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Manchester's Emissions Report 2023



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Executive summary

The latest data on Manchester's direct, energy-related emissions shows that the city's carbon emissions rose by 7% in 2021, an uplift that is also seen in the national emissions data and reflects an increase in activity as COVID-19 restrictions were eased across the country.

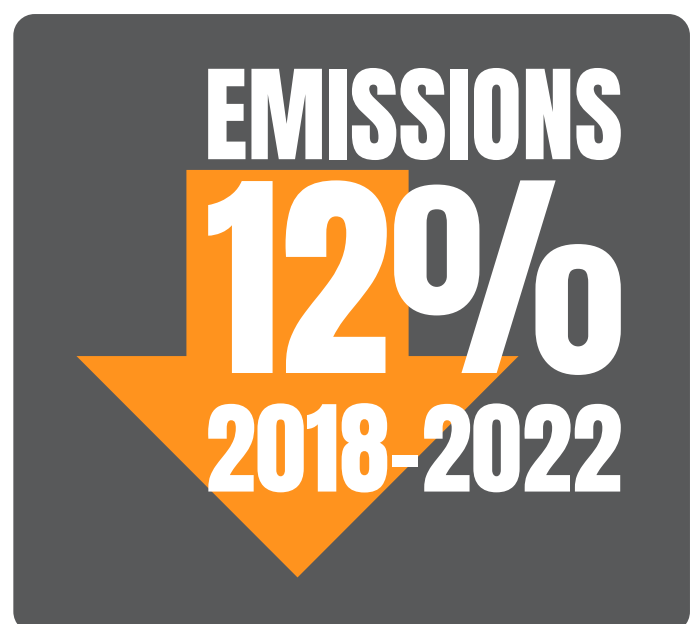
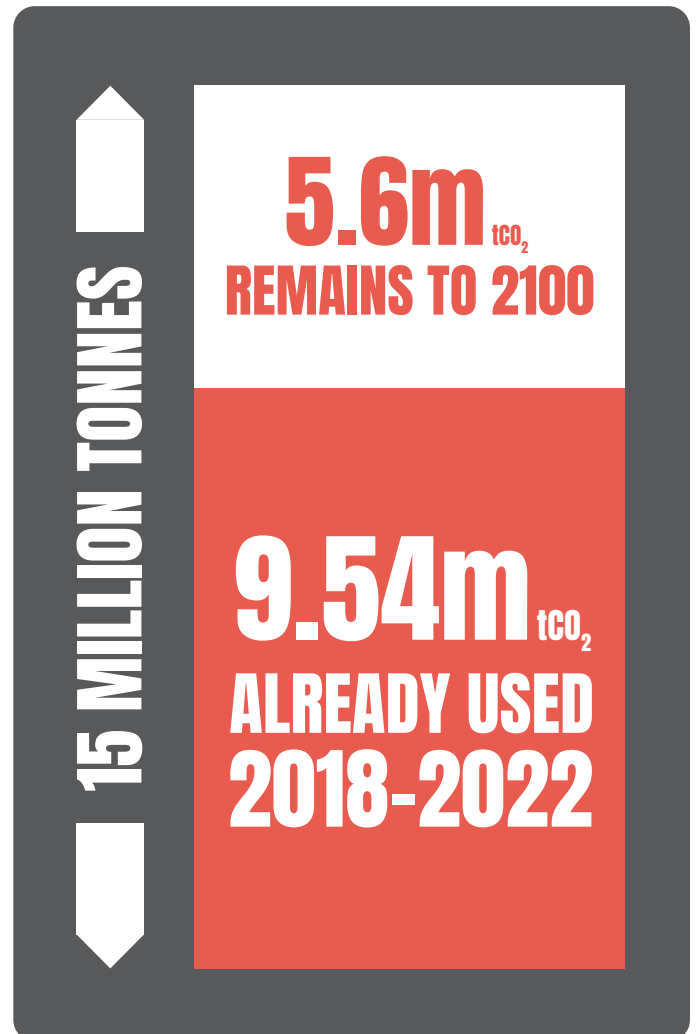
Since 2018, when Manchester's science-based carbon budget of 15 million tonnes of CO₂ (m tCO₂) was set, the city's direct emissions have reached 9.54m tCO₂.

This is almost two-thirds (63%) of the total carbon budget that is intended to transition Manchester to a zero carbon city by 2038, at the latest, and which gives significant cause for concern.

Since 2005, positive progress can be seen as Manchester's emissions have fallen by 44%. This downward trajectory has been driven by the introduction of more renewable energy into the national grid as well as by positive local action.

In the same timeline, Manchester has significantly upped its climate game, making bold climate commitments, working collaboratively to deliver action, and reporting transparently on the progress being made. The city is now recognised by CDP¹ as a climate change leader alongside global cities like Paris, New York and Tokyo.

But it's clear we need to do more.



When compared to the nine other districts in Greater Manchester, Manchester has the highest overall emissions, equivalent to almost one-fifth (17%) of the total for the city region. This is due to Manchester's population size and its function as the region's economic, cultural and employment centre.

If overall emissions are divided by population, however, Manchester has the second lowest per capita emissions in the city region. This is because of factors like population density and the interconnectivity of public transport infrastructure, but also by socio-economic deprivation and the unequal distribution of economic benefits within the city region.

If Manchester is to stay within its carbon budget, a goal made ever more difficult as decarbonisation of the national grid slows, we need to see a step change in the pace and scale of climate action, an ambition that needs to be shared by and acted on by everyone.

Effectively addressing climate change in Manchester requires urgent action at pace and scale, which will require contributions from national and local government, innovative investments, and cross-sector collaboration including residents and businesses.

1. Introduction

Since 2013, Manchester has been publishing annual reports detailing the city's CO₂ emissions. These have been produced by Manchester Climate Change Agency (MCCA, the Agency) from 2015, with technical input and oversight from Manchester Climate Change Partnership's independent Zero Carbon Advisory Group.

In recent years, these reports have tracked the city's progress towards its science-based target of reaching zero carbon by 2038 at the latest while staying within a fixed carbon budget.

The primary data used for this report is published annually by the UK government. It is time-lagged and so the most current data relates to the previous calendar year.

