Derbyshire Dales District Council

The Path to Net Zero

Climate Change Strategy and Action Plan, 2020 to 2030

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1 Executive summary

In 2019 Derbyshire Dales District Council declared a Climate Emergency and committed to making its operations 'net zero' carbon by 2030. To this end, this report quantifies the Council's direct greenhouse gas (GHG) emissions and sets out options for reducing, avoiding, mitigating and offsetting them over the next decade.

In the financial year 2019-20, the Council's direct GHG emissions from natural gas, electricity, directly controlled owned transport, and grey fleet were 807 tCO_2e. Owing to decarbonisation of the UK electricity grid, under a business-as-usual scenario these would be reduced by 13% to around 700 tCO_2e by 2030. This report identifies measures to reduce and offset the remaining emissions over the next decade.

Net zero can be achieved by investing in the following projects:

- Energy efficiency projects at key sites, including further roll-out of LED lighting, and improved heating
- Replace Matlock Town Hall boiler with biomass equivalent
- Consider electrifying heating at Bakewell Pavilion and Northwood Depot, and potentially also Bakewell ABC
- Install roof-mounted solar PV on Northwood Depot and Bakewell ABC
- Install additional renewable electricity generation equivalent to a 2MW solar PV array (e.g. Watery Lane)
- Electrify vehicle fleet up to LGV size.

These measures would allow DDDC to attain net zero status by 2030 (or significantly earlier) at an estimated cost of approximately £2.5m.

2 Introduction, background and context

2.1 Background

In May 2019, Derbyshire Dales District Council resolved to declare a Climate Emergency and committed itself to making the operations of the District Council net zero carbon by 2030. In April 2020, ClearLead Consulting Ltd (ClearLead) was commissioned by the Council to develop a strategy to attain this goal. This encompasses calculating the Council's direct and energy indirect greenhouse gas (GHG) emissions and assessing options for reducing, avoiding, mitigating and offsetting them over the next decade. ClearLead carried out the work between May and July 2020.

2.2 Terminology and clarifications

'Carbon' is often used as a shorthand for carbon dioxide (CO_2), the primary greenhouse gas, and by extension for greenhouse gases as a whole. In this report we prefer to use the more precise term 'greenhouse gases' (usually abbreviated to GHG) except in conventional phrases such as 'carbon neutral' and 'carbon footprint'. All greenhouse gases figures in this report include all Kyoto greenhouse gases and groups[1] converted into 'carbon dioxide equivalent' (CO_2e) and usually expressed in tonnes (tCO_2e).

'Net zero' is also referred to as 'carbon neutral' and refers to a situation where the total greenhouse gases (not just CO_2) produced are equal to those offset, removed or avoided. (This is not the same as zero carbon, where no GHG are produced.)

Two organisational acronyms used throughout this report are 'DDDC', for Derbyshire Dales District Council (also referred to as the Council); and 'CCWG', for the Council's Climate Change Working Group, on whose instruction this report was commissioned.

Finally, note the distinction between greenhouse gas emissions within the DDDC geographical area (including transport, housing, commerce, and industry), and those from the direct activities of the Council itself. It is the latter which form the main focus of this report, although the former are discussed in Section 7.

2.3 About Derbyshire Dales and DDDC

Derbyshire Dales is a local government area in Derbyshire, with an area of just over 300 square miles and a population of around 70,000. The area encompassed by Derbyshire Dales District Council (hereafter 'DDDC') is largely rural, although it includes the market towns of Bakewell, Matlock, Wirksworth and Ashbourne. The district contains part of the Peak District National Park.

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[1] *Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)*

Within the Derbyshire Dales District, the largest proportion of GHG emissions comes from the industrial and commercial sector (315.4k tCO_2/year), followed by transport (234.4k tCO_2/year) and domestic (178.3k tCO_2/year). The cement and aggregates industries are of note for their high energy use and process carbon emissions. (These values apply to all activities within the DDDC geographical area, as distinct from the activities of the Council itself.)

The area covered by the District Council is expected to experience more severe impacts as a result of climate change, including increased flooding and "freak" weather events, water stress and drought, and greater risk of wildfires in hotter, drier summers.

DDDC's directly operated activities (hence GHG emissions sources) comprise electricity and gas use in the Town Hall in Matlock and several other municipal buildings, public toilets, pavilions, some market areas and depots, plus emissions from transport fuel (passenger vehicles, tractors, street cleaning and maintenance vehicles) and for parks and ground care.

Finally, four leisure centres are still owned by the Council but were outsourced in 2018, while waste collection services are also outsourced. Neither form a part of this assessment, although they are discussed in sections 3.5.1 and 3.5.2.

2.4 The net zero brief

DDDC requested a Climate Change Strategy and Action Plan to:

> *…address climate change locally in a way which benefits the people, economy and environment of the Derbyshire Dales. It should act as a starting point for action; providing a strategic framework through which the District Council's activities can be monitored in order to progressively achieve net carbon zero by 2030. It will set out clear research and evidence as to what the Council's Carbon footprint is and precisely how it is composed and assess what further actions might be taken on carbon reduction. It will also set-out what carbon off-setting/sequestration options might be locally available and incorporate climate change adaptation and resilience measures into a Strategy and practical Action Plan to guide delivery. It will also set out appropriate milestones to make the Council's activities carbon neutral by 2030.*

To this end, ClearLead were instructed by the Council to:

- engage with the Council to understand its work on Climate Change Strategy through the cross-party Climate Change Working Group
- calculate the Council's carbon emissions and thereby its carbon footprint
- identify, cost and prioritise carbon-reduction, sequestration, offsetting, and adaptation options, with a view to the Council achieving zero net by 2030
- identify and prioritise community leadership actions to contribute to this target
- amalgamate this into a Strategy and Action Plan.

This document therefore comprises the strategy and action plan for moving towards net zero by 2030, giving an overview of the Council's current emissions and possible routes for reducing them to net zero by 2030.

3 Greenhouse gas review ('carbon footprint')

ClearLead has calculated DDDC's direct GHG emissions for the period April 2019 to March 2020. This includes emissions from or associated with:

- Natural gas combustion
- Owned transport
- Other fuel use
- Electricity use
- Grey fleet (staff's private vehicles used on Council business and reimbursed through expenses)

The purpose of calculating the carbon footprint is:

- To establish an appropriate baseline for measurement of energy use and carbon emissions, and to derive a suitable benchmark against which future emissions can be compared
- To determine carbon "hotspots", hence areas on which to focus emissions reduction efforts.

We have included the following emissions within the overall carbon footprint:

- Electricity: Direct emissions from generation, plus transmission & distribution (T&D, grid loss) emissions and well-to-tank (WTT, upstream emissions associated with extracting and processing combustion fuel prior to generation)
- Natural gas: Direct emissions from combustion, plus WTT emissions from extraction and processing
- Transport: Direct emissions from combustion of diesel, petrol and gas oil, plus WTT emissions from extraction and processing
- Grey fleet: Direct emissions from staff using their own vehicles on company business.

See section 3.4 for sources which have been omitted.

3.1 Baseline and Current Targets

The Council's carbon footprint was previously calculated annually under NI-185 regulations, part of the local government "National Performance Framework" (NPF) which ended in 2010. At the last calculation, for reporting year 2010-11, emissions were 2,420 tCO_2. However, this does not allow for a direct comparison with current emissions, because:

- The leisure centres were still operated directly by the council and included within the footprint.
- Transport and grey fleet emissions were not included.
- It related to CO_2 (i.e. carbon dioxide only), not CO_2e (which allows for other greenhouse gases).
- The electricity emissions factor has greatly decreased over the last decade.

- The NI-185 only included direct emissions from electricity and gas, while it is now standard practice to incorporate indirect emissions.

For this reason, we suggest using the 2019-20 emissions as the baseline against which to track progress. To give a sense of current trajectory, we have also calculated approximate emissions for the financial years from 2016-17 (see section 3.6), although owing to recent organisational changes this data is not directly comparable.

3.2 Benchmarks and Key Performance Indicators (KPIs)

There are no known current official benchmarks or KPIs for local authority GHG emissions. A recent report[2] claimed that the average English council HQ building emits 1,234 tCO_2e annually, which would put Matlock Town Hall (~140 tCO_2e – see section 3.3) well below average. However, it is not clear how this figure was arrived at, which type of authority it refers to, what sample size it is based on, or how it was calculated.

In our experience comparisons of GHG emissions with other organisations are not always useful, because it is not always clear what emissions are included and excluded, how they were calculated, and what assumptions were made. We therefore recommend that DDDC focuses on reducing its own emissions from its current baseline.

3.3 Results of carbon footprint

DDDC's greenhouse gas emissions for the period April 2019 to March 2020 are given below.

Source	tCO_2/yr	%
Electricity	245.4	30.4%
Natural gas	170.5	21.1%
Transport diesel	299.5	37.1%
Other fuels	59.3	7.4%
Grey fleet	31.9	3.9%
Total	806.6	

Table 1:DDDC's direct GHG emissions, 2019-20

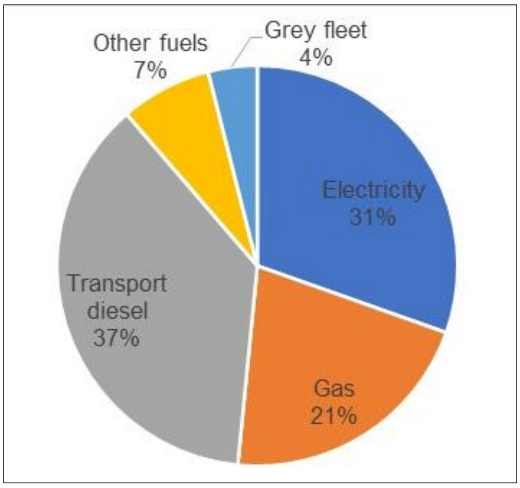


Figure 1: Emissions breakdown

[2] *Electrical Contractors Association survey, January 2020*

Transport diesel is the largest single emissions source, accounting for over a third of emissions. The next largest sources are electricity, contributing just over 30%, and gas (just over 21%). Other sources are relatively marginal.

