Carbon reduction topic paper

This topic addresses: Carbon reduction in new buildings.

SA Objective(s):

1. To achieve the city's ambition to reach net zero **carbon emissions** by 2040

SEA Theme: Climatic factors, material Assets and air.

Introduction

The Council has a legal duty[1] to ensure that the new Local Plan includes policies that, taken as a whole, have been designed to secure action on climate change. This is backed up through national policy[2] which sets out that the planning system should help to: 'shape places in ways that contribute to radical reductions in greenhouse gas emissions', and that Local Plans should take a proactive approach to mitigating climate change. In recognition of the need to take action on climate change, the Council declared a climate emergency in 2019 and has committed to achieving net zero carbon emissions as a city by 2040[3].

Alongside the transport network, the built environment is a primary contributor to Oxford's carbon dioxide emissions, a potent greenhouse gas which is causing global climate change. The power used to heat and light buildings as well as the resources used as part of the construction process all have a role in these emissions. In order to meet national and local commitments on mitigating climate change, it is essential that new development being built in the city is designed to be fit for a zero carbon future, and that existing development is retro-fitted to reduce its carbon footprint. This topic paper sets out the context and key issues in relation to reducing carbon in buildings which will need to be considered as the Local Plan is developed. Reducing carbon in the transport system is dealt with in the transport topic paper.

Plans Policies and Programmes

International and national context

The 2016 Paris agreement

At the international scale, the UK was one of 196 parties to sign up to a legally binding international treaty on climate change which was adopted in Paris and entered into force in 2016. The objective of the agreement was to limit global warming to well below 2 degree Celsius (but preferably 1.5 degrees

[1] As set out in Section 19(1A) of the Planning and Compulsory Purchase Act 2004
[2] Para 148 of the National Planning Policy Framework (Feb 2019)
[3] https://www.oxford.gov.uk/news/article/1781/council_sets_out_action_plan_to_bring_about_a_zero_carbon_oxford_by_2040_or_earlier

Celsius), compared to pre-industrial levels. This renewed commitment for action on climate change has guided further reform of the UK's own national targets on limiting future carbon emissions.

Climate Change Act 2008 (as amended)
At the national level, this Act introduced into law a set of statutory targets for reducing national carbon dioxide levels below 1990 levels at intervals up to 2050. The targets set out in the Act have been amended since to reflect updated goals for climate mitigation, such as in response to the Paris Agreement, most recently setting out a target of net zero emissions by the year 2050. A further amendment to achieve a 78% reduction in carbon emissions by 2035 is expected to come into law in coming months.

Planning and Compulsory Purchase Act 2004
This sets out the current structure for the English Local Planning framework. The Act includes, within section 19 (as amended by the Planning Act 2008), the legal duty to ensure that, taken as a whole, planning policies contribute to climate change mitigation and adaptation.

Planning and Energy Act 2008
This act granted local authorities powers relating to energy, it allowed them to set requirements that a proportion of a new development's energy need should be sourced from renewable/low carbon technologies in the locality of the development. It also set out that they could require energy efficiency standards that went beyond those levels set in Building Regulations, however this was superseded by the Written Ministerial Statement on Plan Making (2015) as set out below.

25 March 2015 Written Ministerial Statement on Plan Making
In 2015 the Government introduced new national optional technical housing standards, intended to streamline and simplify the various standards for housing developments, replacing the Code for Sustainable Homes and other guidance. This set out the expectation that local authorities should not set energy efficiency standards with requirements above the equivalent to level 4 equivalent within withdrawn Code for Sustainable Homes[4].

National Planning Policy Framework (NPPF)
Paragraphs 148-154 of the NPPF set out the Government's approach to planning and climate change. In particular paragraph 148 sets out the approach for the planning system as a whole:

148. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Paragraph 149 sets out the over-arching approach for Local Plans:

149. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts,

[4] More detail can be found in Paragraph: 012 Reference ID: 6-012-20190315 of the PPG: https://www.gov.uk/guidance/climate-change

such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

National Planning Practice Guidance (PPG) including National Design Guide/National Model Design Code

The National Design Guide (2019) which now forms part of the PPG includes a section on "Resources" which sets out that "well-designed places and buildings follow the energy hierarchy". It also provides that the Energy Hierarchy is as follows:

- Reducing the need for energy through passive measures including form, orientation and fabric;
- Using efficient mechanical and electrical systems, including heat pumps, heat recovery and LED lights;
- Maximising renewable energy especially through decentralised sources, including on-site generation and community-led initiatives.

Planning White Paper

There are four proposals within Pillar 2 of the Planning White Paper that relate directly to carbon reduction. These are as follows:

Proposal 15: We intend to amend the National Planning Policy Framework to ensure that it targets those areas where a reformed planning system can most effectively play a role in mitigating and adapting to climate change and maximising environmental benefits.

Proposal 16: We intend to design a quicker, simpler framework for assessing environmental impacts and enhancement opportunities that speeds up the process while protecting and enhancing the most valuable and important habitats and species in England.

Proposal 17: Conserving and enhancing our historic buildings and areas in the 21st century.

Proposal 18: To complement our planning reforms, we will facilitate ambitious improvements in the energy efficiency standards for buildings to help deliver our world-leading commitment to net-zero by 2050.

The White Paper does not provide too much detail on the above, other than to set out what the Government's ambitions are. Clearly there are mechanisms outside of the planning system (e.g. Building Regulations which can also provide a route to reducing carbon emissions in new development.

Updates to Building Regulations (including Future Homes Standard and Future Buildings Standard)

Outside of the planning system, a review of national Building Regulations has also been ongoing.