This report shows Manchester's total CO₂ emissions for 2021, it breaks them down to show emissions from industrial, commercial, public sector, domestic and transport sectors, and provides an estimate for 2022's emissions.

In previous years, these reports have included an overview of actions taken by Manchester's Climate Change Partnership (MCCP, the Partnership) and Agency, examples of good practice and new projects being delivered by others that support Manchester's transition to a zero carbon, climate resilient city.

As the quantity of climate action has grown, so has the complexity of reporting. This report, therefore, now solely focuses on the latest CO₂ emissions data for Manchester.

A separate report, published in September 2023, details the actions taken by the Partnership and Agency between April 2022 and March 2023 and can be found here:

www.manchesterclimate.com/impact-reports

Additional reports to capture wider climate action, investment, and practice across the city, including data on aviation and indirect emissions, are in development.

2. Data sources for this Emissions Report

This report uses the latest data on UK territorial greenhouse gas emissions, currently published by the UK Government’s Department for Energy Security and Net Zero (DESNZ)² and previously by the Department for Business, Energy, and Industrial Strategy (BEIS).

DESNZ calculate emissions following the guidance set out by the Intergovernmental Panel on Climate Change (IPCC)³, as required for the UK’s submission to the United Nations Framework Convention on Climate Change (UNFCCC) each year.

The data can be broken down into Local Authority areas (e.g., Manchester) but it is time-lagged and so the information published in summer 2023 relates to the calendar year 2021.

Due to changes in the methodology over time, historic emissions data is revised each year; the data in this report therefore supersedes that published in previous reports. Table 1 shows the city’s annual direct emissions since 2017 as published in previous reports, and the updated figures provided by DESNZ in 2023. It shows the scale of change between the two figures, all of which are reductions of a relatively small scale.

The DESNZ data can be broken down into the following sectors, although analysis is

constrained by the data available for local electricity and gas use:

- Industrial
- Commercial
- Public sector
- Domestic
- Transport
- Land use, land use change and forestry (LULUCF)
- Agriculture
- Waste management

Following advice from the Tyndall Centre, Manchester’s carbon budget was aligned with the IPCC’s methodology and therefore excludes emissions from LULUCF and agriculture. The analysis in this report follows the same method and, in addition, also excludes emissions from waste management as they represent just 0.1% of the city’s direct emissions and are therefore negligible.

The DESNZ data also includes a provisional figure for emissions in 2022 at a national level⁴, which is used by the UK’s Climate Change Committee⁵ to produce their Annual Progress Report to Parliament. This report applies the national provisional figure to Manchester to give an indication of expected emissions in 2022.

Year	Manchester’s direct emissions in previous reports (k tCO ₂)	Manchester’s direct emissions - 2023 release (k tCO ₂)	Difference
2017	2,190	2,125	-3%
2018	2,151	2,077	-3%
2019	2,070	2,009	-3%
2020	1,814	1,748	-4%
2021	1,871	1,871	-

Table 1 shows the difference in emissions between previous reports and the most recent data.

3. The UK carbon budget

In 2008, Parliament passed the Climate Change Act, legislating the UK government to set legally binding, five-year caps on emissions, otherwise known as carbon budgets, and setting a national target to achieve an 80% reduction in emissions by 2050.

The national carbon budget covers all greenhouse gas emissions, including direct energy-related CO₂ emissions and indirect, consumption-based emissions.

In 2019, the UK government amended the Climate Change Act to increase its ambition, moving from a target to reduce emissions by 80% by 2050, to a target to reach net zero emissions by 2050⁶.

In 2019, the UK government amended the Climate Change Act to increase its ambition and set a target to reach net zero emissions by 2050.

The fourth carbon budget (2023-2027) requires a 52% reduction, and, in December 2020, the UK submitted its Nationally Determined Contribution (NDC) under the Paris Agreement, pledging a 68% reduction in greenhouse gas emissions by 2030, aligning with global climate objectives, and effectively replacing the fifth carbon budget.

The sixth carbon budget (2033-2037) targets a 77% emissions reduction compared to 1990 levels and will encompass aviation and shipping emissions for the first time.

4. National progress towards net zero by 2050

The UK has stayed within its first (2008-2012) and second (2013-2017) carbon budgets and is on track to stay within its third (2018-2022) as emissions in 2021 are 48% lower than 1990 levels (the target for the third budget is to achieve a 38% reduction from 1990 levels).

Whilst the UK is currently reducing its emissions in line with its carbon budget targets, confidence has decreased that the country will continue this path and successfully meet its fourth carbon budget (a 52% reduction by 2027), its Nationally Determined Contribution (a 68% reduction by 2030), or its sixth carbon budget (a 77% reduction between 2033-2037).