The same data is shown in the table and chart below broken down by largest individual emissions sources.

Source	tCO_2/yr		%
Town Hall	142.8		17.7%
ABC	103.7		12.9%
Sweepers	96.2		11.9%
Tippers	69.7		8.6%
Refuse	21.6		2.7%
Other building	169.4		21.0%
Other mobile	203.28		25.2%

Table 2: Main emissions sources, 2019-20

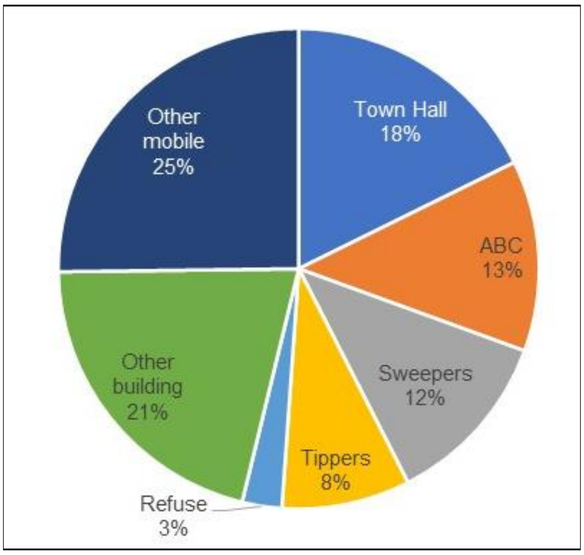


Figure 2: Emissions breakdown by contributor

Matlock Town Hall (comprising emissions from electricity and gas) is the largest individual contributor, with the Agricultural Business Centre second. Sweepers and tippers are the two largest vehicle categories.

3.4 Emissions by scope

For convenience and clarity, GHG emissions are conventionally broken into 'scopes', according to how directly they come under the control of the reporting organisation. The scopes (as relevant to DDDC) are:

- Scope one (direct emissions):
  - fuel combustion (transport fuels such as diesel or petrol; natural gas)
- Scope two ('purchased' emissions): electricity generation
- Scope three (indirect emissions):
  - electricity transmission and distribution (grid losses)
  - well-to tank (upstream emissions) for electricity and all fuels
  - Grey fleet
- Outside of scopes: biogenic additions to forecourt fuel

The table shows DDDC's emissions broken down by scope.

Scope	tCO_2/yr	%
1	432	53.6
2	199	24.6
3	166	20.5
Outside	10	1.3
Total	806.6	**100**

Table 3: emissions by scope (2019-20)

3.5 Omissions

Emissions from refrigerant gases (known as F-gas, which would come under scope 1) are omitted as data was not available. These comprise fugitive emissions from leaks of refrigerant in cooling equipment. As this is restricted to small air-conditioning units at the Town Hall and in vehicles, these are likely to be minimal; however, we recommend that this data is collected for future monitoring and reporting.

Emissions associated with outsourced activities, including leisure centres and waste collection, are also excluded (see next section).

3.5.1 Leisure Centres carbon footprint

The Council's four remaining Leisure Centres, while remaining under Council ownership, were outsourced for management purposes in summer 2018. Their emissions have therefore not been included in the data given above.

However, these emissions are still extant; and as to have any impact GHG reduction has to be global and holistic, we have calculated the approximate emissions from the Leisure Centres to provide context. In 2020, these were estimated at approximately 1,500 tCO_2e, nearly twice as high as the entire remaining Council estate.

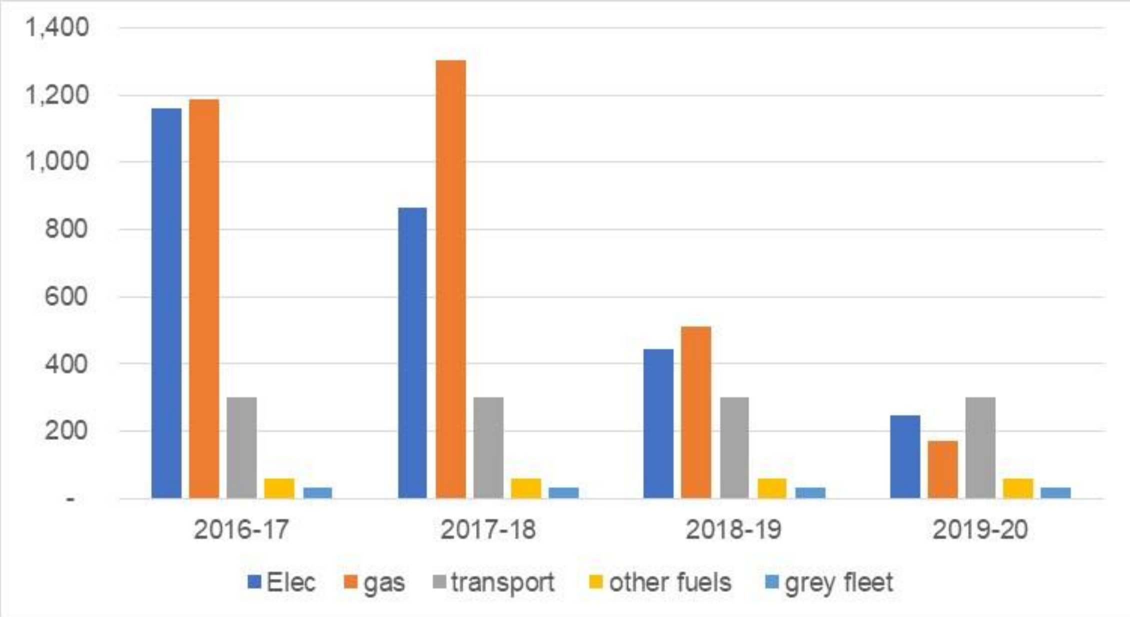
Although reducing and mitigating these emissions falls outside the remit of this report, we suggest that the Council work closely with the Centres' new operator to ensure that these emissions are addressed in addition to the emissions for which the Council is directly responsible.

3.5.2 Waste and recycling collection

Many of the Council's waste collection activities are outsourced to Serco. Again, these emissions are not included in DDDC's direct carbon footprint given above. Data for the activities has not been made available and ClearLead therefore cannot calculate them; however, we recommend calculating and tracking emissions from outsourced activities in future to ensure that they are not overlooked. It is probable that Serco are already tracking this data, access to which should be requested and perhaps mandated in future contracts.

3.6 Emissions trend

DDDC's direct greenhouse gas emissions have been on a sharp downward trajectory since 2016. There are two key drivers for this: the outsourcing of the Leisure Centres in summer 2018, which accounts for the majority of the fall, plus a sharp fall in the carbon intensity of grid electricity over this period (see section 3.7).



DDDC previously reported its carbon footprint under the NI-185 scheme, which ended in 2011. This does not provide a useful comparison with the current footprint, owing partly to the Leisure Centre outsourcing and partly to the fact that NI-185 only accounted for electricity and gas, omitting transport and other emissions sources.

3.7 Grid decarbonisation

The UK's grid electricity has steadily decarbonised over the last decade. This is owing to a shift in the grid mix (the balance of technologies used to generate power) from a fossil fuel-fired base to a mix encompassing less coal and more renewable energy.

The chart below shows the GHG emissions factors of UK grid electricity since 2002.

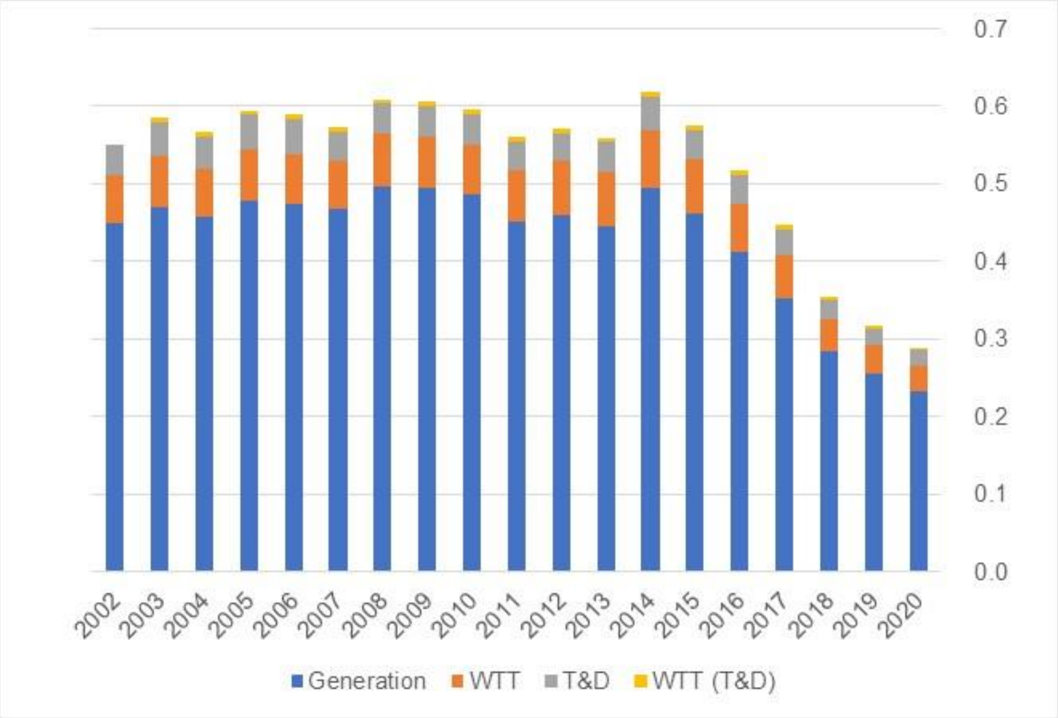


Figure 3: UK grid electricity GHG intensity, 2002 to 2020 (kg CO_2e/kWh)

This trend is projected to continue as coal generation goes offline and gas generation reduces over the next 15 years, to be replaced by more renewable energy generation and imports, and a proposed new nuclear power station building programme.