The Regulation 25b amendment came into force for all new buildings requiring them to be 'nearly zero carbon' from 2021 onwards. This change will be supported by a series of updates to the technical standards within the Building Regulations assessment process itself in order to ensure that new development meets this higher specification. The government has been consulting on these updates as part of its Future Homes Standard consultation[5] (which was run in 2020) and Future Buildings

[5] Future Homes Standard consultation: https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings

Standard consultation[6] (which ran in early 2021). Each of these consultations has proposed various reforms to the technical requirements within Building Regulations in order to ensure that the development of new buildings is net zero ready, as well as to update other approaches such as ventilation, the performance gap and overheating. The changes include enforcing a higher standard of energy efficiency and carbon reduction across all new buildings.

The outcome of the Future Homes Standard consultation was published at the start of 2021 and sets out the government's proposed approach towards implementing its Future Homes Standard in 2025, which will result in new homes being producing at least 75% lower CO2 emissions than those built to current Building Regulations standards, as well as being 'zero carbon ready'. In the meantime, the Government has confirmed its intention to carry out an interim uplift to Building Regulations that would result in homes producing 31% less CO2 emissions compared to current standards. The results of the Future Buildings Standard consultation, which deals with standards in other non-residential buildings, is expected later in the year. The consultation proposed similar measures to address efficiencies in non-residential development, including an interim uplift later in 2021, intended to deliver a 27% reduction in carbon emissions on average compared to existing Building Regulations standards, and that upon implementation of the full Future Buildings Standard in 2025, buildings are 'zero carbon ready' – whereby even if they are still emitting some emissions, these should reduce to zero over time (e.g. with the continued decarbonising of the energy supply sourced from the national grid as fossil fuels are phased out of the system).

Regional and local context

Oxfordshire Plan 2050

The Oxfordshire Local Planning Authorities (including Oxford City Council), working together as the Oxfordshire Growth Board, are developing a Joint Strategic Spatial Plan (JSSP) for the area, known as the Oxfordshire Plan 2050, which will set out strategic policies for the county. An initial consultation was launched on the Plan in February 2019 and a further consultation is being launched in the summer of 2021. The summer 2021 consultation will include a number of options, which will include looking at how climate change and carbon reduction can be addressed across the County.

The Oxfordshire Plan will be submitted to the Secretary of State for examination in September 2022. It will be important to ensure that the Oxfordshire Plan and the Oxford Local Plan 2040 work closely together; there will be many common themes and objectives and much shared evidence behind the two plans.

Oxford Local Plan 2036 (Adopted June 2020)

Policy RE1: Sustainable design and construction – Sets out the Council's expectations regarding carbon emissions in new development. The policy requires new development to achieve reductions in carbon emitted beyond those set out in national Building Regulations. The requirement applies to new build

[6] Future Buildings Standard consultation: https://www.gov.uk/government/consultations/the-future-buildings-standard

residential dwelling houses, or 1,000m^2 or more of: C2 (including student accommodation), C4 HMO, Sui Generis HMO, as well as 1,000m^2 or more of any non-residential development.

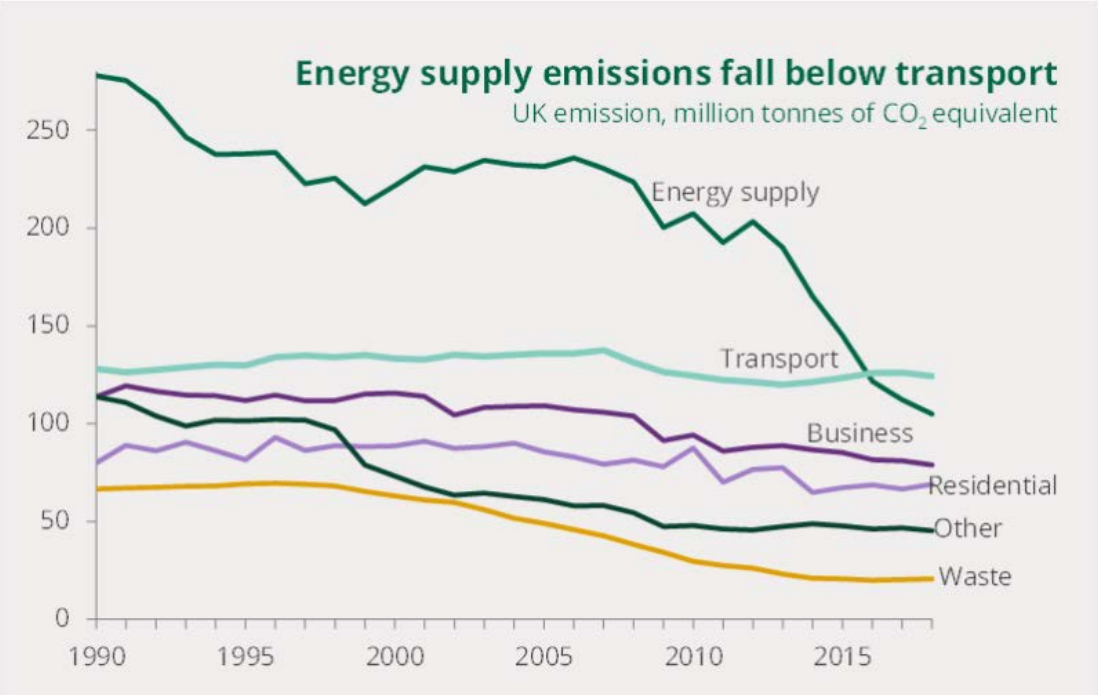
These targets are increased at intervals throughout the plan period, beginning at 40% reduction, before moving to 50% by 31 March 2026, and then zero carbon after 2030 (for residential development). The reduction is to be secured through on-site renewables and other low carbon technologies and/ or energy efficiency measures.

There are a variety of other policies in the adopted Local Plan that have a role in contributing to reductions in carbon emissions in the city. Such policies include those that encourage and enable sustainable/active travel and the transition to electric vehicles (policies M1 to M5), as well as policies relating to protecting and enhancing Oxford's green and blue infrastructure network (policies G1 to G8). The topics of green infrastructure and transport are addressed in depth in accompanying topic papers alongside this consultation.