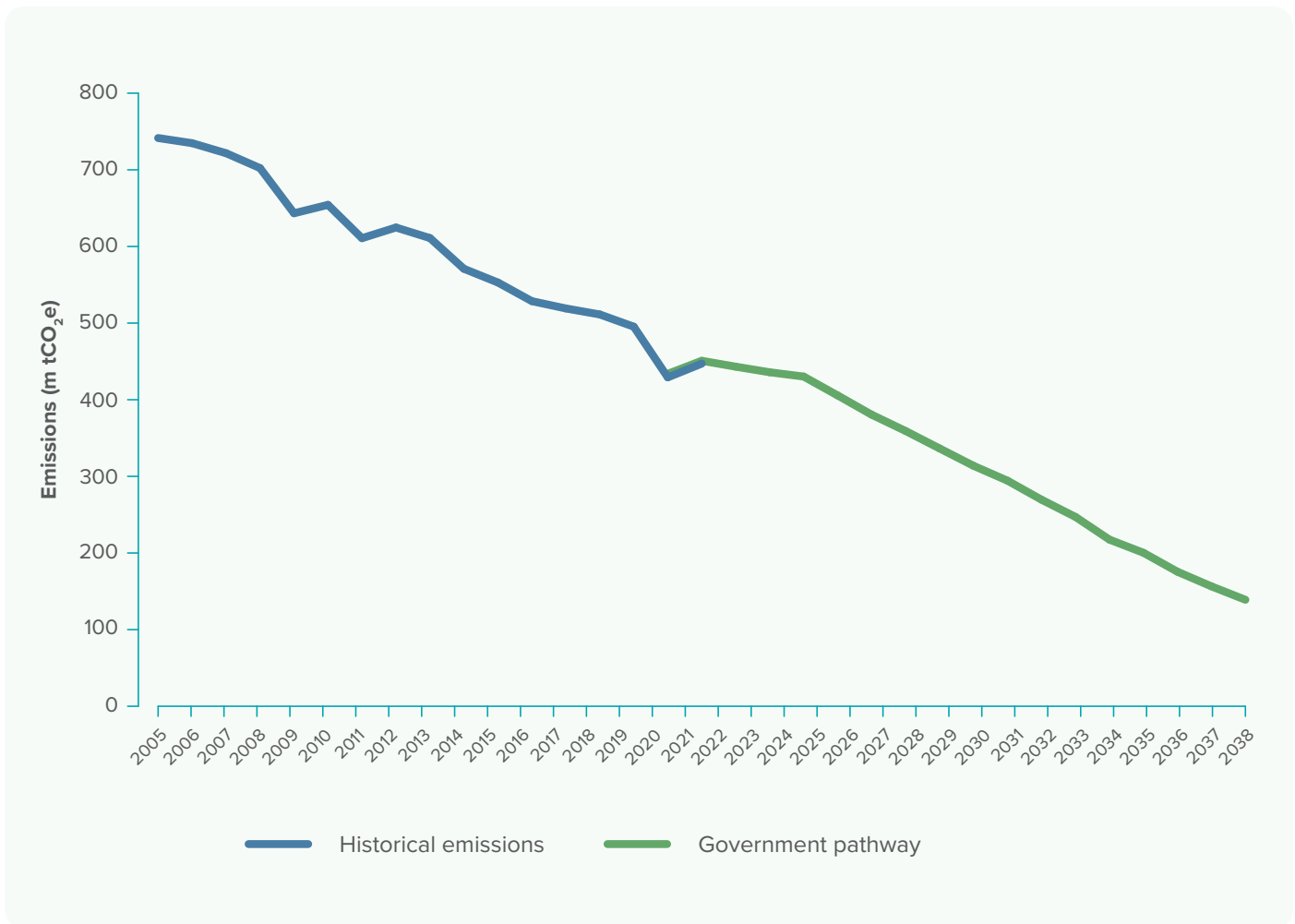
The DESNZ data published in June 2023 shows that the UK's direct, energy-related emissions rose by 7% in 2021, compared to 2020, although they are still 4% lower than in 2019 (pre-pandemic level).

The 7% increase in emissions is linked to an increase in economic activity after the restrictions imposed by the COVID-19 pandemic where emissions reduced as the country went into multiple lockdowns.

The UK's direct, energy-related emissions rose by 7% in 2021, compared to 2020, although they are still 4% lower than in 2019 (pre-pandemic level).

The same pattern of emissions falling in 2020, during the height of the pandemic, and rising in 2021 as the economy recovers, can be seen in Manchester's data (see sections 6 and 7).

Graph 1 (see page 9) shows the UK's historical greenhouse gas emissions over time, compared to the government's intended pathway for decarbonisation over the period until 2037, the end of the Sixth Carbon Budget period, to achieve Net Zero by 2050. Starting in 2005 where the country's annual emissions were over 700m tCO₂e and steadily reducing to the most up to date figures for 2021 where annual emissions are 447m tCO₂e. The graph also shows the pathway that government are projecting we need to take to reach net zero by 2050. The UK does not have annual targets but the five-year carbon budgets and 2030 NDC must be achieved (see section 3).



Graph 1 shows the UK’s greenhouse gas emissions 2005–2021 and the projected pathway to 2038.

Alongside the setting of carbon budgets, the Climate Change Act also requires the UK government to produce detailed plans on how it will monitor and meet its carbon reduction targets and stay within its carbon budgets, including most recently:

- In 2021, the UK government published its Net Zero Strategy⁷, setting out policies for reducing emissions from each sector of the UK economy and a pathway to reaching net zero greenhouse gas emissions by 2050.
- In January 2023, RT honourable Chris Skidmore MP’s Independent Review of Net Zero⁸ reported several recommendations for the UK government’s approach to net zero and its associated delivery pathways. In March 2023, the UK government published its response⁹ to the recommendations of the independent review.

- In March 2023, the UK government published Powering Up Britain: The Net Zero Growth Plan¹⁰, setting out how it plans to achieve net zero in a “pro-growth, pro-business way”.
- The UK government also published its Carbon Budget Delivery Plan¹¹, to inform the UK Parliament and the public on proposals and policies to enable carbon budgets to be met.

Every year, before the end of June, the UK’s Climate Change Committee (CCC) reports to Parliament giving an assessment of the government’s performance in combatting climate change and measuring the government’s actions against the national and international legal obligations to which the UK is committed.

The most recent Progress Report from the CCC in 2023¹² highlights that the UK has lost its global leadership position on climate action, that our response to the recent fossil fuel price crisis did not help to reduce energy demand and grow renewable generation, that we have backtracked on fossil fuel commitments and been slow to react to US and EU plans that are now a strong pull for green investment away from the UK. It emphasises the need for the UK to have a clear strategy to develop net zero industries and technologies to capture the economic benefits of net zero, and highlights that policy development and implementation remains slow, making it more challenging to meet the country's medium-term targets. The report sets out the need to:

- Increase and sustain high-intensity action to ensure we achieve net zero by 2050.
- Commit to and deliver on existing commitments, such as the 2030 fossil fuel vehicle phase-out, 2035 decarbonisation of the electricity system, and the installation of 600,000 heat pumps yearly by 2028.
- Ensure swift delivery, develop necessary skills, and capitalise on plans to guide private sector involvement.
- Reclaim international climate leadership by urgently reducing emissions to meet the 2030 NDC, aligning fossil fuel decisions with net zero, and prioritising climate in UK diplomacy at the highest level.

- Implement urgent policies for industry decarbonisation, incentivise industrial electrification, accelerate tree planting and peatland restoration, resolve hydrogen heating uncertainty, and rebalance electricity and gas prices by spring 2024.
- Empower individuals to make low-carbon lifestyle choices, emphasising home energy use, sustainable diets, and reduced travel.
- Radically reform planning policy to align with net zero, eliminating barriers and ensuring swift deployment of necessary infrastructure.
- Prioritise low-carbon industries and avoid high-carbon developments; reject the expansion of fossil fuel production as it contradicts net zero goals.

