Dorset Council

BUILDINGS & BUILT ASSETS

Detailed Technical Paper

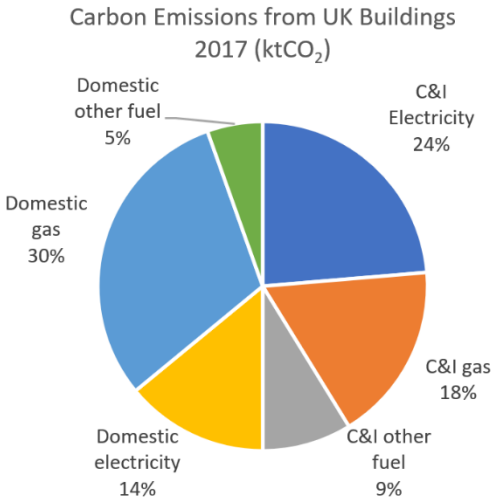
15 July 2021

BUILDINGS AND BUILT ASSETS

1. CONTEXT

National

The emissions from buildings accounted for 34% of total UK territorial greenhouse gas emissions in 2014 . Direct emissions, resulting from the use of fossil fuels (primarily gas) for heating, make up almost half of buildings emissions. 38% of emissions are electricity-related, resulting from lighting and the use of appliances, as well as some electric heating (especially in the commercial and industrial (C&I) sector), leaving 14% emitted using other fuels.



On a sector basis, residential emissions account for 63% of buildings emissions, with commercial and public sector emissions accounting for 27% and 10% respectively.

Climate change will have significant implications for buildings. As buildings have long operational lifetimes, they are sensitive not only to the existing climate at the time of their construction, but also to climate variations over the decades of their use.

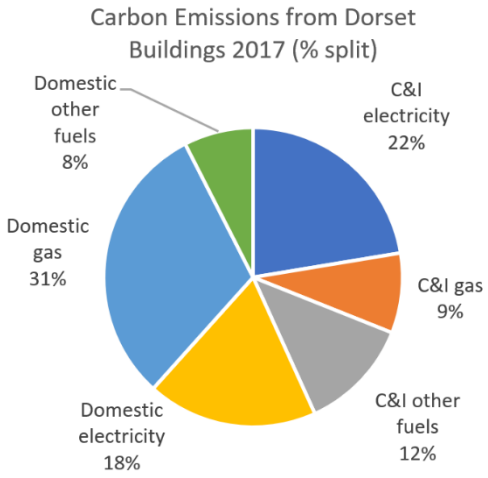
Climate change will impact buildings in several ways. Firstly, more buildings will be at risk from flooding. The Environment Agency estimates that annual damage to UK properties due to flooding from rivers, surface water run-off, and the sea currently totals around £1.3 billion. For England and Wales alone, the figure is projected to rise to £12 billion by the 2080s . Secondly, climate change will affect building energy consumption through changes in heating and cooling demands.

Dorset Context

Emissions from buildings in Dorset were around 1,000,000 tCO_2e/yr in 2017, contributing 60% of Dorset's total footprint. They have reduced by 42% since 2005, partly because of some efficiency investment, but mostly due to the reduction in carbon intensity of grid electricity.

In Dorset, 57% of emissions are generated by domestic buildings, which is higher than the national average of 49%. Also, a higher-than-average proportion of domestic buildings' emissions in Dorset come from use of electricity (18% in Dorset compared to 14% nationally). Another notable way in which Dorset is different from the UK average is that emissions from commercial and industrial buildings (C&I)

show a much smaller contribution from use of gas (9%) compared to the national profile of 18%, which may indicate a relatively large number of C&I properties not connected to mains gas.



The total number of dwellings in Dorset was 177,934 (Council tax data 2018). Of these households, it is estimated that 9.8% were living in fuel poverty (as opposed to 11% in England), which is defined as: "a member of a household living on a lower income in a home which cannot be kept warm at reasonable cost."