This reinforces why decarbonising heating and vehicle use is now, or is becoming, a low-carbon option, as many combustion-based technologies have limited scope or feasibility for decarbonisation, especially over the short term.

3.8 Emissions forecast: "business-as-usual"

The chart below shows a projection of DDDC's business-as-usual emissions, assuming no radical changes to the Council's estate, activities or vehicle use. This is based on constant GHG emissions factors for fossil fuels and BEIS's projected emissions factors for UK grid electricity (see above, section 3.7)[3].

[3] *BEIS' emissions factors are currently based on a two-year 'time lag' from real-time generation data (i.e. the 2020 emissions factor is based on UK generation in 2018). We have assumed the BEIS trajectory is followed from the current emissions factors.*

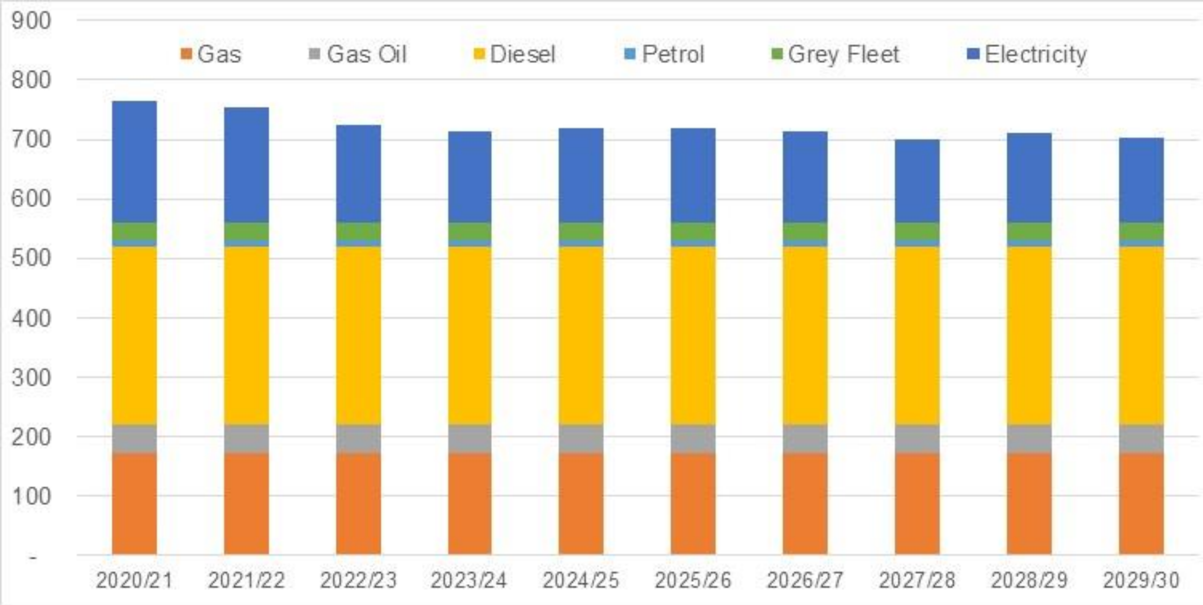


Figure 4: DDDC's projected business-as-usual emissions (tCO_2e), to 2029-30

The chart shows that over the Decade to 2030 DDDC's emissions would fall slightly under a business-as-usual scenario (i.e. using precisely the same amounts of energy as in 2019-20) owing to decarbonisation of the electricity grid (as forecast by BEIS – see above). As shown, without any action by the Council on energy and emissions management, emissions overall would fall from the 2019-20 value of just over 800 tCO_2*e* to around 700 tCO_2*e* by 2030, a decrease of 13%.

In Section 5 we examine what the Council could achieve through proactive measures to further reduce energy use and GHG emissions to meet its net zero goal.

4 Greenhouse gas objectives and targets

4.1 The GHG reduction hierarchy

The council's goal is net zero by 2030. There are typically four stages to a GHG reduction project:

1. Emissions reduction

This typically includes lower overall energy use (for example, by improving energy efficiency in buildings or vehicles) and switching to more efficient or less polluting energy sources (for instance, replacing diesel vehicles with electric equivalents). More radical options might include projects such as building stock replacement. The key options available to DDDC are explored in Sections 5.1.1 and 5.1.2.

2. Low-carbon generation

Options such as solar PV, wind turbines and biomass boilers to replace higher-carbon intensity energy sources with low-carbon or renewable equivalents. While these can greatly reduce emissions, they can be restricted by land and space availability as well as planning and cost constraints. The options available to DDDC are discussed in Section 5.1.3.

3. Carbon sequestration

This entails 'sucking up' carbon from the atmosphere and storing it. A typical example is tree-planting: trees absorb CO_2 as they grow, and 'store' it until the tree dies. This can be a useful means of achieving moderate emissions reduction. This is outlined in Section 6.

4. Carbon offsetting

Offsetting unavoidable emissions by funding projects that will lead to equivalent GHG reductions elsewhere is the final stage of the net zero process. Theoretically simple, it can have significant cost implications, especially where local or UK-based projects are used. This is discussed in Section 6.

Beyond the overall goal of net zero by 2030, to track progress it is valuable to have milestones in the intervening years. This is discussed in section 5.3.

5 GHG reduction opportunities

5.1 DDDC's key GHG reduction opportunities

In this Section, which encompasses stages one and two of the GHG reduction hierarchy set out in Section 4.1 above, we discuss the projects and opportunities available to reduce DDDC's GHG emissions.

5.1.1 Energy efficiency

There is undoubtedly scope to improve DDDC's energy efficiency. Suitable measures may include better energy management, the implementation of staff training and awareness, and investment in energy efficiency measures such as insulation, more efficient lighting and controls, and more efficient boilers.

ClearLead conducted a high-level energy assessment of key buildings within DDDC's estate. We identified measures which we estimate could reduce the Council's overall current electricity use by around 15% by 2023, and its gas use by around 5% by 2021. These estimates are based on ClearLead's observations made during the assessment and our experience of identifying and implementing energy efficiency programmes in similar organisations and building types. The measures envisaged are basic good practice which could normally be expected to have a simple payback of three years or less, but do not include higher costs measures such as the installation of double-glazing at the Town Hall, which would produce additional energy savings, albeit at significant extra cost. Measures such as this are considered to be more asset renewal-based, and should be considered as part of any potential future refurbishment.

The key measures to explore further are summarised in Table 4 below. The list is not exhaustive; a detailed survey of DDDC's estate is likely to add opportunities and enable more detailed prioritisation. Due to the ongoing Covid-19 outbreak and budget limitations a detailed energy survey was not considered practicable within this project, but should form part of any detailed work on implementation of the strategy that follows). More details about the identified opportunities, and the underlying figures, are given in the spreadsheet within the accompanying spreadsheet.

Site	Opportunity
WCs	Replace any residual fluorescent lighting with LED & occupancy detection controls
Cricket Pavilion	New gas-fired boiler: consider electric (air source heat pump) alternative. Install LED lighting with occupancy detection controls
Agricultural Business Centre	Replace any residual lighting with LED. Consider replacing gas-fired radiant/convective heating with air source heat pump if possible. Potential for PV on roof (~2,300m^2 SW-facing)
Darley Dale Depot	Replace any residual non-LED lighting with LEDs. Consider replacing gas-fired convector heater with air source heat pump.

	Replace gas-fired heating in offices, mess room, locker rooms with air source and/or electric radiator panels. Potential for PV on roof (~380 m^2 SE-facing)
Matlock Town Hall	Check roof above Council Chamber and 1900s building for insulation and apply to latest standards if not present. Consider replacing single-gazed windows to modern double glazed units (not included in costs). Consider replacement of gas-fired boilers with biomass boiler. Container unit could be located in car park and piped via basement boiler room to local boilers with heat exchanger interface. There is an opportunity to do this at marginal cost as two of the three older boilers have failed and were due to be replaced in the summer of 2020.
Ashbourne Depot	Convert any residual non-LED lighting to LED
All occupied sites	There is typically scope for increasing energy efficiency via optimised controls and housekeeping in conjunction with occupant behaviour change. Any residual non-LED lighting should be replaced with LED lighting and occupancy controls fitted where appropriate.

Table 4: Building-related energy efficiency opportunities (summary)

Indicative energy savings from these measures have been used to model carbon reductions from energy-efficiency measures, which are set out in Section 5.5.

In addition, there are hypothetical newbuild and major refurbishment opportunities to reduce emissions through design features such as super-insulation to reduce heating and cooling loads, passive ventilation, high efficiency HVAC (heating, ventilation and air conditioning) systems, LED lighting and improved building controls/automation. Any major refurbishments – such as the mooted Bakewell recreation ground WC being converted to a café, or the possible redevelopment of the Ashbourne pavilion – should be taken as an opportunity to maximise energy efficiency and to decarbonise heating and energy supply through building-integrated renewable energy systems.

An alternative to improvements to the Town Hall, which would offer a major potential carbon reduction opportunity, would be to move the Council's HQ operations from Matlock Town Hall to a purpose-built site built to best-practice, low-energy/carbon specifications. This has already been mooted withing DDDC and could be a joint venture with Derbyshire County Council to defray costs. As a major capex and organisational project, this sits outside the scope of this report and has not been considered in further detail; however, we recommend further investigation, as the Town Hall accounts for 18% of DDDC's direct GHG emissions including a high proportion of its gas use (see next section). Note that this would not preclude the biomass boiler replacement mentioned below, as the boiler would most likely be a containerised packaged unit and could be moved to the new building if required. Similarly, significant insulation improvements and installing double-glazing in the 1970s and 80s sections of the Town Hall, while increasing energy savings, would also add considerable capital costs for relatively small gains.

