

Net zero: decarbonising the city

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July 2021



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Acknowledgements

The authors would like to thank Malcolm Morgan for his valuable insights on the report. The authors would also like to express gratitude to Simon Evans, Christopher Jones, Zoe Avison and Louise Marix Evans for their help.

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Executive summary

Large urban areas are often perceived as being bad for the environment, and this is true for air pollution. But when it comes to tackling climate change and reaching the Government's goal of net zero emissions by 2050, cities and large towns are greener than the countryside.

This is because of the specific nature of the challenge ahead. So far, the UK has made good progress on reducing carbon emissions, which have halved in the last 30 years mostly thanks to a shift away from coal and carbon-intensive industries. But further reductions are likely to be tougher to achieve, because they will involve bearing down on emissions in two sectors where cuts have been much less impressive in recent years: transport and housing. And on these two counts, cities and large towns will need to play an outsized role.

Density, something that is inherently unique to an urban area, tends to encourage lifestyles that are less carbon-intensive. In dense urban environments, journeys – whether for work or for leisure – require less energy. They are often shorter, facilitating active travel like walking or cycling, and are more likely to be made on public transport than in cars. And as cities and large towns tend to have a higher proportion of flats, which are smaller in size and more energy efficient than typical detached, single-family housing, domestic emissions tend to be lower too. All this meant that, in 2018, the carbon footprint of an average city resident was about four tonnes of carbon a year, compared to more than six tonnes for people living outside cities.

In fact, because density underpins public transport usage and domestic emissions, the fight to reduce transport emissions should not just focus on transport policy. It needs to focus on the way we plan, build and manage cities and large towns around the country.

The challenge is that, compared to their international counterparts, UK cities and large towns are not very dense. New residential developments often tend to be on poorly connected greenfield land on the outskirts of urban areas rather than on brownfield land and in existing built-up areas, which results in higher levels of car dependency. City centre residents own on average 0.2 cars per person, while the figure is twice as high for

residents of suburban areas, and higher again in rural areas. And, as the location of new residential development is closely tied to the types of homes that are being built, these patterns have also negatively affected domestic emissions: despite the fact that new flats emit 67 per cent less carbon than new houses, the latter account for an increasing share of new-build completions.

This report argues that cities and large towns – and their density – are central to the UK meeting its net zero objective, and that this should be a key consideration as we contemplate the role of urban areas post-pandemic. For net zero to be within reach, cities will need to survive and thrive. To do this:

- **The UK's approach to development needs to change to work with net zero goals, rather than against them.** Both transport and housing emissions can be addressed through spatial planning policies, for instance to allow more homes to be built on brownfield land near existing public transport networks and in existing built-up areas.
- On transport, the priority is to **move away from car dependency and incentivise the take-up of low-carbon alternatives.**
- On housing, the challenge is twofold – to **retrofit existing houses** and to **prioritise the development of compact, more energy efficient housing stock.**

This has important implications in terms of policy. Net zero is a national pledge: much action to achieve it will happen 'to' cities, rather than being driven by them, such as changes in electricity generation. But in the areas of transport and domestic emissions, alongside government intervention (such as the phasing out of petrol and diesel cars), cities and large towns have the potential to bring about change. So, as many are already considering, they will need to play their part. They already have levers to pull, through their approach to planning or by discouraging car use for instance, but their room for manoeuvre is often hampered by a lack of powers and resources, a disorganised local government structure, and a dysfunctional planning system.

To address this, national government should:

- Devolve more powers at the local level to ensure transport and housing planning are integrated as part of a single, coordinated strategy. In mayoral combined authorities this entails moving powers down from Whitehall and up from local authorities, so that all mayors have the same statutory spatial planning powers as the Mayor of London.
- Reform planning by introducing a flexible zoning system that will facilitate and accelerate the densification of existing built-up areas at scale.
- Deliver on the pledge to phase out petrol and diesel cars by 2030, and set an intermediate milestone to reach by 2025.

