-cooling beams in education buildings	0.1
Public and commercial buildings	Solar thermal in education buildings	0.1
Public and commercial buildings	AC upgrades in education buildings	0.1
Public and commercial buildings	Movement sensing lighting upgrades in non-retail buildings	0.1
Public and commercial buildings	Highly-efficient air cooling system in non-retail buildings	0.1
Public and commercial buildings	Fan efficiency upgrades in office buildings	0.1
Public and commercial buildings	Highly-efficient air cooling system in office buildings	0.1

Sector	Measure	Carbon Abatement (kt CO_2e)
Public and commercial buildings	Fan efficiency upgrades in non-retail buildings	0.1
Public and commercial buildings	External shading in education buildings	0.04
Public and commercial buildings	High efficiency AC system in hotels	0.04
Public and commercial buildings	High efficiency AC system in community centres	0.04
Public and commercial buildings	Highly-efficient air cooling system in community centres	0.03
Public and commercial buildings	Fan efficiency upgrades in hotels	0.03
Public and commercial buildings	High efficiency AC system in healthcare buildings	0.03
Public and commercial buildings	Fan efficiency upgrades in healthcare buildings	0.03
Public and commercial buildings	Fan efficiency upgrades in community centres	0.03
Public and commercial buildings	High efficiency AC system in office buildings	0.02
Public and commercial buildings	Movement sensing lighting upgrades in community centres	0.02
Public and commercial buildings	Movement sensing lighting upgrades in hotels	0.02
Public and commercial buildings	Highly-efficient air cooling system in hotels	0.02
Public and commercial buildings	Movement sensing lighting upgrades in healthcare buildings	0.02
Public and commercial buildings	Highly-efficient air cooling system in healthcare buildings	0.02
Public and commercial buildings	Fan efficiency upgrades in education buildings	0.01
Public and commercial buildings	High efficiency AC system in education buildings	0.01
Public and commercial buildings	Movement sensing lighting upgrades in education buildings	0.01
Public and commercial buildings	AC upgrades in industrial buildings/ warehouses	0.01
Public and commercial buildings	Highly-efficient air cooling system in education buildings	0.003

Sector	Measure	Cost per tonne (£)
Domestic buildings	A rated ovens in domestic buildings	-3227
Domestic buildings	Integrated digital TVs in domestic buildings	-1974
Domestic buildings	A+ rated wet appliances in domestic buildings	-1924
Domestic buildings	Turn unnecessary lighting off in domestic buildings	-1855
Domestic buildings	Reduce heating for washing machines in domestic buildings	-1855
Transport	Large petrol car journeys to electric bus journeys	-1854
Domestic buildings	Induction hobs in domestic buildings	-1783
Transport	Medium petrol car journeys to electric bus journeys	-1680
Transport	Small petrol car journeys to electric bus journeys	-1516
Public/Commercial buildings	Electrical circuitry efficiency upgrades in retail buildings	-1329
Public/Commercial buildings	AC upgrades in community centres	-1306
Public/Commercial buildings	AC upgrades in healthcare buildings	-1303
Public/Commercial buildings	AC upgrades in education buildings	-1293
Public/Commercial buildings	AC upgrades in hotels	-1293
Public/Commercial buildings	AC upgrades in non-retail buildings	-1283
Public/Commercial buildings	AC upgrades in office buildings	-1279
Public/Commercial buildings	Electrical circuitry efficiency upgrades in office buildings	-1279
Transport	Large petrol car journeys to diesel bus journeys	-1243
Public/Commercial buildings	Highly-efficient air cooling system in retail buildings	-1238
Public/Commercial buildings	AC upgrades in retail buildings	-1206
Public/Commercial buildings	Fan efficiency upgrades in retail buildings	-1192