5.1.2 Electrification and decarbonisation

This entails a shift to lower-emissions energy sources for heating, such as replacing gas heating with biomass or electric equivalent. (This does not include vehicle electrification, which is discussed separately below.)

It might be technically viable to decarbonise heating in several buildings, including Bakewell Pavilion, Northwood Depot, and the Agricultural Business Centre (ABC) in Bakewell (air source heat pumps), and Matlock Town Hall (with a biomass boiler). Bakewell ABC may prove problematic technically owing to the open nature of much of the site, meaning that it may be preferable to either switch to electric radiant heaters, or even simply to retain the existing gas-fired system (the site's heating is said to be only used for a few hours a week, so the GHG impact is relatively small), or even to consider the viability of not heating the space at all.

The Town Hall biomass project deserves rapid consideration as the site's current boilers require replacement, probably within the next 12 months. The project has high carbon saving potential (the site is by far the Council's largest consumer of gas), but we strongly recommend exploring other options that may see a reduction in heating requirement – such as improved insulation and double-glazing – *before* committing to a like-for-like boiler replacement, to avoid wasting money on a boiler that may turn out to be oversized. Note that the current state subsidy scheme, known as Renewable Heat Incentive (RHI), which would be critical to the payback of this project, closes to new applicants from April 2021, meaning that the project would need to be approved by Ofgem by this date. This would then provide a guaranteed revenue for 20 years.

Costs

Most of these projects are unattractive in terms of simple financial payback, and will require additional justification criteria. An approximate estimate for the biomass boiler project at Town Hall is £175k, at a significant marginal cost of perhaps £143k over a like-for-like fossil fuel replacement, with a simple payback of around 15 years. The heat pump projects would range in cost from £5k to £30k and again would see paybacks, if at all, of over ten years.

5.1.3 Low-carbon electricity generation

This entails deployment of renewable energy generation technology such as solar photovoltaic (PV) arrays or wind turbines. This is a process sometimes known as 'insetting' (for 'internal offsetting'), as it enables an equivalent displacement of emissions from within the organisation's boundaries.

Solar PV generation

ClearLead identified two potential 'phases' of PV: smaller roof-mounted projects; and major ground-mounted projects. A third category, car park-mounted PV, is discussed separately below at the request of the CCWG.

We have used our experience in conjunction with industry benchmarks and supplier budget cost estimates to assess indicative costs, based on £700/kW peak[4] (kW_{peak}) for ground-mounted array, and £750/kW_{peak} for roof-mounted arrays (both costs assume grid connections are relatively straightforward; complications such as needing to install a substation for a ground-mounted system could add significant costs).

The two most obvious sites for roof-mounted PV (aside from Matlock Town Hall, which already has a small PV array) are the Northwood Depot and the Bakewell Agricultural Business Centre (ABC) both of which have reasonably-sized available rood space with a southerly aspect.

Ground-mounted installations are more attractive; however, these pose a problem in that the location of available ground is not necessarily in the same location as the user of the electricity. In this case it is possible to export the electricity into the electricity grid and use a commercial/legal arrangement known as 'sleeving' to extract it elsewhere at the point of use.

Possible sites for ground-mounted arrays are listed below[5]. In our opinion Watery Lane, Ashbourne, should be a priority, as this is largely hidden from view, appears to be unsuited to alternative development, is surrounded by partially industrial land, and owing to the presence nearby of a waste water treatment plant operated by Severn Trent Water will have a substation to hand, making grid connection relatively straightforward. An array here could be sized at up to 2,000 kW_{peak} and could generate around 1.65m kWh a year, enough to 'inset' nearly all of DDDC's residual emissions (see section 5.5). As the location may be subject to a restrictive use covenant from Nestle, the site's previous owners, this would need to be addressed. Other potential sites include Edge View at Stoney Middleton, sufficiently large to accommodate a 2.5 MW_{peak} system, and various smaller sites. Any combination of sites achieving a comparable level of generation would have the same overall carbon-reduction impact.

The simple payback for the ground-mounted arrays is estimated at 7.3 years, rising to 7.9 years for roof-mounted arrays owing to slightly higher typical installation costs. Note that all figures below are high-level estimates subject to confirmation via a full feasibility study.

Location	Type	Yield MWh/yr	Savings £k/yr	Capex £k	GHG saved tCO_2e/yr
Bakewell ABC	Roof	491	59	433	141.5
Darley Dale Depot	Roof	39	4.6	34	11.1
Allen's Hill, Cromford	Ground	92	11	87	26.5
Edge View, Stoney Middleton	Ground	1,990	239	1.9	573.1
Thorncliffe Ave, Darley Dale	Ground	477	57	451	137.5
Watery Lane, Ashbourne	Ground	1,648	198	1.5	475.0
Griggs Gdns, Wirksworth	Ground	158	19	149	45.6
Total		4,894	587		1,410.2

[4] The size of solar PV systems is expressed in "kilowatts peak" (kW_{peak}), the theoretical rate at which they could generate energy at peak performance on a sunny day

[5] Wash Green, Wirksworth, has been omitted as it appears to be a wooded site.

Table 5: DDDC land holdings

Note that the 'GHG saved' column assumes current (2020) grid electricity emissions factors. This value will decrease annually in line with forecast UK grid decarbonisation (see section 3.7).

Car park PV

In addition, the Council's Climate Change Working Group requested that car-park-mounted PV arrays be considered: these are effectively PV panels mounted on frames above car park areas, allowing dual use of the same area.

This option carries a significant cost premium owing to the substantial additional engineering work required in building the steel frameworks, with a typical cost around £1,100 per kW_{peak}. Using indicative costs and benefit data, this gives a typical payback of 11.5 years. (There may be additional costs for car park arrays around insurance and liability, owing to the facts that people and vehicles will necessarily need safe access to the space underneath them, and that protection from vandalism may be an additional requirement. These have not been included.)

Car park PV may have some additional attractions in providing shelter and shade for parked cars, as well as lending itself to future electric vehicle charging.

We estimate that there may be space for additional (or contingent) total PV arrays of >23,000m^2 giving a theoretical capacity of 3,700 kW_{peak} and an annual electricity yield of nearly 3m kWh, at an approximate cost (although see the caveat above around possible additional costs) of just over £4m. As above, an indicative simple payback period would be over 11 years. Just five of the larger car park sites[6] would account for nearly 40% of the available area and potential capacity. The overall potential car park PV benefits, and those from the five key sites alone[6], are shown below in Table 6.

Site	Net area m^2	Size kWp	Yield kWh/yr	GHG saving tCO_2/yr^{**}	Capex £	Savings £/yr***	Simple payback yrs
All sites	23,152	3,718	2,951,906	585	4,090,187	354,229	11.5
Key sites*	9,010	1,447	1,148,785	228	1,591,767	137,854	11.5

Table 6: solar PV capacity at DDDC's land holdings

Notes

** As listed in the footnote below*

*** At 2020 carbon intensity. This will decrease over time as grid electricity decarbonises.*

**** At current electricity prices. Savings are likely to improve as electricity costs rise*

Note that some types of solar PV panel, notably crystalline panels, can have significant 'embodied carbon' – that is, the panel manufacturing process itself generates significant GHG emissions. Although this issue falls outside the scope of this report, we recommend further investigation at the feasibility stage to determine the lowest-carbon option.

[6] Cokayne Avenue and Shawcroft Park Road in Ashbourne, Bakewell ABC, plus ARC Leisure and The Station in Ashbourne. These are the Council's five largest car park sites aside from Fishpond (overspill), which has been excluded as it occupies green space next to a lake and may therefore be considered unsuitable for development.

Wind generation

We understand from discussions with the Council's Climate Change Working Group that wind turbines are politically sensitive in the Council and their installation is unlikely to be considered. We have therefore not carried out a detailed assessment. However, for context, we note that installing turbines would realistically allow a cost per kWh of electricity generated comparable to ground-mounted solar PV, or around a third cheaper than 'car park' PV. In holistic terms it is possible that a mix of wind and solar generation is the most effective option, as this would allow generation beyond the hours of daylight. Note too that wind turbines generally have a significantly smaller carbon footprint from manufacturing than monocrystalline PV panels.

Finally, for all renewables installations above approximately 4kW, permission is needed from the Distribution Network Operator before connecting to the grid. We suggest exploring this issue in the first instance owing to the importance of renewable electricity generation to DDDC's net zero pathway.

Funding renewables projects

There are two main options for funding renewables projects. The first, simplest and most cost-effective method is direct investment: the Council pays for installation and associated costs (such as grid connection) up front, and then enjoys cheaper electricity. Where PV installations are remote from the Council's users, grid transmission and distribution (T&D) costs would still need to be paid, which might represent around a third of market costs, meaning that the electricity might be provided for perhaps 4p/kWh. Where building mounted systems are deployed, or car park systems adjacent to DDDC-owned buildings, the electricity can be supplied directly to the building without use of the grid, an arrangement colloquially known as "behind the meter" as all costs associated with distribution are avoided. The cost savings are at the full rate paid by DDDC. In all cases, any surplus electricity generated could be sold to the grid, typically at around 5p/kWh. As this does not offer a particularly attractive financial return, it would be preferable to size installations in line with anticipated demand, and to use a sleeving arrangement to use the electricity elsewhere. An alternative approach might be to deploy battery storage to enable surplus electricity generated to be used at different times of the day, such as overnight.

The second funding option is to consider a Power Purchase Agreement (PPA). This would entail finding a PV installer/developer and/or external investor to build and own the installation, with the Council guaranteeing to purchase the electricity at an agreed price over a set period, thus insulating the Council from future electricity price rises (under a PPA cost rises are typically linked to an inflation index such as RPI). As well as the agreed unit cost, the Council would also need to pay T&D charges under a "sleeving" arrangement. A PPA would have the advantage of eliminating the need for significant capital expenditure, but would see lower electricity costs savings – possibly even cost-neutral, although there would be a strong decarbonisation benefit, in addition to a level of assurance against future price rises.