- Reintroduce, extend and better fund the Green Homes Grant to subsidise retrofit measures, associated with tax incentives like a ‘green offset’ on property tax adjusted to the energy performance certificate of the property.

Local governments running cities and large towns should:

- Use their existing powers to disincentivise car usage, by adopting schemes like Clean Air Zones, Workplace Parking Levies or Park and Ride.
- Invest in public transport and active travel infrastructure. This may include making permanent some of the measures put in place temporarily as a result of the pandemic, such as pedestrianisation of central areas or pop-up cycle lanes.
- Use building regulations and trading standards to impose higher standards of energy efficiency and carbon emissions and make use of the £500 million Green Homes Grant Local Authority Delivery scheme to improve the energy efficiency of homes of low-income households.

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Introduction

In June 2019, the UK passed a law setting an ambitious target: net zero greenhouse gas emissions by 2050. This, and measures such as the recently adopted Sixth Carbon Budget, is necessary to keep global warming well under 2°C and avoid irreversible damage to the planet.

As this is an international issue, much of the intervention needed will need to be led by national governments. And much of the intervention will be ‘place blind’ – changing the way we generate electricity, for example, will not have a particular place angle to it. But two sources of emissions – transport and domestic – vary across the country because of the way that the built environment affects our lifestyles. On these two sources of emissions, place will be an important factor in bringing them down.

This report looks at the role that different places will have to play to help the UK achieve its net zero goal. It looks at how far cities and large towns are from net zero, how it varies between places and the scale and effort required to get there. With a focus on transport and housing, two activities that need to be decarbonised, this research sets out what needs to change if urban areas are to lead the way in decarbonising the UK’s economy, without leaving people and places behind.

What is net zero?

Net zero does not mean zero emissions; in sectors like agriculture, cutting emissions down to zero will hardly be achievable. Instead it means reaching a balance between emissions going into, and being removed from, the atmosphere: any emissions that are produced are fully offset through ‘carbon sinks’, either natural (like trees) or artificial (such as carbon capture and storage technologies).

Carbon capture will only cover a small amount of the emissions produced in the UK.¹ Given this, achieving net zero will require large cuts in overall emissions, even if this does not mean that emissions will be zero.

Box 1: Methodology

Definition of a city

Centre for Cities research focuses on the UK's 63 largest towns and cities. Unless otherwise stated, here cities refer to Primary Urban Areas (PUAs), using a measure of the built-up area of a large city or town, rather than administrative boundaries like local authorities or combined authority geographies. Often used in Centre for Cities' research to provide a consistent measure of the concentration of economic activity across the UK, PUAs' geographies can help analyse the role cities play in the wider decarbonisation agenda as dense, contiguous built environment tends to have an impact on the carbon footprint of a given area and its residents.

Data used for this research

This paper uses a number of publicly available datasets. These include the UK local authority and regional carbon dioxide emission statistics, published by the Department for Business, Energy & Industrial Strategy (BEIS), which are available for the years 2005 to 2018. These statistics show emissions allocated on an 'end-user' basis (they are distributed according to the point of energy consumption, or emission if not energy related). Emissions from the production of goods are assigned to where production takes place, so those generated from imports are not included.

Other sources include the National Travel Survey, the Driver and Vehicle Licensing Agency, Census 2011 data, as well as the EPC Domestic Register.

Although the decarbonisation agenda and UK's net zero target cover all greenhouse gases, including methane and nitrous oxide, this research focuses primarily on CO₂. This is largely because it is the only component included in the local authority dataset. CO₂ contributes the most to global warming, accounting for more than 80 per cent of all UK greenhouse gas emissions.