Although fuel poverty is lower than the national average, some areas (known as super output areas) of Dorset have significantly higher than average levels, existing in both rural and urban areas settings (up to 14% living in fuel poverty). The rate of fuel poverty relates to three factors:

- The energy efficiency of a property
- Energy prices
- Incomes

Most property in Dorset is in owner occupation (66%). However, the privately rented sector is estimated to have nearly doubled in the last 10 years (22% of all stock). Previous stock condition surveys carried out in Dorset have shown that the condition of privately rented homes is significantly worse than owner occupied, with up to 40% of all category 1 hazards existing in the privately rented property (PRS Stock Condition Survey 2009). These hazards include serious housing disrepair or poor thermal insulation.

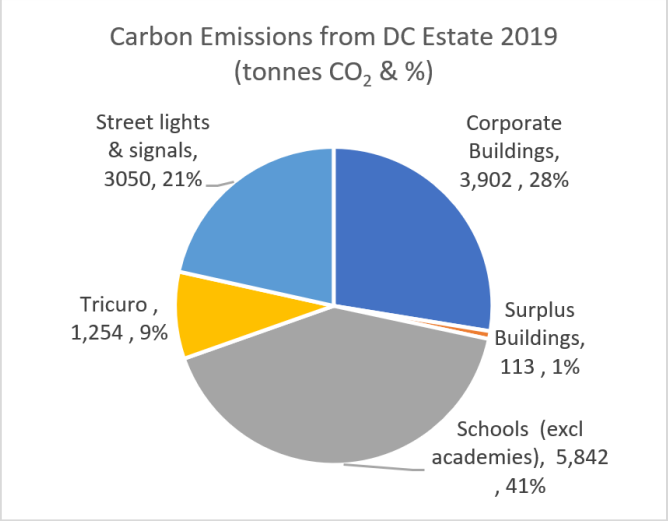
At 69%, mains gas heating is the main form of heating for homes within Dorset, with other types including central heating (13%) and electrical heating (10%). However, there is a small number of properties using coal, bottled gas, or wood as their main source of heating.

The energy performance of property in Dorset is very similar to the national (England) average. Energy Performance Certificates (EPCs) are awarded from A – G, according to a range of energy performance metrics, and include the effective insulation present and heating type. Properties rated with an EPC below E are not allowed to be commercially let, unless the landlord obtains a valid exemption registration. (For example, the construction of a listed building prevents the installation of insulation).

The developing Local Plan and Housing Strategy identify that in the region of 1,800 new houses per year will be required in Dorset for approximately the next decade.

Dorset Council Context

Buildings and Built Assets account for an estimated 14,641 tonnes of CO_2e, which is roughly 70% of Dorset Council's total carbon footprint. Gas and oil used for heating, and electricity used for lighting, IT, ventilation, heating, and cooling, as well as EV charging, creates the largest proportion of these emissions. Electricity for streetlighting, traffic signals, and signs are also very significant. Water accounts for a small proportion of the Buildings footprint and is covered in the water section.



Dorset Council is responsible for over 1,400 assets, including office buildings, schools, care homes, hotels, leisure centres, car parks, streetlights, depots, county parks, and farms. The Council has no direct influence over many of these assets, which can be leased or managed by third parties. Our measure footprint is therefore largely from our own operational buildings, care homes, and streetlighting.

The figures above have included the data from the schools under Local Authority control but have excluded Academies, who are responsible for their own use of energy.

NOTE – This is an incomplete picture. Dorset Council has only been in existence since April 2019, a full year of data is not yet available for buildings energy use. This is expected to become available in June 2020. It is likely that buildings emissions are underestimated by 10-20% at this time.

2. PROGRESS / CURRENT SITUATION

National

Overall emissions from buildings in the UK have declined by 41% since 2007, due to a combination of high energy prices, improved energy efficiency, decarbonisation of the electricity grid, and changes in economic activity (such as recession and the continuing move to a service economy).

Over recent years, the regulatory framework relating to new buildings and energy performance has changed. Some alterations have been made to strengthen Part L of the Building Regulations, but other measures have been removed or reduced (such as the further tightening of Part L to require zero carbon homes and the sustainability planning tool the Code for Sustainable Homes). The Government has

recently consulted on the Future Homes Standard, which will set the legislative framework for future building standards and building regulation.

New buildings account for only around 4% of the building stock. Therefore, many of the emissions from buildings come from older stock.

The Energy Company Obligation (ECO) is a government energy efficiency scheme in Great Britain that helps to reduce carbon emissions and tackle fuel poverty. Energy suppliers are obligated to promote measures which improve the ability of low income, and fuel poor and vulnerable households to heat their homes.