We estimate that electricity equivalent to the Council's annual requirement, plus the surplus required to offset its residual emissions, could be self-generated with an investment of £1.6m in ground-mounted arrays. This is liable to significant variation depending on the site or sites chosen, mainly owing to possible additional costs for grid connection. This is one reason why the Watery Lane site is an attractive option, as the presence nearby of a wastewater treatment works means that a substation will already be located nearby.

A final aspect to consider is that the Council has access to land suitable for ground-mounted PV installations far in excess of its own energy needs. As part of its own net zero carbon strategy and that of the wider district, the Council could consider setting up a community energy scheme to sell surplus electricity to third parties such as households and businesses within the district, or even the Leisure Centres. This may generate some revenue, as well as contributing to lower carbon emissions.

Note that previous government subsidies for PV electricity, such as ROCs and the feed-in tariff, have now ended.

5.1.4 Electric vehicles (EVs) and other decarbonised transport

Background

This opportunity sees fossil fuel-fired vehicles replaced with electric equivalents (commonly known as EVs). This reduces GHG emissions in two ways: first, because an energy unit (such as kWh) of electricity has a smaller carbon footprint than the equivalent unit of diesel (or other fossil fuel): currently around 22% lower, although this is projected to drop to nearly 50% lower by 2030 owing to electricity decarbonisation[7] (see section 3.7).

Secondly, electric vehicles are notably more efficient than internal combustion engines in converting energy input to useful energy (that which propels the vehicle): EV engines are typically around 80% efficient, while internal combustion engine (ICE) efficiency, even in theory, is at best under 50% (for a highly efficient diesel engine in optimum conditions), and in practice is typically between 20% and 35% depending on engine type (diesel engines are generally more efficient than petrol), model, and on driving style and conditions. This means that significantly less energy input is required to travel the same distance in an EV compared to an ICE vehicle.

Note that EVs are only one opportunity for decarbonising transport. Other options are available, including hybrid (partially electrified) vehicles, which may prove to be a useful interim option; and hydrogen-powered vehicles, which are developing fast and may prove to be the long-term option for larger vehicles such as refuse vehicles or tippers. This assessment focuses on a long-term adoption of EVs.

DDDC's situation

DDDC directly operates a fleet of around 60 vehicles, ranging in size from small cars to refuse collection lorries and tractors. (This does not include vehicles used by outsourced contractors, notably the Serco vehicle collection fleet – see Section 3.5.2).

7 In theory, significant additional GHG savings could be achieved by charging EVs directly from renewables, such as PV. However, this would entail siting charging points in physical proximity to the renewables source, and charging the vehicles while power is actually being generated, which may not always be feasible. Such savings have therefore not been taken into account.

In 2019-20 these collectively used just over 90,000 litres of diesel, plus an estimated 15,000 litres of gas oil (red diesel) and 3,000 litres of petrol, with associated emissions of nearly 360 tCO_2e, 44% of DDDC's direct emissions. (This does not include 'grey fleet' emissions.) Transport energy is therefore a crucial area to address on the net zero journey.

In consultation with DDDC's Transport Manager we have assumed that any vehicle up to the size of a 4x4 or Transit/Transit tipper will have a commercially available and financially viable electric equivalent by 2030, but that larger vehicles and HGVs will still need to be fired by diesel by 2030, for financial if not technical reasons[8].

This is a conservative assumption: in practice it is likely that lower-carbon alternatives will be feasible by 2030 for most of DDDC's requirements. (Derbyshire County Council have assumed full decarbonisation of HGVs between 2027 and 2032[9], although it is not clear what marginal cost is attached to this.) We have also assumed that all current petrol use can be electrified by 2030, along with half of gas oil use. We understand that DDDC is considering plug-in hybrids for some imminent renewals as a first step.

Costs, payback and GHG reductions

Using DDDC's estimated ICE replacement costs, we have assumed an average 50% marginal cost for EVs compared to ICE models. This gives a combined marginal cost of approximately £475k over like-for-like replacement costs per iteration of fleet replacement (again, only for vehicles up to LGV size). This can be set against an estimated annual fuel cost saving of £45k, giving a simple payback of over ten years.

Real-world payback is likely to be better, for three reasons: this assumes current diesel and petrol costs, which in reality are likely to increase sharply, especially in the event of additional fossil fuel taxation, which is probable by 2030; because EVs may require less mechanical maintenance than ICE vehicles; and as, depending on financing of solar generation options, it might be possible to secure electricity at below current market prices; a hypothetical 20% increase in the price of diesel in conjunction with a 30% decrease in electricity costs would see the annual fuel cost saving rise to £68k.

On these assumptions we would expect to see transport emissions reduce to around 150 tCO_2e by 2030, a fall of 58%. Again, we emphasise that this is a conservative estimate based on current technology and costs, and that substantially greater emissions reductions are plausible.

A final point to note is that the fleet is largely managed on a five-year renewal schedule. We therefore recommend tracking the commercial EV and low-carbon vehicle market carefully to avoid committing to ICE vehicles when a low-carbon alternative is imminently viable, thus

8 Some low-carbon alternatives to HGVs are already available, either using EV/battery, hybrid, or hydrogen technology. However, the marginal cost (the difference between the low-carbon model and the ICE version) is currently prohibitive – often double or more. There are also technical limitations, notably around range and recharging. Although this is highly likely to improve by 2030, for the purposes of this assessment we have assumed that DDDC will accept a maximum marginal cost of 50%.

9 https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/climate-change/carbon-reduction-plan.pdf, p.7

locking in to five years of needless fossil fuel emissions. DDDC's Transport Manager is aware of this issue.

5.2 Potential emissions reductions

The chart below shows one possible glidepath to net zero by 2030. Note that this in an illustration of one series of options – projects would not have to be implemented in the order or at the times shown. The chart makes the following assumptions:

- Energy efficiency projects (which are the most immediate, cost effective options) are addressed within the first two years, i.e. by 2021-22, leading to a 15% reduction in electricity and a 5% reduction in gas
- Matlock Town Hall boilers are replaced with biomass equivalent in Summer 2021
- Heating at Bakewell Pavilion and Northwood Depot is electrified by 2021/22, and Bakewell ABC in 2022/23 (the Bakewell Pavilion boiler is condemned and will need replacing sooner)
- Roof-mounted solar PV is installed on Northwood Depot and Bakewell ABC in 2022/23
- Additional renewable electricity generation equivalent to a 2MW solar PV array is installed in 2024-25
- The fleet (up to LGV size) is electrified by 2025.

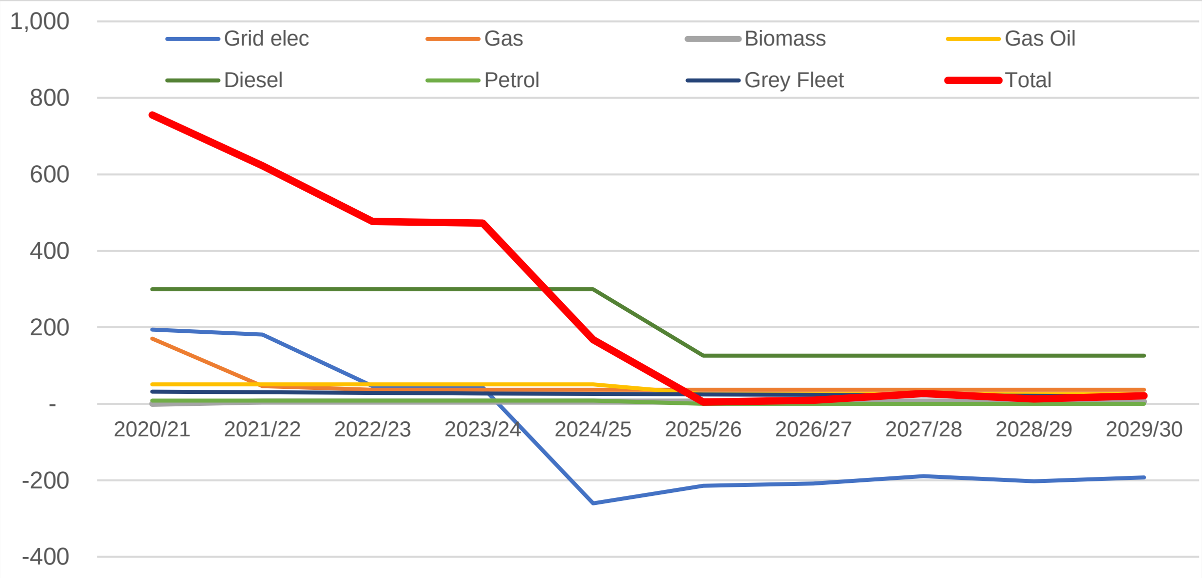


Figure 5: possible GHG reduction glidepath

Under this scenario total net emissions (shown by the red line) can reach zero as early as 2025-26, although this will require an 'offset' of the actual emissions still projected to be emitted by (primarily) diesel-fired transport (orange line). Emissions from other sources could become relatively marginal as early as 2022-23.

We reiterate that although the trajectory above looks relatively straightforward and attainable, it will require substantial investment and therefore political will to achieve. While it is possible to change the assumed intervention dates – perhaps to allow more time for investment-raising – and still meet the 2030 timeline, note that this would come at the cost of not maximising cumulative GHG reductions (and cost savings, where relevant). This is discussed further in Section 5.3.

5.3 Timetable, milestones and pre-requisites

With two exceptions, the key opportunities identified have neither pre-requisites nor ‘expiry’ deadlines. The exceptions are:

- The Town Hall biomass boiler, which owing to the condition of the existing boilers will probably need to be replaced within the next 18 months. Additionally, we strongly recommend addressing energy efficiency (especially insulation and possibly double-glazing) in the Town Hall prior to the boiler replacement to avoid wasting money on a new system sized on a like-for-like basis, which may then turn out to be oversized.
- The vehicle replacement timetable will presumably be to some extent dictated by the existing vehicle renewal programme, which we understand operates on a five-year cycle.