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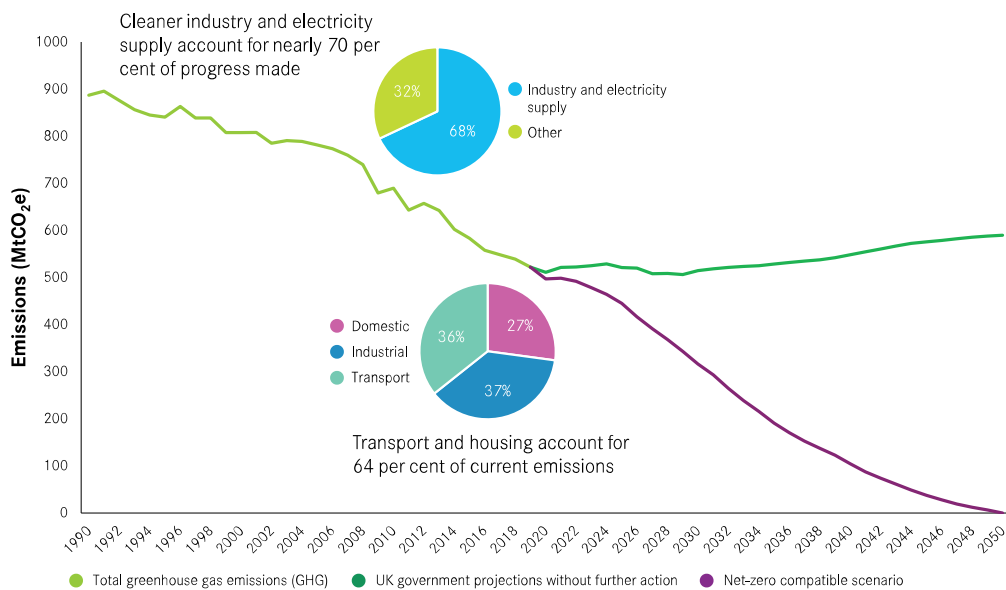
Why cities will need to play a central role in the net zero agenda

The UK needs to make progress on transport and domestic emissions to meet its net zero goals

The UK has made considerable progress in cutting its emissions since the turn of the century. Greenhouse gas emissions have already halved compared with 1990 levels (Figure 1).²

Figure 1: UK greenhouse gas emissions have halved since 1990

Greenhouse gas emissions: historic and projected data, 1990 - 2050 (MtCO₂e)



Source: BEIS, 2020; Climate Change Committee, 2020.

Over the past three decades, the main driver has been a reduction in industrial and commercial emissions (Figure 1). The phasing out of coal, gradual uptake of renewable energy and structural shift away from carbon-intensive manufacturing account for nearly 70 per cent of the progress made in the past 20 years. However, much less progress has been made in transport and the domestic sector, which now account for more than 64 per cent of all carbon emissions (Figure 1). Transport emissions have fallen by just 3 per cent since 1990, while those from the residential sector have decreased by only 13 per cent, and have remained largely flat since 2013.

The next half of the challenge is likely to be more difficult. Relying on improvements in the industrial and energy supply sector alone will not be enough: the share of coal in the 'electricity mix' is now very limited, so the marginal room for improvement is smaller.³ Government projections show that if no additional measures are taken, emissions are likely to flatten out (Figure 1). If the UK wants to meet the net zero target by 2050, the pace of change needs to accelerate in other sectors like transport and housing. And on these two counts, cities and large towns have a particular role to play.

Further reductions in transport and domestic emissions will be more easily delivered in cities

Reducing emissions from transport and domestic heating will require a change in the way people go about their daily lives. Their ability to do this will be influenced by the built environment.

Despite perceptions that cities are bad for the environment, the opposite is true when considering climate change. The 63 largest cities and towns in the UK generate 45 per cent of all emissions, with London accounting for 10 per cent. But cities and large towns are home to 54 per cent of the population, so emissions per capita are much lower than in more rural areas, and the average Londoner produces less carbon than someone living outside a city or large town. On average, cities and large towns produce about four tonnes of CO₂ per capita, compared with more than six tonnes elsewhere in the UK (see Figure 2). Only four have per capita emissions above the non-urban average.