The CCC makes it clear that more comprehensive and urgent action is needed from national government if the country is to stay on track to reach net zero by 2050; this includes targeted support for cities like Manchester to decarbonise faster, which is essential for success at national level.

Manchester's Climate Change Partnership has collated a series of 'asks of national government' to help the city meet its climate change goals which can be found here:

www.manchesterclimate.com/askofgovt

5. Manchester's carbon budget

In 2018, the Agency worked with the Tyndall Centre for Climate Change Research¹³ at the University of Manchester and used a science-based targets approach to set a zero carbon target date of 2038 (at the latest) and an associated carbon budget for the city. This is in line with the Paris Agreement objective to 'keep global temperature increases to well below 2°C, pursuing efforts for no more than 1.5°C'.

The zero carbon date and the carbon budget pertain to direct energy-related emissions which are defined by the Tyndall Centre as 'carbon dioxide emissions from our energy system, i.e., the gas, electricity and liquid fuels used to power and heat our homes and businesses, and to transport us around the city. They are sometimes referred to as territorial emissions.'

The definition of zero carbon, as set by the Tyndall Centre¹⁴, and outlined in the 2022 Update to the Manchester Climate Change Framework¹⁵, is the baseline for the city's carbon budget is 2017's emissions of 2.19m tCO₂.

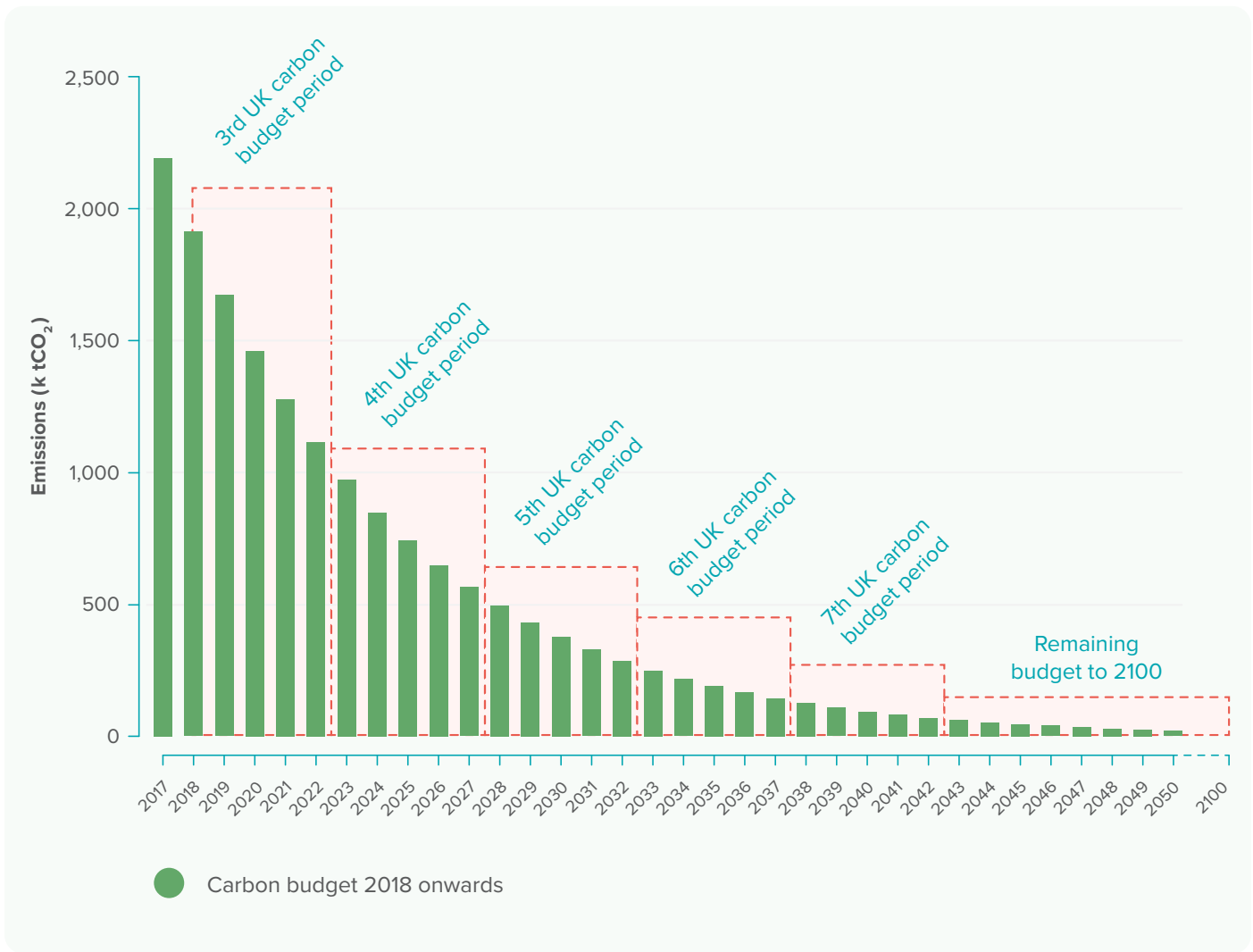
The carbon budget covers the period from 2018 to 2100 and requires that Manchester emits no more than 15million tonnes of CO₂ (15m tCO₂) in that time.

The carbon budget is divided into four, five-year periods (or interim budgets) that are aligned to the carbon budget periods in the UK's Climate Change Act 2008, starting from 2018-2022. This 2018-2022 interim budget for Manchester allows for a maximum of 6.9m tCO₂ of direct emissions to be emitted.

The next three interim budgets cover the fifteen-year period from 2023 to 2037 and allow for a maximum of 6.6m tCO₂ to be emitted. The remaining 1.6m tCO₂ in the carbon budget is allocated to the period from 2039 to 2100.

Manchester's total carbon budget against UK carbon budget periods is shown in graph 2 (see page 12).

Manchester has committed to become zero carbon by 2038, 12 years ahead of the UK's legally binding target.