Aside from these, the emissions reduction projects could be implemented in any order as finance and other concerns allow. Any milestones are therefore to some extent arbitrary. We thus recommend prioritising the projects in the ‘value for money’ order shown by the marginal abatement cost (MAC) curve in Section 5.5. A feasible (arguably conservative) milestone would be a halving of direct emissions to approximately 400 tCO_2e by 2025. However, please note the following section, which discusses the cumulative impact of earlier emissions reductions.

5.3.1 The holistic impact of early emissions reduction

From the point of view of global emissions reduction – which is the fundamental goal of any GHG reduction – it is preferable to cut emissions sooner rather than later, even where the slower scenario still meets the timeframe.

This is illustrated by the chart below showing three hypothetical net emissions trajectories: fast, medium and slow. Although all three would meet the 2030 target, in the ‘fast’ scenario the total emissions generated over the decade (shows in the green box) are 60% lower than in the ‘slow’ scenario (blue) and 40% lower than the ‘medium’ scenario (amber). Note that the graphic shows hypothetical scenarios for illustration, and do not directly apply to DDDC’s options. In DDDC’s case, addressing the best opportunities earlier in the decade will lead to substantially lower cumulative emissions than leaving them until towards 2030.

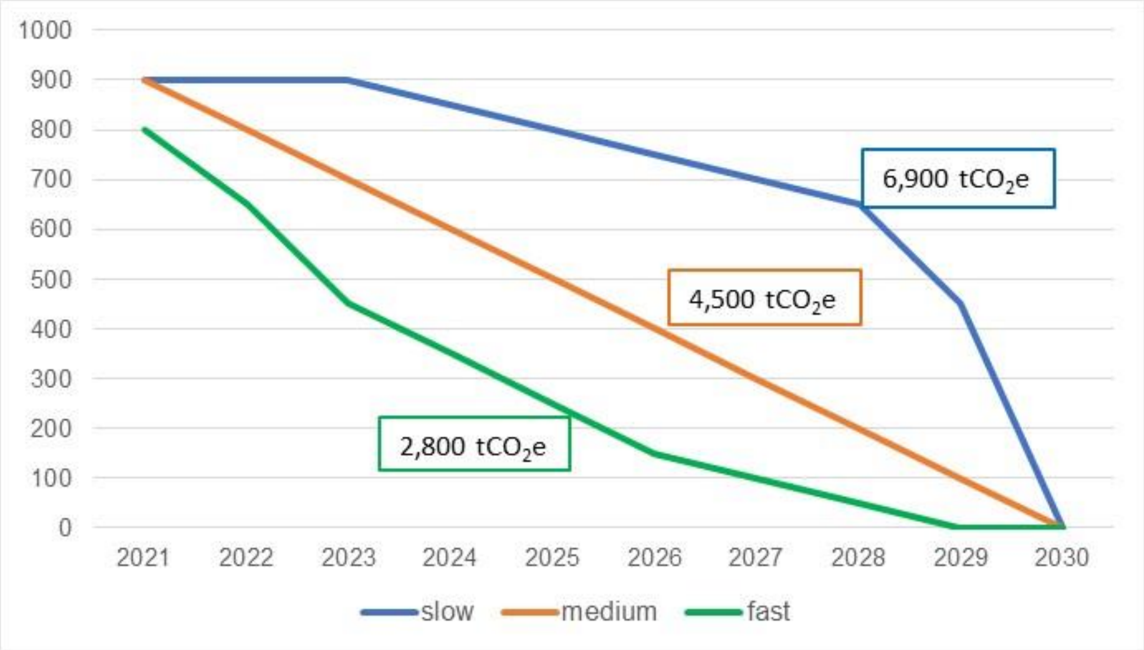


Figure 6: contrasting holistic emissions reduction paths

5.4 2030 carbon footprint

DDDC's potential carbon footprint in 2030 (assuming adoption of the measures listed below) is shown below. Self-generated electricity contributes a significant net negative emissions of around 190 tonnes, offsetting emissions from diesel (126 tCO_2e under this pessimistic scenario), gas (37 tCO_2e under this scenario), gas oil (25 tCO_2e) and, marginally, biomass (6 tCO_2e). There would be a small residual carbon footprint of around 20 tCO_2e from grey fleet, which is not directly under DDDC's control. This could be offset if required, either by the purchase of carbon offset credits or by increasing self-generated electricity capacity.

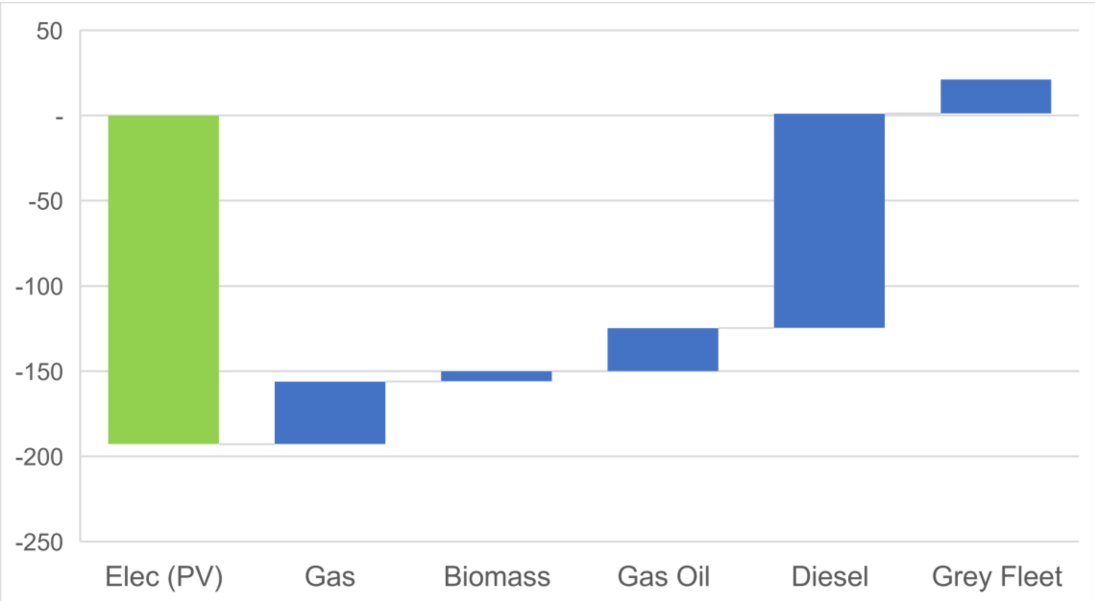


Figure 7: projected DDDC carbon footprint, 2030

The green bar represents self-generated PV (sized at ~2MW_P, equivalent to the Watery Lane site, although it would not have to be on this specific site), represents a 'negative' carbon footprint, as the array would be able to generate more electricity annually than DDDC would need directly, even after partial vehicle electrification. This would therefore effectively 'offset' the emissions still generated elsewhere in the Council's operations.

These are, from left to right: some residual gas use for space heating (this is a worst-case scenario – it may be possible to eliminate all natural gas use); minimal emissions from biomass (which, although carbon neutral in itself, needs to be processed, dried and shipped); and an assumed residual amount of gas oil (likely to be relatively minimal, around 25 tCO_2e on this projection) and diesel (far more significant, at 136 tCO_2e).

We reiterate again that this scenario conservatively assumes no adoption of low-carbon technology in HGVs by 2030 (see Section 5.1.3), which is essentially a worst-case scenario: depending on the evolution of technology and related adoption costs, it is plausible that by 2030 diesel and gas oil emissions will be far lower than those shown. Any additional shift from diesel and gas oil to electrification (or other low-carbon technology) will enhance the carbon balance in favour of neutrality.

5.5 GHG reduction costs and Marginal Abatement Cost Curve

Indicative capital costs and estimated annual cost savings and GHG reduction benefits for each project or emissions reduction measure identified in Section 5.1 are shown below.

Project	Capex £k	Benefit £k/yr	GHG saved tCO_2/yr
Energy Efficiency	65	13	28
PV (building)	467	64	105
PV (ground)	1,563	198	327
Electric Vehicles	473	48	152
Biomass (Town Hall)	150	10	83
PV (car park)	1,592	134	228
Heat pumps	55	0.5	27

Table 7: marginal abatement costs by project

This data is adapted in the chart below into a MAC curve, which essentially shows the cost per tonne of GHG emissions reduced or avoided by each project. The opportunities offering the better carbon reduction value are shown from the left. The target is shown by the dotted line. It can therefore be seen that the target can be reached by carrying out the following projects, in descending order of "carbon value":

- Cost-effective energy efficiency projects
- Building-mounted PV
- Ground-mounted PV
- Switch vehicles up to LGV size to electric
- Convert Town Hall heating to biomass

A small amount of additional PV is then required to fully meet the net zero target (on this projection). This is shown on the MACC as car-park mounted PV, to illustrate the cost per tonne of this option being significantly higher than building- and ground-mounted PV; however, additional ground- or building-mounted PV would perform the same function at lower cost. Note that the heat pumps, while offering some GHG reduction, do not offer attractive payback in financial or carbon terms and are not a recommended priority.