This includes actions that result in heating savings, such as the replacement of a broken heating system, upgrade of an inefficient heating system, or insulation upgrades (Ofgem). Dorset Council helps people access ECO grants through the Healthy Homes Dorset Scheme, although the ECO scheme allows other providers to also operate within Dorset.

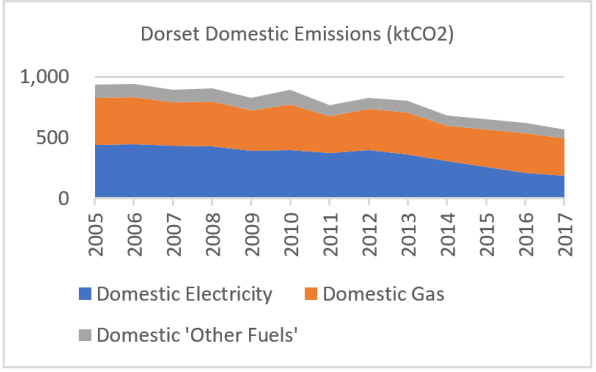
Dorset

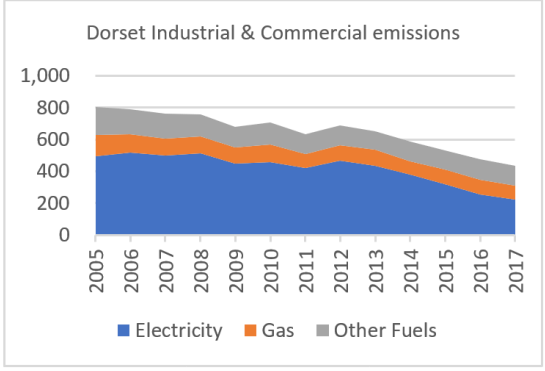
The building emissions within Dorset have fallen by over 40% from 2005 to 2017, in line with national figures. Electricity emissions have reduced by 57 % during this period (largely grid decarbonisation) and emissions from gas and other fuels have reduced by 25-30%, partly from reduced consumption and fuel switching (such as switching from oil to gas to reduce carbon intensity).

For the Domestic sector, building emissions are dominated by gas, which is used for heating our homes (see the Dorset Domestic Emissions graph below). Commercial emissions are less dependent on gas, with a higher proportion of emissions being from the use of electricity and other fuels.

Dorset residents can access information and advice on domestic energy efficiency via Dorset Council's Healthy Home Scheme. In addition, 150 homes a year are benefitting from funding to improve heating systems and tackle fuel poverty.

Organisations in Dorset can currently access free advice and grant funding to improve their energy efficiency or generate renewable energy via the Low Carbon Dorset Programme. This programme has successfully supported approximately 200 organisations and provided £2.5m in grant funding to facilitate projects valued over £5m. While this project is currently only funded until the spring of 2021, it has created several innovative best practice case studies that can be replicated across Dorset.





A significant proportion of the reduction in emissions realised so far have come from the decarbonisation of the electricity that Dorset's buildings consume. Looking forward, we can expect further reductions in the carbon intensity of electricity supplied through the national grid, but the rate of reduction is slowing.

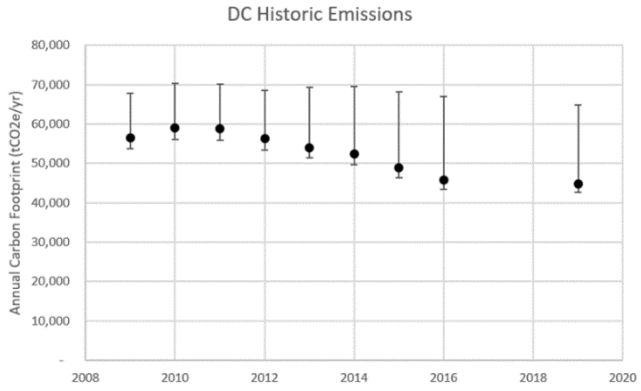
In terms of new buildings, Dorset Council's Building Control function aims to ensure that buildings meet their expected performance standards under the current Part L of the Buildings Regulations. However, there are no policies in place to insist on more than Part-L compliance. There is also a Biodiversity Protocol and Compensation Framework in place to protect and enhance Dorset's unique ecological assets.