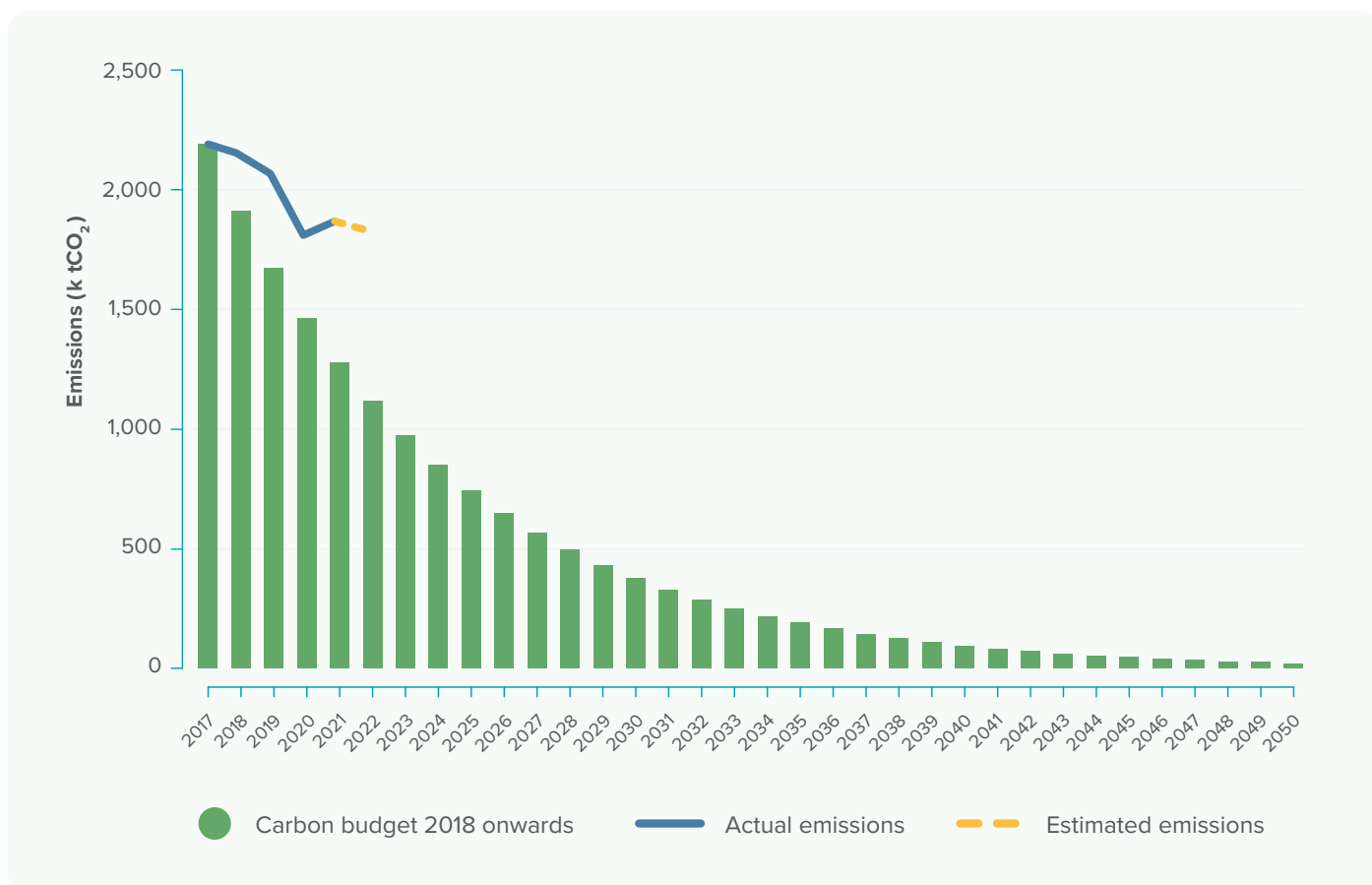
Graph 2 shows Manchester's carbon budget broken down by year against UK interim carbon budget periods.

6. Manchester's progress towards zero carbon by 2038

For the five-year period from 2018 to 2022, including the estimate for 2022, Manchester's direct emissions are set to hit 9.54m tCO₂.

This is 38% higher than the interim carbon budget for this period of 6.9m tCO₂. This is 38% higher than the interim carbon budget of 6.9m tCO₂ for this period.

The city will need to reduce its emissions much further and faster in the coming years to compensate for surpassing the interim carbon budget and ensure it can reach zero carbon by 2038 while staying within its carbon budget of 15m tCO₂.



Graph 3 shows Manchester's carbon budget with actual and estimated emissions from 2017 to 2022.

Against the city's overall carbon budget of 15m tCO₂, intended to cover the period up to and beyond 2038, emissions of 9.54m tCO₂ represent 63% of the total available budget.

Graph 3 shows Manchester's carbon budget from the baseline year 2017 (vertical bars) and

our direct emissions to 2022 (descending line). The gap between the line (actual and estimated emissions) and the bars (carbon budget) indicates that Manchester is not reducing its emissions at the targeted pace and therefore is not on track to stay within its carbon budget.

7. Manchester's direct emissions in 2021 and 2022

The DESNZ data shows that Manchester's direct emissions in 2021 were 1.87m tCO₂.

This represents a 7% increase compared to 2020 (1.75m tCO₂) and can largely be attributed to an increase in activity, particularly travel, as the city came out of COVID-19 lockdowns.

The target for 2021, set within the (2018-2022) carbon budget, was to emit no more than 1.28m tCO₂, so actual emissions of 1.87m tCO₂ are 47% higher than the target.