There are two reasons for this. Firstly, with the exception of a few, high-emitting industrial activities tend to be located outside of cities, and this is likely to continue as they increasingly specialise in knowledge-intensive industries. Secondly, density influences the decisions people make about how they live, and it tends to encourage greener lifestyles.

Figure 2: Cities have a lower carbon footprint across all three sectorsCO₂ emissions per capita, 2018 (t)

Sources: BEIS, 2020.

The gap is particularly visible for transport emissions, with the average city resident emitting around 1.4 tonnes a year (Figure 2), compared with 2.5 for people living outside cities. Dense, well-connected, urban developments tend to have a smaller carbon footprint as journeys are often shorter, so require less energy. Data from the National Travel Survey shows that in areas classified as ‘urban conurbation’, the average distance travelled by car is 2,000 miles a year, but this rises to 4,700 miles for areas classified as ‘rural town and fringes’.⁴

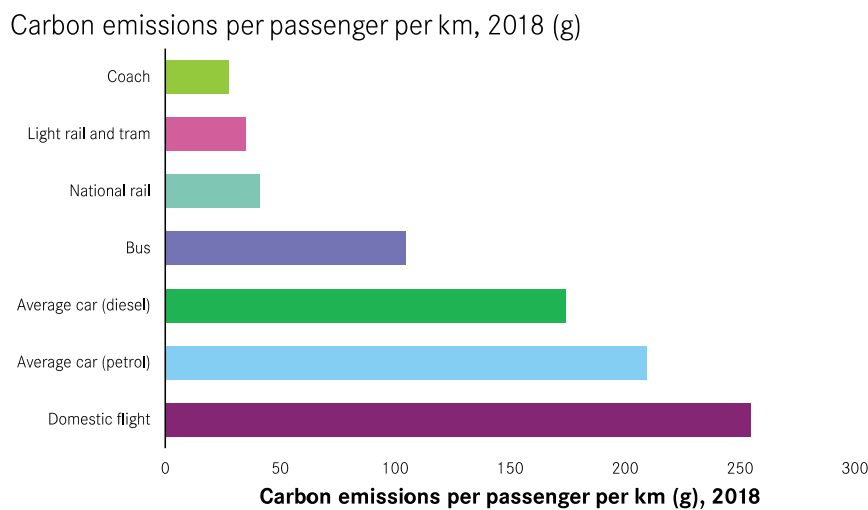
The distance travelled is not the only important metric. The mode of transport also affects the carbon footprint of a place (Box 2). This is in part influenced by density, which facilitates the development of and demand for public transport; it also explains why emissions vary between places. In London, for instance, an average commute is around 12 kilometres, similar to places like Stoke or Slough. But transport emissions per head in the capital are respectively 40 per cent lower than in Stoke and 24 per cent lower than in Slough because London’s higher density facilitates better-quality public transport network.

The important role played by density suggests the dispersion of a place’s population matters more than its actual size. Telford and Oxford have similar populations, but Telford’s built-up area is 61 per cent larger (see Figure 4), and its transport emissions per head are twice as high as in Oxford (1.8 tonnes of CO₂ against 0.9 tonnes).⁵ Internationally, a common comparison is Barcelona and Atlanta.⁶ They both have populations of about five million, but Barcelona’s dense urban form results in a much lower carbon footprint per capita.

Box 2: What are the main drivers of transport emissions?