Dorset Council

It is not possible to analyse the historic progress of Dorset Council, as the organisation has only existed since 2019. Therefore, we do not have a full set of data for that year. However, each of the constituent local authorities had a good history of energy conservation in their buildings.

The former County Council had an ongoing energy conservation and carbon reduction programme, which aimed to reduce emissions by 30% (from 2009 levels) by 2020. They were making slow but good progress, with a 15-20% reduction achieved. However, this work largely stopped and was last measured in 2015. Similarly, the former district and borough councils all had carbon reduction plans, though measurement of progress against them stopped sooner than the former County Council's, in 2012 or 2013.

The information available does allow some limits to be placed in the historic total footprint of the organisations, which now form Dorset Council. This can be seen in the Dorset Council Historic Emissions plot below.



Historically, the work taken by the Council's former constituent organisations has resulted in several good examples of sustainable construction, renewable energy generation, and energy efficiency.

Particularly good progress has been made to reduce electricity use in streetlighting, which has decreased by 47% since 2008. This is a result of more energy efficient lamps, part-night burning and, more recently, LED replacements.

Currently, Dorset Council is undertaking a full asset review to ensure the estate is fit for the requirements of the new Council. This will undoubtably change the makeup of the estate, which will further be influenced by the Council's transformation programme.

Several new building projects are being developed / led by Dorset Council, including the Weymouth Peninsula and the Building Better Lives programme. These will increase Dorset Council's carbon emissions, unless they are designed to achieve true net zero carbon now or in the near future.

3. FUTURE DIRECTION - SCALE OF THE CHALLENGE

National

In order to eliminate carbon emissions from buildings, all energy that is used in buildings to maintain a comfortable indoor environment in terms of thermal comfort (heating or cooling) and air quality (ventilation), as well as energy used for lighting, hot water, and electrical equipment, will need to be energy generated from renewable sources (such as solar, wind, hydro, tidal, and biomass). This means that energy demand must be reduced as much as possible, and heating needs to be switched to either heat pumps or biomass.

Hydrogen may also be available in the medium term as a replacement for natural gas, but this technology is immature and there is no national infrastructure in place. Gas network companies are currently working with the Government to trial hydrogen technologies to test viability on a domestic scale. Hybrid gas / hydrogen boilers are also being developed as a method to transition to hydrogen, if this becomes a reality. Hydrogen will only help if it is itself generated in a low-carbon way (either electrolysis from renewable electricity or stripped out of fossil methane with carbon capture and storage).

Short term, a huge retrofit programme is required to significantly improve the thermal efficiency of the current building stock and furthermore upgrade heating systems to heat pumps. Longer term, a potential mixed economy, which includes hydrogen use, is required for buildings on the gas grid.

Smart energy management systems, including storage, will become critical to ensure we maximise the use of locally produced renewable energy and minimise the strain on the grid.

Buildings must also be able to operate efficiently in changing climatic conditions, minimising any heat gain from increased temperatures on secure foundations that do not succumb to subsidence due to longer dry spells. They must be fitted with energy and water efficient equipment and be located to prevent risk from flooding, with future-proofed drainage systems.

Given the competition for land use, buildings will be an important part of addressing the ecological emergency, by providing potential structures for green roofs and green walls. The national policy framework for the future of heat is not yet established. There is no plan for low-carbon heat, other than the fact that fitting gas boilers in new buildings will be banned from 2025.

The possibility of hydrogen in the gas grid and the problems of meeting peak electricity demand, if heat pumps are widely adopted, make decisions regarding the heating systems of any building on the gas grid challenging. In addition, the Future Homes Standard is still to be finalised, but critics suggest this will not go far enough fast enough to meet zero carbon requirements for new homes.

Dorset

In order to hit the national carbon reduction target, Dorset will need to ensure all existing and new buildings produce net zero carbon emissions by 2050 at the latest. This will require significant retro fit programmes for improving building efficiency, switching heating systems to those powered by renewable energy (e.g. heat pumps, biomass and hydrogen), and generating vastly more renewable energy than we currently do.