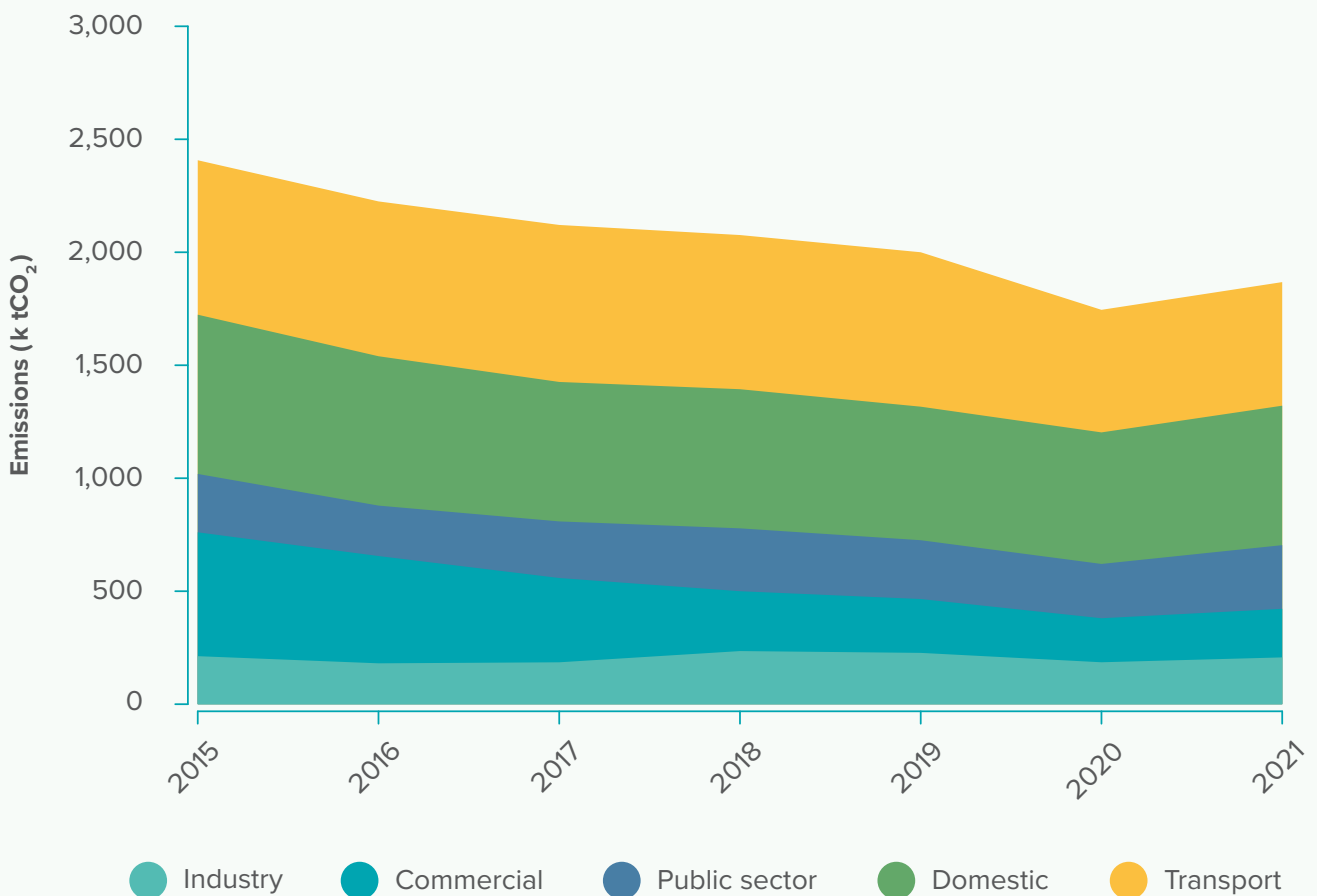
The same data is forecasting a 2% reduction in direct emissions in 2022, which would equate to annual emissions of 1.83m tCO₂ against a target of 1.12m tCO₂.

Manchester's carbon emissions rose by 7% in 2021, an uplift that is also seen in the national emissions data.

8. Sectoral analysis for Manchester

Graph 4 shows Manchester's direct energy-related emissions between 2015 and 2021, broken down by sector. It shows the same steady reduction over time indicated by the data in section 6, along with how each sector has contributed.

This data largely corresponds with the analysis presented in the 2022 Update to the Manchester Climate Change Framework¹⁵ which showed that energy use in our buildings (industrial, commercial, public/institutional, and domestic) accounted for 76% of emissions and ground transport accounted for 24%.



Graph 4 shows Manchester's direct energy-related emissions (k tCO₂) broken down by sector.

Table 2 shows the same emissions, over the same timeline, and highlights what percentage of 2021's annual emissions each sector is responsible for, and what percentage change has been achieved by each sector between 2015 and 2021.

Manchester's emissions in year (k tCO ₂)									
Sector breakdown	2015	2016	2017	2018	2019	2020	2021	% of total in 2021	% change between 2015- 2021
Industry	215	188	188	235	228	184	210	11%	-2%
Commercial	547	475	374	263	240	190	217	12%	-60%
Public Sector	261	220	244	285	257	251	280	15%	+7%
Domestic	699	653	626	612	596	576	616	33%	-12%
Transport	689	696	692	682	687	548	548	29%	-20%
Total	2,411	2,233	2,125	2,077	2,009	1,748	1,871		-22%

Table 2 shows the breakdown of emissions (k tCO₂) by sector over time and percentage change.

Each sector is assessed in more detail in the following sub sections, including by comparison against national sectoral data.

Industrial sector

Emissions from the industrial sector in Manchester (11% of the city's total emissions in 2021) are relatively low compared to the England average (29%) due to the densely populated nature of the area, resulting in fewer industrial installations.

Emissions since 2015 have fluctuated over time, with a 12% decrease between 2015 and 2016, followed by an increase in 2018, and reductions in 2019 and 2020 (the latter most likely connected to COVID-19).

By 2021, emissions from this sector are only about 2% lower than in 2015; however, over the longer term (since 2005) industrial emissions in Manchester have decreased by 39%.

Commercial sector

Commercial emissions stem from electricity and gas use in non-industrial businesses; in Manchester in 2021 they represent approximately 12% of the city's emissions, which is higher than the national average (7%) and is driven by the scale and make-up of the city centre.

Between 2015 and 2021, emissions from this sector have fallen by a substantial 60%. Tangible reductions were made in 2016 (-13%), 2017 (-21%), 2018 (-30%), and 2019 (-9%). A 21% reduction was delivered in 2020 due to the pandemic, with emissions rising by 14% in 2021 as economic activity rebounded.

Over the longer term (2005-2021), commercial emissions in Manchester have decreased by 73%.

Public sector

Manchester's public sector is responsible for 15% of the city's direct emissions, which is more than double the national average in 2021 (6.5%) and reflects the concentration of institutions in Manchester that support the wider city region and beyond.