Sector	Measure	Cost per tonne (£)
Domestic buildings	Low energy lighting in domestic buildings	-1142
Public/Commercial buildings	Highly-efficient air cooling system in office buildings	-1133
Public/Commercial buildings	New LED system in office buildings	-1046
Transport	Medium petrol car journeys to diesel bus journeys	-1028
Public/Commercial buildings	High efficiency AC system in retail buildings	-1019
Public/Commercial buildings	New LED system in healthcare buildings	-988
Public/Commercial buildings	LED conversions in office buildings	-972
Public/Commercial buildings	New LED system in education buildings	-953
Public/Commercial buildings	New LED system in community centres	-952
Public/Commercial buildings	High efficiency AC system in community centres	-930
Public/Commercial buildings	Electrical circuitry efficiency upgrades in industrial buildings/warehouses	-929
Public/Commercial buildings	New LED system in hotels	-877
Public/Commercial buildings	High efficiency AC system in hotels	-856
Public/Commercial buildings	High efficiency AC system in education buildings	-855
Public/Commercial buildings	Daylight sensing lighting upgrades in office buildings	-855
Public/Commercial buildings	Highly-efficient air cooling system in education buildings	-817
Public/Commercial buildings	High efficiency AC system in healthcare buildings	-816
Public/Commercial buildings	New LED system in non-retail buildings	-812
Public/Commercial buildings	High efficiency AC system in non-retail buildings	-804
Public/Commercial buildings	High efficiency AC system in office buildings	-793

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	Highly-efficient air cooling system in non-retail buildings	-760
Public/Commercial buildings	Highly-efficient air cooling system in community centres	-757
Public/Commercial buildings	Highly-efficient air cooling system in hotels	-741
Public/Commercial buildings	Highly-efficient air cooling system in healthcare buildings	-731
Public/Commercial buildings	Fan efficiency upgrades in office buildings	-727
Domestic buildings	District heating networks in domestic buildings	-706
Transport	Medium diesel car journeys to bicycle journeys	-658
Public/Commercial buildings	AC upgrades in industrial buildings/ warehouses	-650
Transport	Small diesel car journeys to bicycle journeys	-630
Transport	Large diesel car journeys to bicycle journeys	-614
Transport	Medium diesel car journeys to walking journeys	-577
Transport	Small diesel car journeys to walking journeys	-562
Transport	Medium petrol car journeys to walking journeys	-556
Transport	Small petrol car journeys to walking journeys	-542
Transport	Large diesel car journeys to walking journeys	-529
Transport	Medium petrol car journeys to bicycle journeys	-518
Transport	Large petrol car journeys to walking journeys	-513
Domestic buildings	Tank insulation in domestic buildings	-510
Transport	Small petrol car journeys to diesel bus journeys	-506
Transport	Small petrol car journeys to bicycle journeys	-498
Public/Commercial buildings	Area-based commercial retrofits in office buildings	-494

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	LED conversions in office buildings	-490
Domestic buildings	Biomass boilers in domestic buildings	-487
Transport	Large petrol car journeys to bicycle journeys	-487
Public/Commercial buildings	LED conversions in community centres	-449
Public/Commercial buildings	LED conversions in education buildings	-398
Domestic buildings	Loft insulation in domestic buildings	-395
Transport	Medium petrol car journeys to EV journeys	-363
Transport	Large petrol car journeys to EV journeys	-346
Transport	Medium diesel car journeys to EV journeys	-334
Transport	Small petrol car journeys to EV journeys	-326
Public/Commercial buildings	LED conversions in non-retail buildings	-322
Domestic buildings	Lowering thermostats in domestic buildings	-320
Transport	Large diesel car journeys to EV journeys	-317
Transport	Large diesel car journeys to diesel bus journeys	-302
Transport	Small diesel car journeys to EV journeys	-298
Domestic buildings	Reduce household heating by 1 C in domestic buildings	-296
Domestic buildings	Cavity wall insulation in domestic buildings	-280
Domestic buildings	Top-up loft insulation in domestic buildings	-267
Domestic buildings	Tank thermostats in domestic buildings	-255
Public/Commercial buildings	Heat recovery in retail buildings	-255
Public/Commercial buildings	Daylight sensing in community centres	-248
Domestic buildings	Draught proofing in domestic buildings	-234
Public/Commercial buildings	LED conversions in healthcare buildings	-208