Current situation

When looking at the contributions of emissions from different countries, the UK is currently ranked as the 16th largest emitter accounting for 1.1% of all global emissions[7]. Between 2010-2019 UK carbon emissions fell by 29%. The graph in Figure 1 shows that in 2018, transport was the UK's highest emitter of carbon emissions, while all other sectors, in particular energy generation associated with the shift to renewable energy sources, saw reductions.

Figure 1: UK greenhouse gas emissions national statistics 1990 to 2018, DBEIS

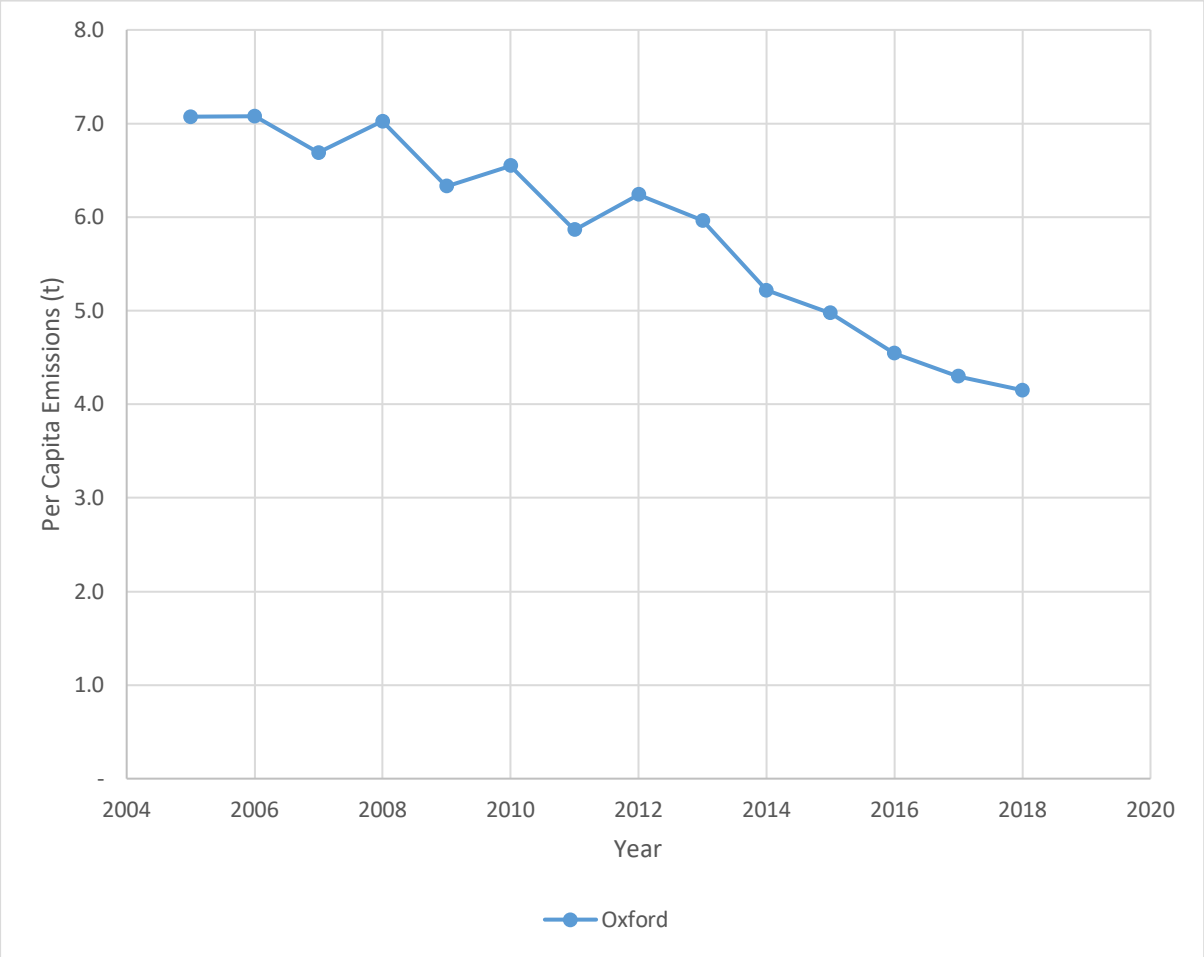


Indeed, per capita emissions in the city have been steadily falling in recent years as is highlighted in Figure 2, though they are still far from zero. The decline, in part, likely reflects the steady

[7] https://commonslibrary.parliament.uk/uk-and-global-emissions-and-temperature-trends/