Averaged across all cities, transport accounts for exactly one third of all carbon emissions, and is the largest source in 29 cities. Road travel (emissions from road vehicles powered by fossil fuels) is the greatest contributor, with petrol and diesel cars emitting the most, especially on a per passenger/per km basis (see Figure 3). In 2018, private cars were responsible for about 60 per cent of all transport emissions, a share that has remained fairly stable since 1990, and about 13 per cent of all greenhouse gas emissions. Vehicle improvements (such as greater fuel efficiency and more people choosing to drive electric) were offset by increases in road traffic, especially from sport utility vehicles (SUVs) and vans. Between 2009 and 2019, the number of registered vehicles rose from 33 million to 38 million, a 17 per cent increase that is well above the population growth rate.⁷

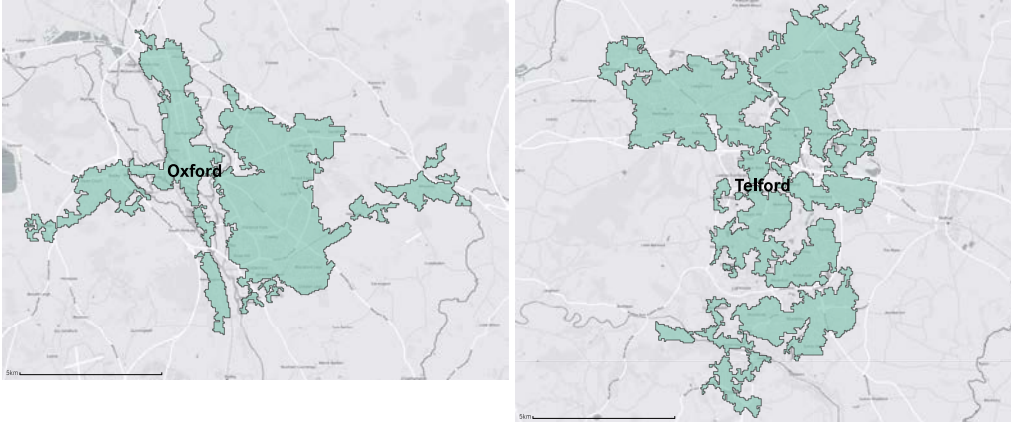
Figure 3: Private cars emit three times more carbon than shared modes of transport



Source: Department for Transport (DfT), 2020.

Figure 4: Telford's built-up area is 61 per cent larger than Oxford's

Oxford BUA and Telford BUA



Source: ONS, 2011.

Density impacts emissions from buildings too. This is because cities tend to have a higher proportion of flats, which generate fewer carbon emissions (Box 3). It has been estimated that the average emissions of a flat in a building with five or more dwellings is one tonne of carbon a year, compared to two for the average house.⁸

Much of that gap can be explained by the fact that flats tend to be smaller – in itself a function of density – as smaller dwellings emit less carbon. But size is not the only factor.

Data analysis suggests that emissions per square metre are 6 per cent lower in flats than in houses. This is because they are more heat efficient than detached homes (Box 3). They have fewer external walls, tend to share more heat with adjoining properties, and lose less through the floor and ceilings.

There are also gains that are yet to be realised from higher densities. For example, shared technologies like district heating, which can decarbonise multiple homes at once through economies of scale and supply, are only viable in dense urban environment with sufficient demand for heat.

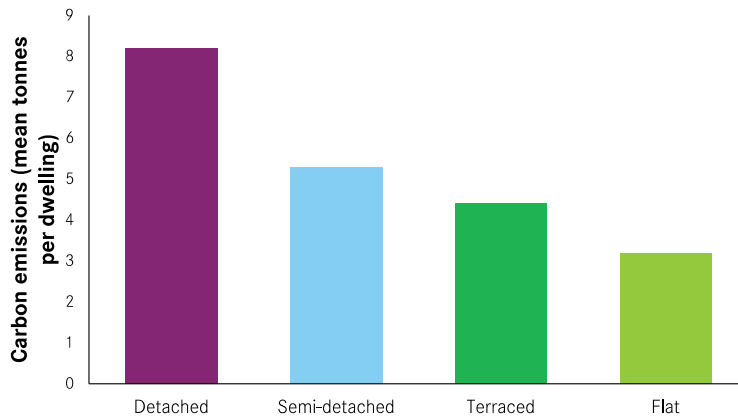
Combined, these elements explain why domestic emissions per capita are lower in denser urban environments. That said, the gap between cities and rural areas is narrower than for transport emissions (Figure 2). This is because the quality of housing is important – many cities and large towns still have old, energy inefficient housing that is carbon hungry.⁹

Box 3: What are the main drivers of domestic emissions?