Sector	Measure	Cost per tonne (£)
Domestic buildings	Floor insulation in domestic buildings	-198
Public/Commercial buildings	Daylight sensing lighting upgrades in non-retail buildings	-190
Public/Commercial buildings	LED conversions in hotels	-178
Transport	Diesel bus journeys to electric bus journeys	-158
Public/Commercial buildings	Daylight sensing lighting upgrades in education buildings	-150
Public/Commercial buildings	Daylight sensing lighting upgrades in healthcare buildings	-121
Transport	Diesel light goods vehicles to electric light goods vehicles	-120
Public/Commercial buildings	Air tightness in office buildings	-112
Public/Commercial buildings	Air tightness in retail buildings	-110
Public/Commercial buildings	High efficiency boilers in retail buildings	-105
Public/Commercial buildings	External shading in education buildings	-103
Public/Commercial buildings	Daylight sensing lighting upgrades in hotels	-76
Public/Commercial buildings	Fabric improvements in industrial buildings/warehouses	-72
Public/Commercial buildings	High efficiency boilers in industrial buildings/warehouses	-60
Public/Commercial buildings	Area-based commercial retrofits in industrial buildings/warehouses	-52
Public/Commercial buildings	Area-based commercial retrofits in retail buildings	-46
Public/Commercial buildings	High efficiency boilers in office buildings	-46
Transport	Diesel light ordinary goods vehicle to electric ordinary goods vehicle	-5
Land-Use and Management	Optimal pH lining	-2
Land-Use and Management	Manure spreading on farmland	-1

Sector	Measure	Cost per tonne (£)
Land-Use and Management	Low tilling practices	0
Transport	Diesel heavy ordinary goods vehicle to electric ordinary goods vehicle	2
Land-Use and Management	Miscanthus planting	5
Land-Use and Management	Afforestation of grazing land	9
Domestic buildings	Internal wall insulation in domestic buildings	11
Land-Use and Management	Cover crops	17
Land-Use and Management	Partial restoration of peatlands	19
Land-Use and Management	Full restoration of peatlands	24
Land-Use and Management	Methane inhibitors in animal feed for dairy cows	31
Land-Use and Management	Ban on peat extraction	32
Public/Commercial buildings	95% efficiency boilers in hotels	32
Public/Commercial buildings	Heating controls in industrial buildings/ warehouses	40
Land-Use and Management	Methane inhibitors in animal feed for beef cows	47
Public/Commercial buildings	95% efficiency boilers in non-retail buildings	62
Public/Commercial buildings	95% efficiency boilers in education buildings	68
Public/Commercial buildings	Heating controls in office buildings	73
Public/Commercial buildings	Heating controls in retail buildings	82
Public/Commercial buildings	95% efficiency boilers in healthcare buildings	83
Land-Use and Management	Silvopastoral agroforestry	87
Public/Commercial buildings	95% efficiency boilers in community centres	95