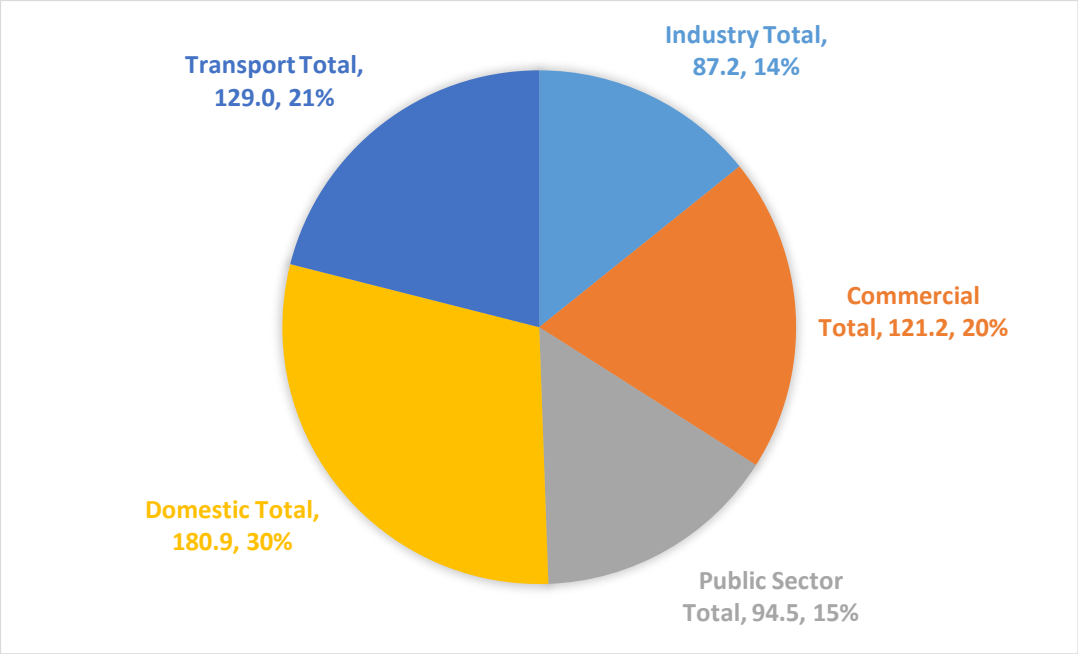
decarbonisation of the energy we source from the national grid as the country switches to bigger amounts of renewable generated energy and away from fossil fuel sourced energy.

Figure 2: Oxford carbon dioxide emissions per capita (based on data from UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018)



Analysis of the greenhouse gas emissions that are generated for the entire city is challenging and estimates can vary based upon methodology and data sources used. The Department for Business, Energy and Industrial Strategy (BEIS), publishes estimates on carbon emissions from each local authority, the most recent of which was published in June 2021 and relates to 2019 (the data is generally delayed by a couple of years). The estimates for Oxford are shown in Figure 3, and highlight that the domestic sector is responsible for the largest proportion of carbon emissions being produced in the city, followed by transport.

Figure 3 – BEIS estimates of carbon emissions in Oxford in 2019, (figures are in kt CO_2)[8]



The Council has also commissioned its own analysis of emissions in the city to support its work on addressing the climate emergency. In its Climate Emergency Strategy Support report produced by the consultancy Anthesis in 2019[9], an assessment of all greenhouse gas emissions across the city was made (not just carbon, as is highlighted in the BEIS figures above). This assessment drew upon data from both BEIS and from the SCATTER cities tool[10] as well as local data, to produce a sector-by-sector breakdown of emissions in the city in order to help understand those areas that the City Council has direct control or influence over, as well as areas where partnership work is needed in order to reduce emissions. It identifies key influencers and underlines the need for organisations across Oxford to work together to tackle carbon emissions.

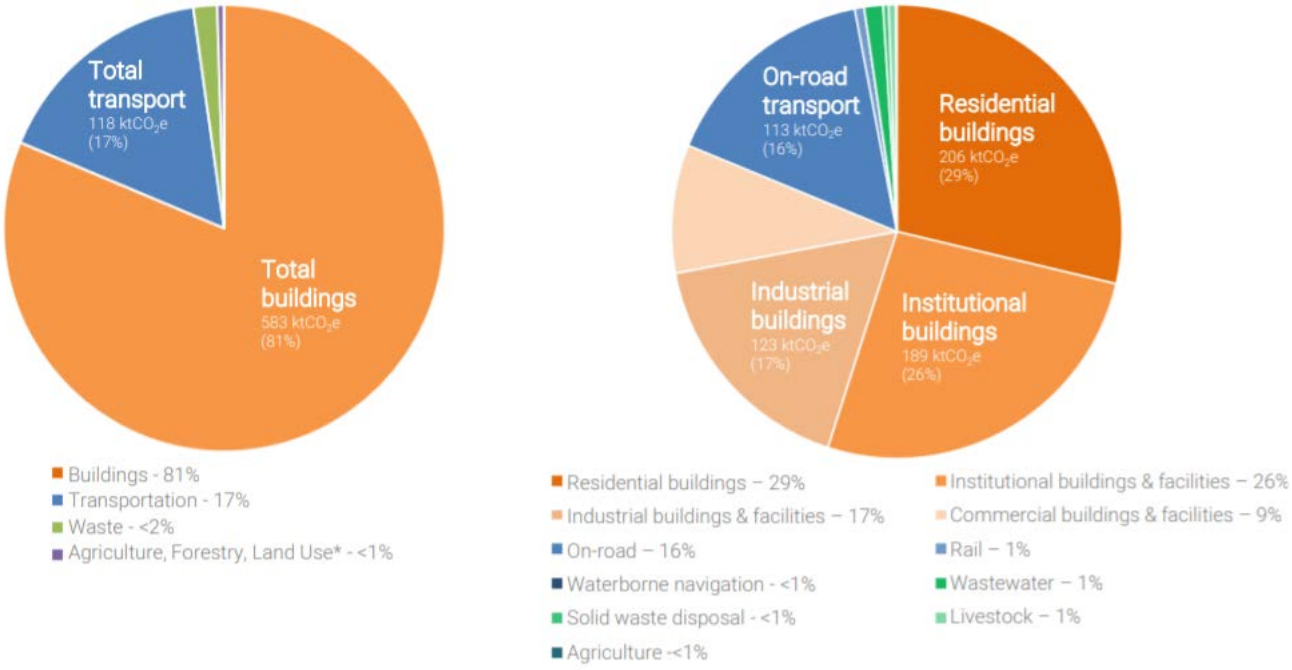
As shown in Figure 4, the analysis highlighted that the existing built environment is responsible for the majority of emissions in Oxford (81%), followed by the transport sector (17%). Within the built environment, it was determined that existing residential buildings are the largest source of emissions (29%) in the city.