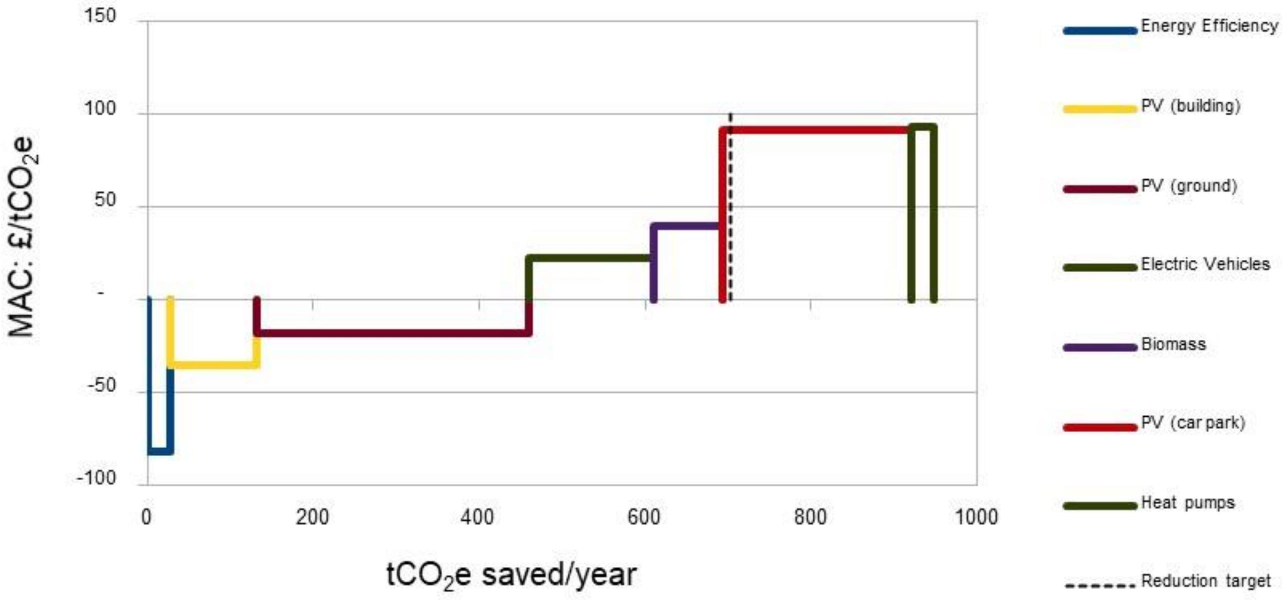


Figure 8: MAC curve

We reiterate that emission savings from each opportunity are high-level estimates. We recommend further investigating the key opportunities through detailed feasibility studies prior to committing to a definitive net zero pathway.

5.6 Opportunities and costs: summary

In summary, it is technically viable to meet the Council's net zero target by 2030, or indeed earlier. There is, though, a significant cost attached to this, probably in the range of £2.5m – £3m[10] depending on which options are selected (see Table 7*: marginal abatement costs by project* in section 5.5 above for an approximate breakdown).

Although raising finance falls outside the remit of this report, we will briefly touch on funding sources. Possible options for solar PV are discussed briefly in Section 5.1.3, while some other options that may be worth consideration are listed below; most are adapted from a recent

[10] Most but not all of this cost is additional. Some replaces or overwrites investment that would be required in a business-as-usual scenario over the same period.

Friends of the Earth publication[11] aimed at local authorities. Note that ClearLead offers no view or comment on the efficacy, viability or political acceptability of these suggestions.

- Introduce a workplace car parking levy (or equivalent) to fund and incentivise the development of sustainable transport
- Raise money from the UK Municipal Bonds Agency for low-carbon infrastructure or energy efficiency
- Legal and planning mechanisms such as Section 106 agreements and the Community Infrastructure Levy
- Some funds could be used by introducing internal carbon pricing[12], which would have the twin benefits of incentivising the move from fossil fuels by making them more expensive, while raising funds to invest in low-carbon technology
- Implement licensing of the private rented sector to cover the costs of ensuring compliance with minimum energy efficiency standards.

[11] *33 Actions Local Authorities Can Take on Climate Change (Friends of the Earth, 2019)*

[12] *For an overview of internal carbon pricing, see: https://www.cdp.net/en/climate/carbon-pricing*

6 Sequestration and offsetting

6.1 Sequestration

Carbon sequestration is the process of 'locking in' greenhouses gases (primarily carbon dioxide) to temporarily (or occasionally permanently) remove them from the atmosphere, and hence from contributing to climate change. Tree-planting is a typical example, although hedgerows, peat bogs, and some soils can also be used. Considering tree-planting, DDDC's main landholdings (as listed in Section 5.1.3) have an estimated theoretical sequestration capacity approximately ~58 tCO_2 a year. This is based on a study by Exmoor National Park, a broadly comparable geographical area, which found that tree-planting typically sequestered around 7.1 tonnes per hectare per year.

There are some critical caveats. First, quantity: based on the above rate of sequestration, using all available landholdings for tree planting would be effective in removing only 7% of DDDC's current emissions. Second, tree-planting would render the land unusable for PV, building, grazing, or many most other uses. Third, and crucially, trees take some time to begin absorbing significant quantities of CO_2: in some cases, they are unlikely to sequester significant amounts of net carbon for up to 15 years (this varies substantially with tree type, location, soil type, and other variables). Finally, when they die, trees release back to atmosphere their embedded CO_2, either through biodegrading or combustion, and would thus require an ongoing management and replacement programme, with associated costs.

In conclusion, we believe that there are better and more cost-effective routes to emissions available to DDDC than sequestration, chiefly through the decarbonisation measures discussed in Section 5.

6.2 Offsetting

Offsetting is the final stage of the net zero process. This allows the Council to offset unavoidable emissions by funding (or more commonly part-funding) projects that will lead to equivalent GHG reductions elsewhere, either locally or globally.

Ensuring that offset projects deliver the promised reductions is not always straightforward, especially when the projects are not geographically proximate, and great care should be taken to identify good-quality offsetting schemes. The respected Stockholm Environment Institute (SEI) has recently published a useful guide[13] to offsetting and offset projects, which we recommend consulting for further guidance. This recommends that organisations wishing to offset residual emissions ensure that offset projects are:

- Additional (they would not have taken place anyway)
- Not overestimated. Emissions reductions should be assessed conservatively. This has been a persistent problem with offsetting projects in the past

[13] *Securing Climate Benefit: A Guide to Using Carbon Offsets* (Stockholm Environment Institute, 2019)

- Permanent, to ensure that GHG reductions are and remain net reductions, not temporary reductions which are then reversed (or reversible)
- Not claimed by another entity. This is to avoid double-counting carbon reductions, a recurring issue in the offset market
- Not associated with significant social or environmental harms.

In addition to these points, we suggest investing in projects that offer maximum transparency around the project goals, means, and achievements.

Offsetting costs vary widely, with better-quality (in accordance with the SEI criteria listed above) and more transparent projects naturally tending to cost more. Current international offset costs are often in the range of €2 – €15 per tCO_2e, although these are expected to rise significantly as more organisations move towards net zero goals. There is usually a significant cost premium for domestic (hence more visible) offsetting schemes, as most easy (hence cheap) GHG reduction has already taken place.

Note that according to the net zero pathway identified in Section 5, DDDC will have minimal net emissions to offset by 2030 – around 20 tCO_2e on the given projection.

6.2.1 Issues and caveats with carbon offsetting

In our view offsetting should only be considered as a complement – ideally a final option – for emissions which is it not practical to avoid or eliminate, and not as a primary means of mitigation or a 'quick fix' in place of actual reduction of the Council's direct emissions.

There are several reasons for this. First, no offset scheme, however good quality, can guarantee GHG reduction as well as a tangible reduction in direct emissions.

Second, offsetting without reducing direct emissions leads to the continuation of high-emitting activities, and may even 'lock in' ongoing future emissions when high-carbon technology is invested in in place of a low-carbon alternative.

Third, offset costs, while currently cheap, are very likely to rise sharply, and will recur annually, while most GHG reduction projects are either long-term or permanent, meaning that offsetting as a long-term strategy is not as cost-effective as it currently appears.

Finally, if too many organisations declare themselves carbon neutral on the basis of offset rather than genuinely reduced emissions, this could lead to complacency and an erroneous belief that the issue of global heating has been adequately addressed and that business-as-usual is an acceptable response.

7 The bigger picture

This report intentionally focuses on DDDC's direct GHG emissions. However, to put these into perspective, while the council's direct emissions in 2020 were around 900 tCO_2e, the figure for District area was estimated to be over half a million tonnes in 2018[14] (see chart below). In addition to this, there are also DDDC's indirect ('scope 3') emissions to consider, which may or may not occur within the District area.

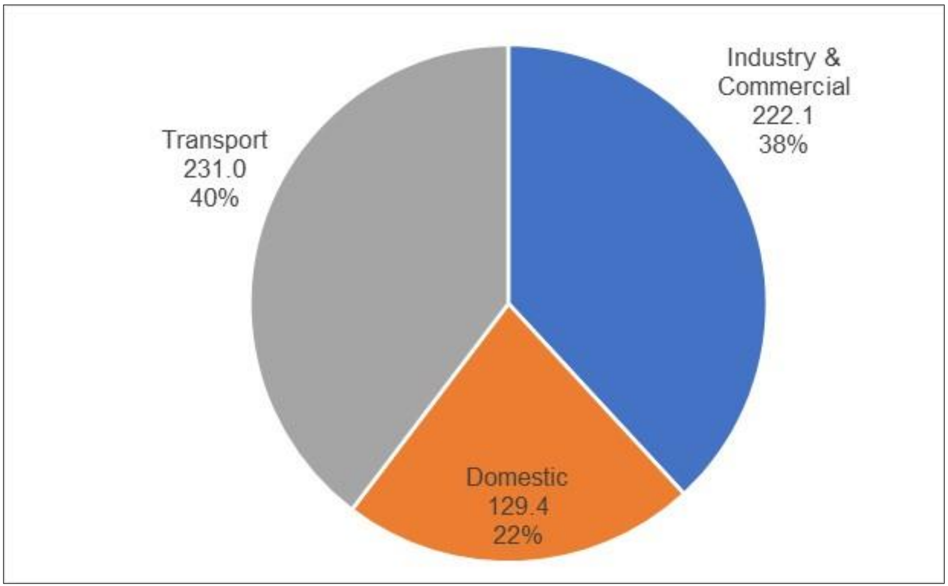


Figure 9: estimated emissions in the DDDC area, 2018 (thousand tCO_2)

Therefore, as important as the Council's own net zero drive is – both as a GHG reduction effort in itself, and as an exemplar and statement of intent – the Council also needs to consider how it can help address its own indirect emissions, plus the broader emissions in its geographical area. We therefore discuss below the issue of broader GHG emissions and the importance of any role DDDC may be able to play in helping, however indirectly, to reduce or mitigate them.