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	External shading in hotels	104
Public/Commercial buildings	External shading in non-retail buildings	107
Domestic buildings	Thermostatic radiator valves in domestic buildings	108
Industry	Compressors and variable speed systems in industry	138
Industry	Compressed air systems in industry	141
Transport	Large diesel car journeys to electric bus journeys	147
Industry	Fan correction, repairs, and upgrades in industry	149
Domestic buildings	Oil boilers to heat pumps in domestic buildings	154
Industry	Pump upgrades, repairs and maintenance in industry	155
Land-Use and Management	Silvoarable agroforestry	156
Land-Use and Management	Hedgerow expansion	157
Domestic buildings	External wall insulation in domestic buildings	178
Public/Commercial buildings	Oil boilers to heat pumps in community centres	200
Public/Commercial buildings	External shading in healthcare buildings	221
Public/Commercial buildings	Air tightness in industrial buildings/ warehouses	224
Domestic buildings	Gas combi-boilers in domestic buildings	280
Public/Commercial buildings	Warm air blowers in industrial buildings/ warehouses	281
Public/Commercial buildings	External shading in community centres	311
Public/Commercial buildings	Heating controls in community centres	316
Industry	Condensing and insulation measures to boilers and steam piping in industry	339
Public/Commercial buildings	Oil boilers to heat pumps in healthcare buildings	342

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	Oil boilers to heat pumps in hotels	342
Industry	Refrigeration efficiency and technical upgrades in Industry	350
Land-Use and Management	Nitrate supplements in animal feed for pigs	352
Domestic buildings	Solar PV in domestic buildings	353
Industry	Improving efficiency of boilers and steam piping in industry	353
Industry	Furnace efficiency and heat recovery mechanisms in industry	363
Transport	Medium diesel car journeys to electric bus journeys	371
Public/Commercial buildings	Heat recovery in office buildings	373
Domestic buildings	A++ rated cold appliances in domestic buildings	399
Public/Commercial buildings	Oil boilers to heat pumps in retail buildings	420
Public/Commercial buildings	Heating controls in education buildings	423
Public/Commercial buildings	Heating controls in non-retail buildings	440
Public/Commercial buildings	Replace single with double glazing in office buildings	442
Public/Commercial buildings	Heat recovery in community centres	460
Land-Use and Management	Nitrate supplements in animal feed for sheep	473
Public/Commercial buildings	Heat recovery in healthcare buildings	485
Domestic buildings	Whole house retrofits in domestic buildings	488
Public/Commercial buildings	Heating controls in healthcare buildings	490
Public/Commercial buildings	Heating controls in hotels	533
Public/Commercial buildings	Area-based commercial retrofits in education buildings	573

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	Heat recovery in hotels	579
Transport	Small diesel car journeys to electric bus journeys	582
Public/Commercial buildings	Heat recovery in non-retail buildings	612
Public/Commercial buildings	Heat recovery in education buildings	639
Public/Commercial buildings	Fan efficiency upgrades in non-retail buildings	757
Domestic buildings	Heat pumps in domestic buildings	762
Public/Commercial buildings	Area-based commercial retrofits in healthcare buildings	829
Public/Commercial buildings	Fan efficiency upgrades in hotels	844
Public/Commercial buildings	Fan efficiency upgrades in education buildings	853
Public/Commercial buildings	Area-based commercial retrofits in non-retail buildings	880
Public/Commercial buildings	Area-based commercial retrofits in community centres	920
Public/Commercial buildings	Oil boilers to heat pumps in office buildings	937
Public/Commercial buildings	Fan efficiency upgrades in healthcare buildings	940
Public/Commercial buildings	External shading in office buildings	1005
Public/Commercial buildings	Area-based commercial retrofits in hotels	1018
Transport	Medium diesel car journeys to diesel bus journeys	1060
Public/Commercial buildings	LED lighting upgrades in education buildings	1196
Public/Commercial buildings	LED lighting upgrades in office buildings	1262
Domestic buildings	Solar thermal in domestic buildings	1268
Public/Commercial buildings	Fan efficiency upgrades in community centres	1292
Public/Commercial buildings	Solar thermal in retail buildings	1321