[8] BEIS Emissions of carbon dioxide for Local Authority areas data: https://data.gov.uk/dataset/723c243d-2f1a-4d27-8b61-cdb93e5b10ff/emissions-of-carbon-dioxide-for-local-authority-areas

[9] Oxford City Council Climate Emergency Strategy Support report (Anthesis, 2019): https://www.oxford.gov.uk/news/article/1184/new_data_on_carbon_emissions_in_oxford

[10] https://scattercities.com/

Figure 4 – Greenhouse gas emissions in Oxford broken down by sector and sub-sector (this uses 2016 & 2017 baseline data)[11]



It is important to remember that these assessments are a snapshot in time, they also reflect the city's emissions as they were prior to the onset of the Covid 19 pandemic, the impacts of which are discussed in greater detail below. New data and analysis is likely to become available as the Local Plan develops, such as through the ongoing work of Zero Carbon Oxford partnership, and this will be incorporated into the background work where this becomes available.

Clearly, however, the built environment plays a significant role in the emissions profile of Oxford. The emissions associated with buildings predominantly arise from the need to light, and heat these spaces for occupants. According to EU approximations[12], energy use in residential buildings typically follows a broad breakdown to the following:

- Heating (64.7%)
- Water heating (14.5%)
- Lighting and appliances (13.8%)
- Cooking (5.4%)

Each new building that is constructed in the city is likely to add to the carbon footprint already associated with these existing buildings if appropriate steps are not taken to mitigate the emissions associated with the above energy use.

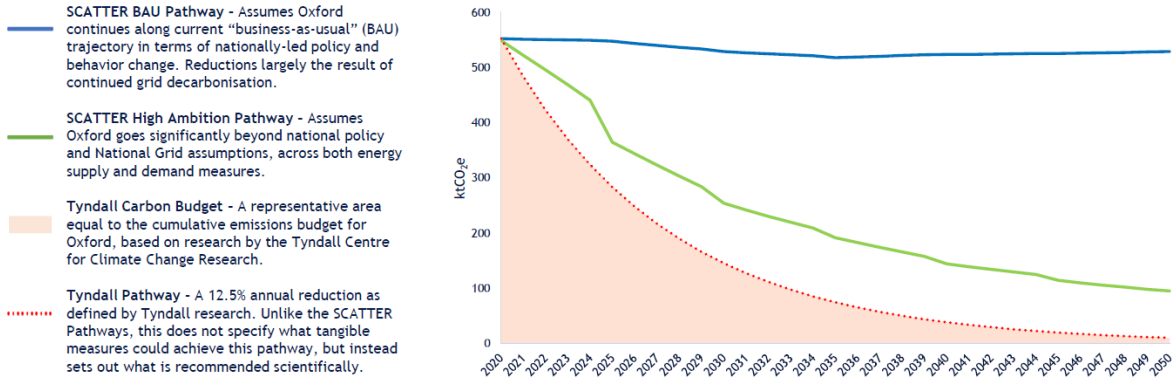
As Figure 4 demonstrates, carbon emissions are not only associated with residential buildings however, other sub-sectors of the built environment are also responsible for emissions including institutional buildings and industry. There is a wide range of manufacturing businesses in Oxford, with several automotive and hi-tech engineering and pharmaceuticals companies based within the city –

[11] Oxford City Council Climate Emergency Strategy Support report (Anthesis, 2019): https://www.oxford.gov.uk/news/article/1184/new_data_on_carbon_emissions_in_oxford
[12] European Commission Eurostat - Energy consumption and use by households: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190620-1

these provide important economic benefits to Oxford which need to be balanced with the need for ongoing decarbonisation. Positive progress is already being made however, for example, almost half of the city's industrial space is taken up by the BMW MINI Plant and BMW are one of the largest employers in the region. As the Anthesis 2019 report highlighted, they were also one of the founding members of Low Carbon Oxford and the largest Solar PV array in the city can be found at the plant.

The scale of decarbonisation that is required in the city to achieve the national target of net zero by 2050, and Oxford's own goal of net zero by 2040 is significant. Figure 5 shows various 'pathways' for carbon reduction necessary to reach net zero by 2050 which were developed by Anthesis for the City Council's Climate Emergency Strategy Support report. It illustrates that if activity in the city were to continue with no change, a 'business as usual' approach, then greenhouse gas emissions would remain fairly level in the coming years. This is set against the Tyndall pathway, which is an assessment of the scale of emissions reduction the city would need to achieve to meet international targets of limiting future climate change. More radical change is illustrated by the green line and shows that going beyond national policy wherever possible (not just in planning), the city could potentially achieve a larger reduction in emissions towards 2050, but that there would still be a level of emissions by the end of the period which would likely ned to be addressed in future either through offsetting, or development of new technology to secure higher rates of reduction.

Figure 5 – Carbon reduction pathways to achieve net zero by 2050[13]



Centre for Sustainable Energy viability report looking at costs of zero carbon (December 2018)[14]

This independent report was prepared as a piece of background evidence underpinning planning policies for local authorities in the west of England investigating the costs of incorporating zero carbon measures as part of new homes and buildings. It presented detailed energy and cost modelling for a range of dwelling and non-domestic buildings, investigating a range of energy efficiency, low carbon heating and renewable power generation strategies for five house types. Various policy options were considered in terms of costs, exploring minimum levels of energy efficiency, onsite carbon savings and

[13] Oxford City Council Climate Emergency Strategy Support report (Anthesis, 2019): https://www.oxford.gov.uk/news/article/1184/new_data_on_carbon_emissions_in_oxford

[14] https://www.bathnes.gov.uk/sites/default/files/sitedocuments/Planning-and-Building-Control/Planning-Policy/LP20162036/cost_of_carbon_reduction_in_new_buildings_report_publication_version.pdf

the achievement of net zero carbon standards considering just regulated energy or both regulated and unregulated energy.

The findings of this study suggested that it is possible, for an additional capital cost of between 5-7%, to achieve net zero regulated carbon emissions from a combination of energy efficiency on site carbon reductions and allowable solutions for new homes and non-domestic buildings. Achieving net zero regulated and unregulated emission is likely to result in a cost impact of 7-11% for homes.