Emissions from this sector have fluctuated up and down since 2015 and increased by 12% in 2021 compared to 2020. This mirrors a trend seen across the UK where there was a 12.6% overall rise in public sector emissions from 2020 to 2021.

Over a longer period going back to 2005, Manchester's public sector has reduced its emissions by 28%.

Domestic sector

The domestic sector is responsible for one third (33%) of the city's direct emissions in 2021.

Emissions from this sector can be influenced by various factors, including the types of fuels used, housing characteristics (including levels of insulation), local temperature conditions (urban areas being easier to heat), household size, household type, and the income and preferences of the occupants.

Nationally, a third of local authorities (including Manchester) saw domestic emissions being the largest single contributor to overall emissions in 2021.

Domestic emissions in Manchester can be seen to steadily reduce each year since 2015 (by -7% in 2016, -4% in 2017, -2% in 2018, -3% in 2019, and -3% in 2020), until rising by 7% in 2021.

Over the period 2015-2021 domestic emissions have reduced by 12%. Over a longer period back to 2005, the overall trend for this sector also shows a reduction of 12%.

Transport sector

Transport in Manchester is responsible for 29% of the city's direct emissions in 2021, which is higher than the national average (19%) and reflects the city's role as a critical transport hub to the city region and beyond.

While Manchester's transport emissions remained relatively constant from 2015 to 2019, there was a significant reduction of 20% in 2020, primarily due to the pandemic's impact on our mobility and travel patterns.

In 2021, national transport emissions rose by over 9%, largely due to the easing of COVID-19 restrictions. Most local authorities (94%) experienced a similar uptick in transport-related emissions in 2021, with 41% of them identifying transport as the leading source of total emissions.

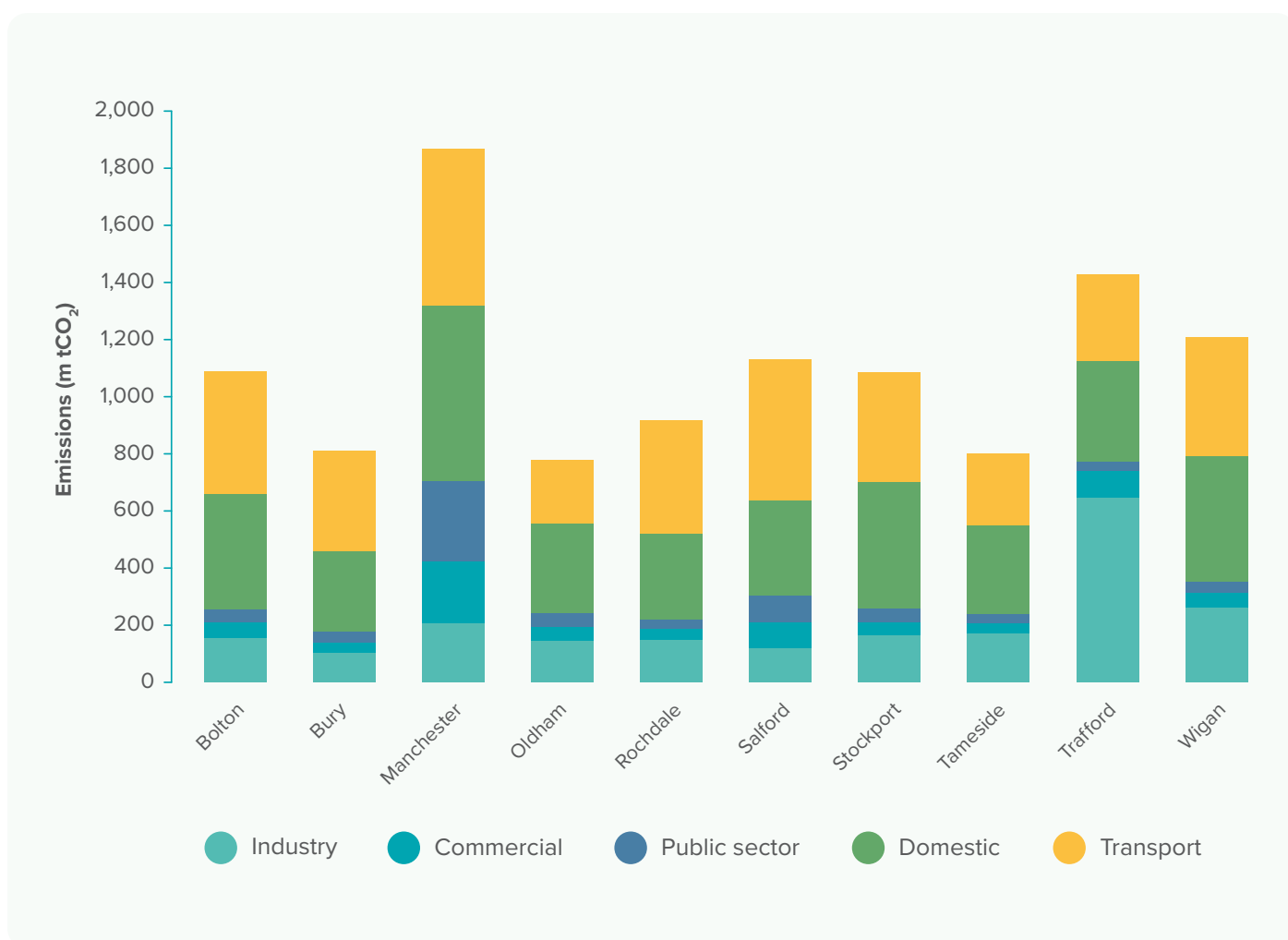
In contrast, Manchester's transport emissions remained stable in 2021, compared to 2020, which could be attributed to prolonged localised lockdown measures restricting travel beyond the national norm.

Looking over a longer period, Manchester's transport emissions are 30% lower in 2021 than in 2005.

9. How does Manchester compare to Greater Manchester?

Graph 5 shows Manchester’s direct emissions in 2021, including the sectoral breakdown, compared to those for the other nine local authority areas within Greater Manchester.

Manchester’s emissions are clearly the highest of the ten districts, representing 17% of the city region’s total emissions and reflecting Manchester’s role as the commercial, cultural and employment heart of the city region with the highest population.