There will be a significant need to switch from existing domestic gas and oil central heating systems (currently 82% of all domestic heating systems). Currently, these provide the most cost-effective form of home heating and switching to other forms, such as electric, could significantly increase levels of fuel poverty. Dorset Council has no powers to insist upon retrofitting, and so any effort will either require incentives or action at a national level. This is in addition to significant development research and development of new low carbon or carbon neutral domestic heating systems.

We will need to heat our buildings with low carbon and / or renewable heating, change our behaviours towards energy use, and increase the adoption of energy efficiency technologies in both commercial and domestic buildings.

Dorset may potentially have 1,800 new homes each year, which will add to the County footprint if they are not built to net zero now or built to be easily and cheaply retrofitted to enable this in the near future. As national and local policy currently stand, these homes will be built with a non-zero operating footprint.

The Low Carbon Dorset Programme is in the process of applying for more funding to continue this successful project until 2023. If the application is not successful, there will be a need to look for alternative funds to assist organisations and businesses to improve their resource efficiency. There is no legislative requirement for them to do so, and projects are rarely financially viable without some subsidy.

Arguably, the programme should be massively increased in scope if Dorset is serious about reducing its emissions. The Government has mentioned a Future Prosperity Fund, aimed at supporting businesses in place of the current EU funding, which may be a suitable source of funding. However, the details of this fund are yet to be defined.

Dorset Council

The Council will have to significantly invest in its own buildings and assets to enable a zero-carbon estate. There are three key actions that will need to be taken:

- **Improve energy efficiency**

Ongoing energy efficiency measures will be critical to reduce future energy demand and therefore reduce the scale of additional renewable energy capacity required. A building retrofit programme will be required to improve the thermal efficiency of buildings and reduce electricity demand from lighting, cooling, IT, etc. All streetlighting and road signs / signals will need to switch to LEDs and be switched off where / when not required.

- **Transition from fossil fuels**
  The next challenge is heating. This will require a switch from fossil fuels (gas and oil) to electric heat pumps or biomass to meet heating demand, or potentially a phasing in of hydrogen if this becomes available in Dorset.

- **Sourcing energy from renewable sources**
  In addition to switching from fossil fuels, the Council will need to invest in a significant increase in renewable electricity generation, at a small scale on Council buildings (e.g. solar PV) and by investing in larger-scale renewable energy installations. An estimated 60MW of renewable electricity generation capacity will be needed to meet the demand of a future zero-carbon Dorset Council estate (see the Energy section for more details).

The results of the assets review will dictate the number of buildings to be retained by Dorset Council, scale of a programme of full retrofit, and switch to carbon neutral heating needed. Any rationalisation of the estate will result in energy savings and a reduction in Dorset Council's carbon emissions (though not those of Dorset, or critically, the total global emissions). However, the scale of this is currently unknown.

The scale and speed of the transformation will depend on the target date for zero carbon operations and the level of investment and resources made available to enact schemes and programmes of work.

4. KEY ISSUES

- Substantial investment will be needed in the long term
- Retrofitting existing housing stock is a very significant challenge and requires action by different organisations, government, and individuals
- The lack of national strategy for heat, resulting in uncertainty for investment decisions
- The lack of renewable energy capacity in Dorset, which means the demand of buildings cannot be met from renewable sources
- The lack of sufficient renewable energy, carbon capture, and storage capacity in the UK as a whole, which means that any heat decarbonisation route taken will not be able to achieve zero-carbon operation, as it would be dependent upon fossil-fuel energy to power the heat pumps or make the hydrogen
- The lack of legal requirement to retrofit buildings, combined with the relative cost of retrofit measures and average energy costs
- The rural nature of Dorset, resulting in a relatively high proportion of older, detached, hard-to-treat, and off-gas-grid buildings

- Fitting gas boilers is currently the most cost-effective way of addressing fuel poverty but maintains reliance on fossil fuels
- Current planning legislation that prevents setting zero carbon standards for new builds
- Higher build specifications to address the climate emergency may increase build costs and conflict with the need for more affordable housing
- Significant embedded energy and carbon in typical construction materials
- Dorset Council is currently undertaking an asset review and therefore it is unclear which buildings will be retained, making it difficult to plan any retrofit programme.