The study suggests that the future costs of achieving the standards proposed were likely to fall over time due to reducing costs of technology and decarbonisation of the electricity grid. It then goes on to highlight that although the adoption of minimum levels of energy efficiency as part of a policy target would be liable to increase the costs of achieving carbon savings (net zero carbon costs might be 2% lower without energy efficiency requirements), that this could be justified on the basis of the positive impact in reducing household bills and because more energy efficient homes will reduce overall (and peak) demand for energy. This should in turn reduce costs on the wider energy generation and supply infrastructure.

Climate Emergency Declaration (Oxford City Council)

In January 2019, Oxford City Council members unanimously declared a climate emergency and agreed to create a citizens assembly in Oxford to help consider new carbon targets and additional measures to reduce emissions. The Oxford Citizens Assembly on Climate Change took place on the weekends of Saturday 28 September and Sunday 29 September, and Saturday 19 and Sunday 20 October 2019.

Ipsos MORI's headline findings from the Citizens Assembly were:

- The majority of Assembly members felt that Oxford should aim to achieve 'net zero' sooner than 2050. However, even among those who agreed with this, there was little consensus on when 'net zero' should be achieved
- There was widespread belief that Oxford should be a leader in tackling the climate crisis
- Assembly Members found a great deal of encouragement in the examples of what is already being done across Oxford to address climate change and meet the goal of becoming 'net zero'
- Enhanced biodiversity was central to the overall 'net zero' vision of Oxford with increased flora and fauna in the city centre, along with more cycling, walking, and public transport, and far fewer cars
- The buildings sector should adopt improved building standards, widespread retrofitting, and more domestic and non-domestic energy needs being met by sustainable sources
- Around one in four to one in three Assembly Members rejected the most ambitious – and, therefore, challenging to achieve – visions of a future Oxford
- They were also perturbed by the extent to which the burden of change was – in their eyes – being placed on individuals

- There was, therefore, a sense that the council needs to communicate a shared vision and strategy to reaching 'net zero' that shows the roles played by local and national government, businesses, and individuals
- Specifically, Assembly Members wanted more information about how to recycle correctly
- There was a demand for more education and information provided for the wider public in Oxford to help them understand what they can personally do to help

Zero Carbon Oxford Partnership

In February 2021, a group of leaders from 21 of Oxford's major businesses and organisations gathered at a virtual Zero Carbon Oxford Summit and gave their support to the aspiration of achieving net zero carbon emissions as a city by 2040 by signing the Zero Carbon Oxford Charter.

The Summit brought together leaders from both City and County Councils, both universities, both hospital trusts, major businesses including BMW, Unipart and LandSec, transport providers, schools and further education colleges, anchored institutions, and other organisations that are strategically important to achieving a net zero city by 2040.

The Council's Scientific Adviser, Nick Eyre, Professor of Energy and Climate Change at the University of Oxford, addressed the Summit confirming that the 2040 net zero date was technically achievable and ambitious for the city. A detailed roadmap to net zero emissions for Oxford has been commissioned and is set to be published in summer 2021.

The closing of the summit was marked by the signing of the Zero Carbon Oxford Charter, and the creation of a new Zero Carbon Oxford Partnership for the city. The new Partnership will involve those organisations gathered at the Summit as well as enabling a wider range of stakeholders to play their part in cutting Oxford's carbon footprint to zero. By agreeing to join the Partnership, organisations will be supporting an ambition of achieving net zero carbon emissions as a city by 2040.

What trends to data show?

The overall trend in carbon emissions per capita for Oxford is similar for the rest of the country in showing a gradual decline year on year. In part, this reduction is likely due to the ongoing national effort of decarbonising the energy sourced through the national grid as we switch to greater proportions of renewables and phase out reliance on fossil fuels for energy generation. The city's existing footprint of emissions is still significant however and the built environment, particularly residential buildings, are responsible for the majority of these emissions. New buildings coming through the planning system will be making a small additional contribution to this each year, however the majority of these emissions are coming from buildings that are already constructed and in existence suggesting a significant need for retro-fitting to happen alongside ensuring that new development does not exacerbate the problem.

The scale of decarbonisation that is required in the city in order to achieve the city's ambitions of becoming net zero carbon by 2040 is therefore significant. If activity in the city were to continue with no change, a 'business as usual' approach, then greenhouse gas emissions would not come down fast enough to achieve our climate targets.

Impacts of Covid

The impacts of the ongoing Covid pandemic have been disruptive and wide ranging and it is difficult to be certain what the long term effects will be. Evidence[15] suggests that global carbon emissions in 2020 saw a reduction of around 2.3 billion tonnes as many activities that burn fossil fuels came to a temporary standstill. Transport emissions account for a high proportion of carbon emissions, and clearly the reduction in travel for work and pleasure associated with the pandemic has resulted in a commensurate reduction in carbon emissions. People's energy use habits were also changed with a more steady use of energy throughout the day as opposed to spikes in use at peak times in the morning and evening that typically occur in more 'normal' periods before and after people go to work.

Already, in areas of the country (and the world), where we are seeing a recovery from this disruption, people are returning to the roads and businesses are beginning to start up again. Therefore it is entirely likely that the declines in emissions evidenced last year could be a temporary occurrence rather than a long term trend, making a marginal difference to the need for continuing to work towards decarbonising the city.

Another impact of the pandemic was the shift to working from home for many people and the increased amounts of time we have been spending at home. This move has shifted the cost of heating and lighting during the day away from the office to the home, and has prompted many businesses to begin reviewing their assets and trying to cut costs of running larger buildings without the same numbers of people occupying them. Whilst the answer is unclear at present, this move has potentially exposed the importance of more resource efficient and greener buildings and homes for many people.