Graph 5 shows emissions profiles (m tCO₂) for the ten Greater Manchester local authority areas in 2021.

For the industrial sector, Manchester's emissions are the third highest in Greater Manchester, behind Trafford and Wigan.

For the remaining sectors, Manchester is the highest emitter in the city region.

Commercial emissions and public sector emissions are high due to the concentration of activity in Manchester's centre; the city has the highest number of employees engaged in financial, professional, and scientific sectors, closely followed by health and social work.

Domestic emissions are high due to the size of the city's population; and transport emissions are high due to travel coming in and out of the city centre from the other areas.

Looking at the percentage share of total emissions for each sector and comparing Manchester to the average for Greater Manchester re-emphasises this narrative.

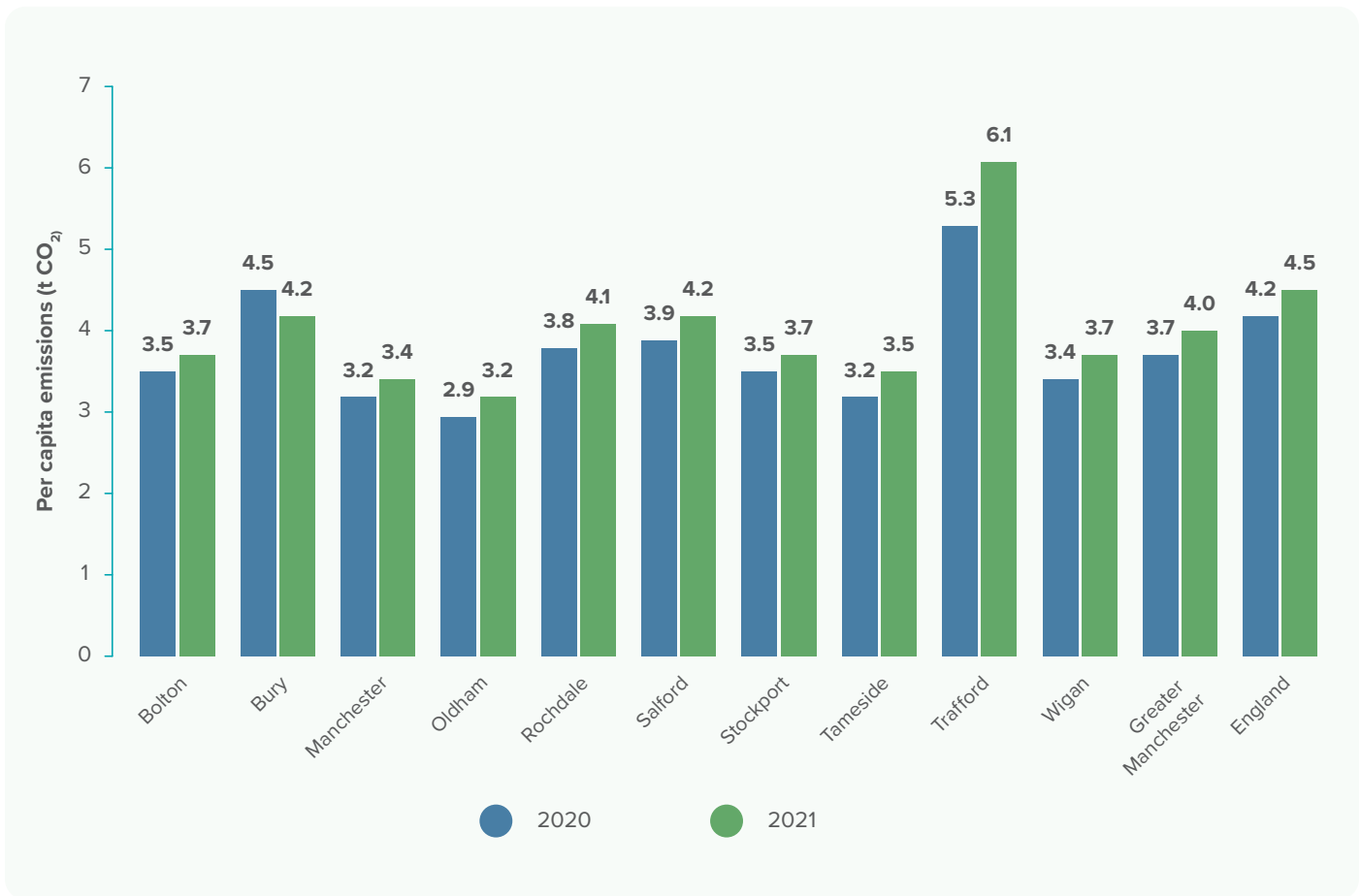
Industrial emissions in Manchester are just 11% of the total, whereas for Greater Manchester this figure is significantly higher at 19%, driven up by the Trafford data where industrial emissions

account for 46% of that district's total.

Commercial sector emissions in Manchester are responsible for double the share compared to Greater Manchester (12% versus 6%) and public sector emissions are a higher share still (15% compared to 6%).

Domestic emissions in Manchester and Greater Manchester are aligned, with both responsible for around one third of the total (33% and 34% respectively), transport emissions are responsible for a slightly higher share of the total in Greater Manchester (34% compared to Manchester's 29%), perhaps due to higher car use outside of the centre.

Graph 6 (see page 20) enables the same information to be viewed in a different way, by dividing the total direct emissions of an area by its population to produce a per capita figure. The graph shows per capita emissions for 2020 and 2021 for each of the ten local authority areas in Greater Manchester. It also shows the average figures for Greater Manchester and England for ease of comparison.



Graph 6 shows per capita emissions for Greater Manchester districts and England (t CO₂).

Despite Manchester’s overall emissions being the highest in Greater Manchester, in 2021 the city had the second lowest per capita emissions of 3.4t CO₂ per person; this is 14% below the Greater Manchester average of 4.0t CO₂ and 20% below the national average of 4.5t CO₂ per person.

Lower per capita emissions in Manchester are driven by a range of factors including high population density, wide-spread and well-

connected public transport infrastructure, and the presence of lower-emission industries, alongside socio-economic deprivation, and the unequal distribution of economic benefits within the city region.

This analysis highlights the importance of considering both total emissions and population size when evaluating a city’s environmental impact.

10. Acknowledgements

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