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	Area-based commercial PV installations in office buildings	1361
Public/Commercial buildings	Area-based commercial PV installations in industrial buildings/warehouses	1468
Public/Commercial buildings	Solar thermal in education buildings	1588
Transport	Small diesel car journeys to diesel bus journeys	1582
Public/Commercial buildings	Solar thermal in office buildings	1615
Public/Commercial buildings	Oil boilers to heat pumps in education buildings	1684
Public/Commercial buildings	Solar thermal in community centres	1689
Public/Commercial buildings	Solar thermal in non-retail buildings	1728
Public/Commercial buildings	Solar thermal in healthcare buildings	1737
Public/Commercial buildings	Solar thermal in hotels	1758
Public/Commercial buildings	LED lighting upgrades in healthcare buildings	1845
Public/Commercial buildings	Water-cooling beams in hotels	1937
Public/Commercial buildings	LED in non-retail buildings	1968
Public/Commercial buildings	Water-cooling beams in office buildings	2030
Public/Commercial buildings	Area-based commercial PV installations in retail buildings	2068
Public/Commercial buildings	LED conversions in retail buildings	2087
Domestic buildings	Triple glazing in domestic buildings	2091
Public/Commercial buildings	Area-based commercial PV installations in healthcare buildings	2117
Public/Commercial buildings	Water-cooling beams in healthcare buildings	2118
Public/Commercial buildings	Water-cooling beams in education buildings	2148

Sector	Measure	Cost per tonne (£)
Public/Commercial buildings	Water-cooling beams in non-retail buildings	2175
Public/Commercial buildings	Water-cooling beams in community centres	2176
Public/Commercial buildings	LED conversions in industrial buildings/ warehouses	2195
Public/Commercial buildings	LED in community centres	2251
Public/Commercial buildings	New LED system in industrial buildings/ warehouses	2305
Public/Commercial buildings	Oil boilers to heat pumps in non-retail buildings	2309
Public/Commercial buildings	LED lighting upgrades in hotels	2349
Public/Commercial buildings	New LED system in retail buildings	2362
Public/Commercial buildings	Area-based commercial PV installations in hotels	2435
Public/Commercial buildings	Area-based commercial PV installations in education buildings	2595
Public/Commercial buildings	Area-based commercial PV installations in non-retail buildings	2671
Public/Commercial buildings	Area-based commercial PV installations in community centres	2819
Public/Commercial buildings	Air-cooling beams in education buildings	4149
Public/Commercial buildings	Air-cooling beams in healthcare buildings	4341
Public/Commercial buildings	Air-cooling beams in hotels	4466
Public/Commercial buildings	Air-cooling beams in non-retail buildings	4561
Public/Commercial buildings	Fabric improvements in retail buildings	4568
Public/Commercial buildings	Movement sensing lighting upgrades in office buildings	4862
Public/Commercial buildings	Air-cooling beams in community centres	5193
Public/Commercial buildings	Air-cooling beams in office buildings	5307

Sector	Measure	Cost per tonne (£)
Domestic buildings	Reduced standby consumption in domestic buildings	5656
Public/Commercial buildings	Movement sensing lighting upgrades in industrial buildings/warehouses	6118
Public/Commercial buildings	Movement sensing lighting upgrades in retail buildings	6975
Public/Commercial buildings	Movement sensing lighting upgrades in community centres	23667
Public/Commercial buildings	Movement sensing lighting upgrades in non-retail buildings	26423
Public/Commercial buildings	Movement sensing lighting upgrades in education buildings	26925
Public/Commercial buildings	Movement sensing lighting upgrades in hotels	28923
Public/Commercial buildings	Movement sensing lighting upgrades in healthcare buildings	31242

About Your Climate Strategy

We are an impact-driven consultancy run by experienced professionals who understand both the need for ambitious climate actions and the challenges that are often faced in delivering them.

Our team have worked on all sides and at all stages in the process of designing and delivering ambitious climate strategies. We have worked with local authorities, regional development agencies, businesses and communities across the UK and all over the world.

We understand the challenges in turning a complex, systemic problem like climate change into practicable, fundable, deliverable projects and programmes, and the need to mobilise resources and build capacities to enable real-world implementation.

For further information contact us at **info@yourclimatestrategy.com**