7.1 DDDC's scope 3 GHG emissions

As a next step, we recommend carrying out an approximate calculation of DDDC's main scope 3 (indirect) GHG emissions. This is a complex and often inexact area: there are around 15[15] separate categories of scope 3 emissions, broadly divided into 'upstream' and 'downstream' emissions, and include areas as diverse as staff commuting, waste, purchased products, and holdings & investments (this latter category would include the Council's Leisure Centres). Currently omitted scope 1 emissions such as refrigerants should also be reported and monitored.

[14] *UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018* (BEIS, 2020)

[15] This varies slightly depending on which protocol is used.

In DDDC's case, we suggest a high-level 'screening' of key emissions categories to identify emissions hotspots for future mitigation or reduction, perhaps using a ready-reckoner tool such as Scatter or the Quantis Scope 3 Evaluator. This will screen out the less relevant categories and allow resources to be channelled to the areas of maximum potential impact.

As an example of potential mitigation efforts, we have briefly set out some actions which the Council could take in two closely related scope 3 areas, staff commuting and grey fleet:

7.1.1 Grey fleet and staff commuting

Grey fleet (staff-owned vehicles used on Council business) contributes just under 4% of emissions in 2020, while commuting has not been quantified but is likely to be significantly higher. DDDC might consider the following measures to help decarbonise these activities:

- Incentivise efficient vehicle ownership: for instance, by paying a higher mileage rate to owners of cleaner or electric vehicles. (This would need to be carefully managed and announced well in advance to avoid alienating the staff who would not immediately benefit.)
- Provide pool cars (which could be EV) for staff use on Council business, and/or set up a hire car scheme with a commercial provider, and prioritise this over use of staff's own vehicles. This could be cost-neutral or may even offer a saving in some cases, where hire cost plus fuel/electricity is less than total mileage at whatever rate is paid (e.g. 45p/mile).
- Introduce EV charging points to facilitate the transition to electrified transport.
- Ensure facilities are available to enable staff to cycle to work, including showers, electric bicycle charging points, and adequate secure storage facilities. Allow for and encourage the likely future impact of electric bikes, which will allow staff to comfortably commute greater distances but will require additional storage areas.
- Encourage and possibly fund 'green driver' training, which can sharply reduce driving fuel consumption through behaviour change such as less aggressive acceleration and braking. Explore fair and reasonable ways to link driver remuneration and mileage rates to lower fuel consumption.
- Optimise and incentivise working from home and video conferencing to reduce mileage and avoid unnecessary journeys. Ensure that all staff know how to use the relevant software, and create a working culture in which it is permissible and acceptable to do so in place of attending in person.

7.2 The DDDC area and community leadership

The Council could consider using its influence to facilitate emissions reductions across the District. Three key emissions areas are domestic emissions and housing, transport, and commerce and industry. We present some ideas below on how the council may be able to help address these emissions[16]. Note that many of these would involve collaborating with other

[16] *These are partly based on ideas from various sources including Friends of the Earth's report* 33 Actions Local Authorities Can Take on Climate Change*, 2019;* There Is No Planet B *(Mike Berners-Lee, 2019); and* The Road to Zero *(BEIS, 2018)*

bodies, such as the County Council and other local authorities, transport organisations, and civic groups.

7.2.1 Transport

District-wide emissions from transport were estimated to amount to 231,000 tCO_2e in 2018. It is understood that vehicle ownership in the District is above average because of its rural nature and relatively poor accessibility.

Aside from electrifying its own fleet, the Council should consider ways and partnerships which could lead to a reduction in these emissions. Examples might include:

- Enable a rapid shift to electric vehicles by installing electric vehicle charging points, and encourage electric bicycles, buses and taxis with appropriate infrastructure and incentives.
- Prioritise investment in cycling (including segregated cycleways), walking, and public transport.
- Consider clean air zones or other forms of transport-related GHG taxation as required.
- Promote lift-sharing and related initiatives such as park-and-ride.
- Consider preferential parking charges for cleaner and electric vehicles.
- Careful planning may be able to help reduce the need for vehicle ownership in favour of cycling, walking and public transport.

Another key area is tourism, with most tourists entering the District by private car. This is hard to address, but there may be scope for partnerships with public transport operators to offer transport packages by train or coach to 'hub' destinations. Train travel within the District is limited, with the former Derby to Manchester through-route now terminating at Matlock. Studies have been undertaken on the reopening of this line, which would have the benefit of making wider parts of the area accessible by rail. Although this issue is somewhat beyond the scope of this strategy (and indeed of DDDC itself), it is an aspect on which DDDC could lobby from the perspectives of both GHG emissions and tourism revenue.

7.2.2 Industry

The DDDC area's emissions from industry and commerce were estimated at 222,000 tCO_2e in 2018. Some examples of how the Council may be able to help reduce these emissions include:

- Encourage local large businesses and industrial organisations to carry out carbon footprinting (including scope 3), and to adopt science-based or net zero GHG reduction targets if their emissions are material. (Care should be taken to avoid burdening small companies, especially those with marginal environmental impacts, with additional reporting requirements. SMEs could be encouraged towards a lighter touch initiative such as Bioregional's One Planet Living toolkit.)
- Facilitate mechanisms and platforms for sharing of environmental and GHG reduction collaboration and best practice.

- Identify industries with carbon hotspots, such as cement, and encourage and if possible incentivise adoption of low-carbon methods and technologies (such as use of GGBS, in the case of cement) to lower the overall GHG impact.

7.2.3 Housing

District-wide emissions from housing in the DDDC area were estimated at 130,000 tCO_2e in 2018. Council actions to help reduce this total might include:

- Retrofit council-owned properties with to high-performance insulation, and consider "cleaner" heating systems such as air source heat pumps with heat recovery.
- Consider applying high energy-efficiency standards[17] to buildings on Council land.
- Facilitate increased energy efficiency in owner-occupied homes (for example, by providing guidance and possibly funding on insulation retrofitting, or working with other parties such as the County Council or Housing Associations on technology such as local community heat networks and solar farms).
- Enforce minimum energy efficiency standards in the private rented sector, and explore mechanisms to incentivise landlords to insulate homes to a higher than minimum EPC level.
- Work with housing developers to achieve the best possible energy performance for private newbuilds.
- Develop a heating and energy efficiency strategy, including providing skills and training to increase local employment to aid recovery from the COVID-19 pandemic

The Council faces some specific issues around emissions from housing. There is understood to be a high proportion of stone-built properties which are harder to insulate, as well as a relatively high proportion of listed buildings and a high proportion of larger properties, which can mean higher energy consumption. These are not insurmountable issues but will require correspondingly greater political will and funding to address. DDDC could consider using its position to provide leadership to private homeowners, landlords and tenants by providing information and advice on energy efficient building and retrofit, signposting to established providers such as the Energy Saving Trust or the Green Building Council, and working with community action groups to promote energy efficiency at a local level.

7.3 Global arrangements and influence: the 'third strand'

The respected author and environmental strategist Mike Berners-Lee[18] posits that, for maximum impact, a holistic environmental strategy requires three 'strands'. These are:

- Reduce the organisation's own direct impact. This report forms the basis of this strand.
- Enable others to improve their impact. This is addressed incipiently in Section 7.2.
- Push for global arrangements where needed. This is addressed briefly below.

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[17] The Passivhaus standard is the most widely-known benchmark, although some authorities feel that the costs associated with formal accreditation to the standard might outweigh the benefits.

[18] *There is No Planet B* (Cambridge University Press, 2019)

The crux here is that where emissions reductions in one area simply cause emissions to increase elsewhere, there has been no net gain (and possibly a net loss). This means that, where possible, emissions reduction efforts should be as synchronised and holistic as is compatible with speed and efficiency. In the case of DDDC, this may mean using whatever political influence is available to lobby for regional and national (and where relevant international) measures to address GHG emissions, such as financial incentivisation of low-carbon solutions and technologies, with commensurate disincentives for technology and behaviour – chiefly fossil-fuel fired transport, power and heating – that increase emissions. We reiterate that GHG reduction is an international issue and that without broader measures DDDC's admirable outlook and carbon reduction measures will be in vain.

7.4 Climate change adaptation and resilience

It now seems probable that some degree of anthropogenic climate change is now inevitable whatever action is taken. In the case of the UK, this is likely to lead to higher temperatures, greater rainfall, and more frequent extreme weather events such as flooding. Without minimising the importance of reducing emissions, the Council may also wish to explore the viability of climate adaptation and resilience. Some high-level options include:

- Identifying high-risk flood areas, and avoiding building key infrastructure or transport routes in or through these areas.
- Encourage, facilitate and, where viable, help to fund future-proofed high-performance buildings, incorporating essential but sometimes overlooked elements such as shading, cooling, and avoiding the urban heat island effect. Where necessary, "flood-proofing" measures may also need to be considered, such as in-built flood defences, moving critical services to higher levels, and so on. This applies in both commercial and domestics sectors.
- Examine ways to reduce the risk of flash-flooding from rainfall in high land, including upland tree-planting. DDDC falls within the Peaks and Moorlands sub-area of the River Trent Catchment Flood Management Plan, the preferred policy for which is to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.
- Encourage and facilitate the electrification of transport, and encourage any planning options for eliminating the requirement for transport, for example by building close to existing transport links and avoiding isolated settlements.