Likely trends without a new local plan

In the absence of a new local plan, the existing Oxford Local Plan 2036 policies would still apply up until 2036. Policy RE1: Sustainable design and construction, sets out the carbon reduction requirements that proposals for new-build residential developments and new-build non-residential developments of 1000m^2 or more need to demonstrate through submission of an energy statement.

> **Carbon reduction in new-build residential developments (other than householder applications):**
>
> Planning permission will only be granted for development proposals for new build residential dwellinghouses or 1,000m2 or more of C2 (including student accommodation), C4 HMO or Sui Generis HMO floorspace which achieve at least a 40% reduction in carbon emissions from a 2013 Building Regulations (or future

[15] https://www.nature.com/articles/d41586-021-00090-3

equivalent legislation) compliant base case. This reduction is to be secured through on-site renewable energy and other low carbon technologies (this would broadly be equivalent to 25% of all energy used) and/ or energy efficiency measures. The requirement will increase from 31 March 2026 to at least a 50% reduction in carbon emissions. After 31 March 2030 planning permission will only be granted for development proposals for new build residential dwelling houses or 1,000m2 or more of C2 (including student accommodation), C4 HMO or Sui Generis HMO floorspace that are Zero Carbon.

Carbon reduction in new-build non-residential developments of 1000m2 or more:

Planning permission will only be granted for non-residential development proposals that meet BREEAM excellent standard (or recognised equivalent assessment methodology) in addition to the following reductions in carbon emissions which are also required.

Planning permission will only be granted for development proposals of 1,000m2 or more which achieve at least a 40% reduction in the carbon emissions compared with a 2013 Building Regulations (or future equivalent legislation) compliant base case. This reduction is to be secured through on-site renewables and other low carbon technologies and/ or energy efficiency measures. The requirement will increase from 31 March 2026 to at least a 50% reduction in carbon emissions.

As shown by this extract from Policy RE1, these requirements are not fixed over time, with an increase in the required reductions in 2026 and 2030 for residential developments, and 2026 for non-residential developments. As a result, if a new local plan was not adopted, Policy RE1 would continue to require increasing levels of regulated carbon emissions reductions into the future.

By 2026, under Policy RE1, at least a 50% reduction in carbon emissions from a 2013 Building Regulations (or future equivalent legislation) would be required for new-build residential developments and new-build non-residential developments of 1000m2 or more.

By 2030, planning permission will only be granted for development proposals for new build residential dwelling houses or 1,000m2 or more of C2 (including student accommodation), C4 HMO or Sui Generis HMO floorspace that are Zero Carbon.

The requirement for Zero Carbon new-build developments by 2030 does not apply to new build non-residential developments and as such the requirement for those without a new policy would remain at a 50% reduction from 2026 onwards. It should be noted that Policy RE1 applies only to regulated carbon emissions, excluding those unregulated emissions from any policy requirements.

The carbon emissions reductions required by Policy RE1 are based upon the Part L Building Regulations. The updates to the Building Regulations, discussed earlier, and expected as part of the Future Homes/Buildings Standard (including interim uplift), are aimed at reducing the carbon footprint

of new developments thus carbon emissions are likely to reduce in future once these come into effect even before the Local Plan policy is applied.

Beyond the plan period (past 2036), in the absence of an up to date local plan, the policies for planning would revert to national planning policy and would therefore be based upon the NPPF. This would mean that plans and decisions should apply a presumption in favour of sustainable development.

The NPPF specifies that for decision-taking this means:

"d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:

i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or

ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole."

Ultimately, without appropriate mitigation measures in place to address emissions, any additional growth throughout the Local Plan period can be expected to result in an increase in emissions where these are not fully mitigated through appropriate policies at national and local level.

What can the next local plan do?

In order for the city to achieve its goal of becoming net zero carbon by 2040 (and to meet the national target of 2050), it is clear that a significant amount of work needs to be undertaken to achieve the radical reductions in carbon emissions that will be required across all sectors. Planning policy set out through the new Local Plan is primarily focussed on new development that happens in Oxford and has a limited role in influencing what is already there, except for where it comes forwards for redevelopment through the planning process. The Local Plan will therefore have to form one part of the overall approach to reducing carbon emissions in Oxford as a whole. Nevertheless, policy has an important role to play to ensure that anything new that is built in the city supports these targets and does not further exacerbate climate change. There are a variety of approaches that could be considered going forwards as the new Local Plan is developed.

The energy hierarchy should help guide the approach, first through ensuring energy in buildings is used sparingly and efficiently, then ensuring that what energy is used is sourced from renewables and low/zero carbon sources. New development will need to be designed and built to be as fabric efficient as possible. Fabric efficient design can reduce the amount of energy required to heat and cool buildings and is essential for supporting more sustainable and low carbon heating/cooling technologies like heat pumps. There is also the added benefit that fabric efficient buildings should reduce heating costs for users, thus helping to mitigate issues of fuel poverty which can be particularly challenging for those on lower incomes.

The Local Plan can also require that new developments secure a proportion of energy needs from renewable sources in the locality of the site. Indeed, the current Oxford plan policy seeks to secure this. There are various constraints in the city with its significant levels of urban development, ecological designations and heritage protections, which make it challenging to incorporate large

amounts of renewables, but there are likely to be ongoing opportunities to utilise traditionally redundant spaces above within the city, such as on roof tops using building mounted solar PV. As part of the Local Plan development process, there may also be value in assessing the city for its potential to deliver larger-scale renewable energy generation, such as solar PV farms. Where sites are found to be acceptable, these could be allocated as part of the plan.

The means by which the spaces within buildings and the water they use are heated (and cooled) are a major source of carbon emissions and a move away from the burning of fossil fuels for heating purposes towards lower carbon heating technologies in future will be essential. Low carbon heating could include heat pumps, (e.g. air, and ground sourced); combined heat and power technologies; as well as communal and district heat networks.