5. OPPORTUNITIES

Direct Action

- Leading by example by ensuring Dorset Council's estate becomes zero carbon by 2050, or earlier, by decarbonising our own estate through retrofit programmes to reduce energy use and generate renewable energy locally.
- Ensure climate change is a central consideration throughout the asset review and in the development of Dorset Council Asset Management plan.
- Develop and promote case studies and examples of best practice on our own estate to encourage replication by others, such as ecological practices or innovative approaches to decarbonise buildings and use of low carbon technologies.
- Establish policies to ensure that any of new build projects where Dorset Council is the landowner, client, or designer are designed to be zero carbon from the outset.

Indirect Through Service

- Enforce energy efficiency standards in new buildings and building extensions and ensure that development is brought forward in the most favourable locations that protect them from flood risk and minimise travel through our building control and planning functions
- Encourage designs and layouts which lend themselves to low carbon energy solutions, such as PassivHaus and solar PV, and provide guidance and advice for developers to achieve zero carbon standards through our planning function. We do not currently have the power to enforce improvements beyond the Building Regulations.
- Ensure the Dorset Housing Strategy incorporates the reduction of carbon emissions and increased risk to climate impacts and includes a strategy for Hard-to-Treat properties and enforcement of minimum energy efficiency standards in the private rental sector.
- Develop local plan policies to ensure climate risks are identified and avoided in new developments, including flood risk and overheating and, as far we can within our powers, relax the Listing and Conservation Zone rules to allow low-carbon measures, such as better windows and solar PV.

- Secure funding to expand and extend the Low Carbon Dorset Programme. If this is successful, seek funding to extend it much further, both in time and scope.

Influence / Partnership

- Lobby the Government for clarity on the national strategy for heat and a national policy framework that supports zero carbon buildings, higher energy standards in the Building Regulations, the ability to enforce them ourselves through the planning system, and for more funding for climate risk management.
- Improve energy efficiency of current housing stock. Dorset Council is currently working in partnership with several bodies to deliver programmes to improve energy efficiency in existing housing stock. This is as well as encouraging behaviour change in both the residential and non-residential sectors, by providing information and guidance and signposting to sources of funding, such as the Healthy Homes Dorset and Low Carbon Dorset programme. There is, scope to expand on this work dramatically.
- Seek to decarbonise heating in Dorset through investigating largescale installation of low carbon sources of heating (air / ground / water source heat pumps) and undertaking heat mapping to identify opportunities. Encouraging all buildings off the gas grid to switch to heat pumps or biomass for heating and using social housing as a test bed for low carbon heat in partnership with RSLs.
- Work with other councils or partners to develop area-wide retrofit schemes at the most appropriate scale, such as trialling Energiesprong (or similar) retrofits (100 a year), initially in social housing and then rolling out to the private sector.
- Expand provision of information and materials to educate and engage residents and businesses with low carbon technologies, energy efficiency measures, and sources of funding. This must include a campaign to educate people about the future of heat and the fact that off-gas-grid properties will soon (likely within the lifetime of any new heating plant installed today) need to switch to heat pumps or biomass.
- Work with partners to increase the resilience of communities and buildings to climate change by fully understanding the future climate risks within Dorset, and ensuring Emergency Plans are adapted to reflect changing climate risks and are tested and proven fit for purpose.
- The opportunities of decarbonising buildings and making them resilient to climate change in Dorset has several additional benefits, including:
    - Upgrading the quality of housing stock, making homes healthier, more comfortable, and safer from the impacts of climate change
    - Reduced energy bills for residents, helping tackle fuel poverty
    - Improving the quality of commercial premises, creating better working environments, reducing energy bills, and helping Dorset businesses to become more productive and competitive
    - Green roofs and walls can result in less heat gain, resulting in a reduced demand for energy needed for cooling purposes, as well as enhancing ecology
    - New builds provide a great opportunity to design out energy use and in climate resilience.

6. OBJECTIVES

- Ensure Dorset Council's estate becomes zero carbon by 2040
- Ensure all new Council developments are zero carbon
- Decarbonise heating in housing and community, public, and commercial buildings
- Improve energy efficiency of current housing stock
- Improve energy efficiency of organisations buildings
- Increase buildings' resilience to climate change