A challenge for the Local Plan to consider will be how total energy use in new development is regulated through policy. The total operational energy consumption of a building is generally broken down into regulated and unregulated energy. Regulated energy, results from the energy consumed through controlled services and fittings that are inherent to the design of the structure, including space heating/cooling, hot water, pumps, fans and lighting and is easier to control through traditional planning policies. Unregulated energy, is more challenging however, relating to systems and processes within a building which are not controlled, such as IT equipment, refrigeration, appliances, lifts and escalators. Unregulated energy can be responsible for 50% of the building's ultimate energy use[16], and may vary throughout its lifetime depending on how the building is used and who is occupying it. Planning policy therefore has far less influence when it comes to unregulated energy use which we will need to consider.

When enforcing performance we also need to be wary of the 'performance gap'. The performance gap occurs where predictions of energy use in a new building are outstripped by the actual measured performance once it is in operation. There are many, complex reasons for performance gaps including, poor design, sub-standard or incorrect construction, as well as unexpected uses in the building once in operation. It will be important to consider how the monitoring of energy standards is implemented to try to reduce the performance gap. Beyond the carbon associated with energy use in new development, another issue is that of carbon produced during the processes of construction and demolition and typically referred to as 'embodied carbon'. Sourcing materials for construction, the process of building, of repairing and refurbishing existing buildings, and eventual deconstruction all have an embodied carbon footprint. The Local Plan can play a positive role in its reduction through encouraging prudent use of natural materials, sourcing locally and using sustainable construction practices, but effectively measuring and regulating embodied carbon in the construction process is complex and still a subject of much learning and development.

It can be difficult to ultimately negate all greenhouse gas emissions from new buildings through their design, in part due to the need for certain technologies still to mature and for the market to fully catch up with net zero aspirations. Whilst offsetting should only be considered once all other means of reducing carbon emissions in new development have been explored, the Local Plan may need to consider how it can be utilised in the short-medium term as an additional method by which net zero carbon aspirations for the city can be delivered in future.

[16] https://www.designingbuildings.co.uk/wiki/Regulated_and_unregulated_energy_consumption

Of course, new buildings are responsible for a fraction of the city's carbon emissions associated with its built environment. The majority of the emissions in the built environment come from existing homes and buildings which have already gone through the planning process and over which the new local plan has little direct influence. Planning policy can help by ensuring that buildings which come forward for redevelopment, extension, and that require planning permission, do so in a way that aligns with the principles above. Of Oxford's existing buildings, more than 1,500 are listed for their heritage value too, and present added complications in balancing the need to protect historic character against carbon reduction objectives and retrofit measures need to be handled with additional care (though the challenge is not insurmountable). Undeniably, there is a significant retro-fit agenda which the city will need to pursue if it is to address the carbon emissions coming from these extant structures, this cannot be enforced through planning alone and will need to happen alongside the Local Plan process.

Wider local plan policies

Beyond energy use, there will be a variety of wider policies that support the issue of carbon reduction in new development around Oxford and these are discussed more in the accompanying topic papers. A couple of notable policy areas are:

- Transport policies will play a vital role in supporting the transition towards more sustainable forms of travel around the city and addressing emissions coming from the transport sector. Key issues in this topic include the need to support the adoption of electric vehicles, enabling greater cycling and walking, as well as public transport options like bus and rail.
- Green infrastructure policies that seek to protect, enhance and provide new green and blue spaces in the city (such as open spaces, trees and ecological habitats) can help to strengthen carbon sinks in the city. Green spaces work to lock up carbon from the atmosphere as they grow, whilst also encouraging active/sustainable travel by providing for a more pleasant environment for people to move through.

Conclusion

Oxford has set itself ambitious targets for reaching zero carbon by 2040, in advance of the national target of 2050, and it is clear from the analysis set out in this paper that there are a variety of priority areas which require significant attention in order to do this. The new Local Plan will be important in ensuring that any new development which takes place is designed in a way that aligns with these targets. This paper has focussed on the actions needed to deliver carbon reduction across the city's buildings in particular, with other papers focussing on carbon reduction across other sectors like transport.

What is clear is that the Local Plan policies will need to utilise a range of measures in order to deliver zero carbon development, including energy efficiency, renewables and sustainable heating/cooling. There will also be a variety of challenges to overcome, including a highly constrained built environment, addressing regulated and unregulated energy sources, embodied carbon and the potential need for offsetting in the short term. National policy is also shifting at a fast pace with updates to the Building Regulations and proposed reforms to the national planning system all

imposing additional challenges and uncertainties in relation to what the Local Plan can and cannot influence directly.

Ultimately, mitigating our impacts on climate change in new development will have broader benefits for the sustainability of the city. Reducing emissions into the environment is likely to support improvements in air quality and benefit people's health and the quality of the natural environment, more energy efficient buildings should reduce household energy bills which will be particularly beneficial for those living in or close to fuel poverty. It is also likely that investment in greener technologies will support new jobs and businesses focussed on renewables.

Sustainability/Plan issues

- Significant amount of action required addressing all sectors including buildings, transport and waste to reduce existing carbon footprint and meet city's ambitious 2040 target.
- Ensuring that new development is fit for a zero carbon future and does not contribute to climate change further.
- Embedding the principles of the energy hierarchy into the approach to designing new buildings (fabric first, reducing energy use, mitigating remaining emissions).
- Addressing embodied carbon as part of the construction process.
- Potential for supporting small and larger scale renewable energy generation across city.
- Supporting mitigation of emissions from existing built environment outside of the planning system.
- Challenges of retro-fitting of existing built stock and balancing need to deliver carbon reduction against other constraints like protecting heritage/conservation assets.

Plan issues

- Balancing the needs to deliver other important council priorities (e.g. affordable housing) with the cost of delivering net zero developments across the city.
- Ensuring that any new standards set are deliverable financially and practically.