Averaged across all cities, domestic emissions account for 31 per cent of the total generated (the largest source of emissions in 16 cities and large towns). Most are the result of gas and electricity consumption in and around homes. The quantity of emissions is influenced by a number of factors including the types of fuel used (the burning of fossil fuels for heating being the main source of emissions); the age, type (Figure 5), quality and condition of the property (especially its size and insulation); and other household characteristics.

Figure 5: Detached houses emit more than twice as much carbon than flats

Carbon emissions by dwelling type, 2012 (mean tonnes per dwelling)

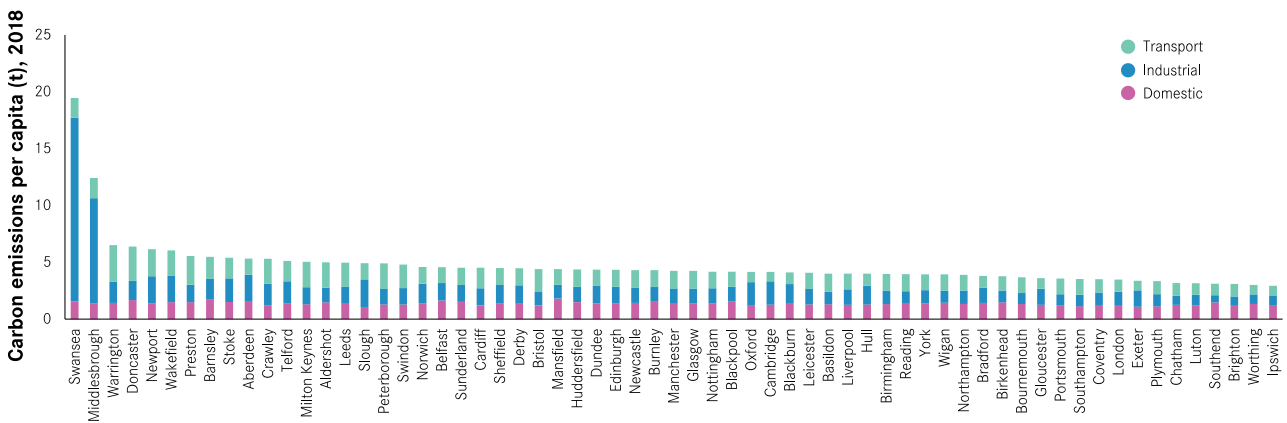


Source: English Housing Survey, 2012.

Taken together, the transport and domestic sectors explain why and how the scale of the challenge varies significantly between places (with the exception of two outliers, Swansea and Middlesbrough.)¹⁰ And so does the distance to the net zero target, as shown on Figure 6 below: cities and large towns like Warrington and Doncaster have a much higher carbon footprint than Ipswich or Worthing. And the role played by transport and housing varies, which suggests that different cities and large towns will have different challenges to address. While places like Warrington, Milton Keynes and Peterborough have high transport emissions per head, in Mansfield, Barnsley and Blackpool domestic emissions are higher.

Figure 6: Carbon emissions per head vary between cities

CO₂ emissions per capita, 2018 (t)



Source: BEIS 2020.

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Cities need to become denser to achieve net zero

Cities are likely to keep playing a disproportionate role in helping the UK hit its net-zero target, as their density means that they are places in which greater progress can be made in cutting transport and domestic emissions. But it will mean that cities and large towns will need to become denser to make this happen.

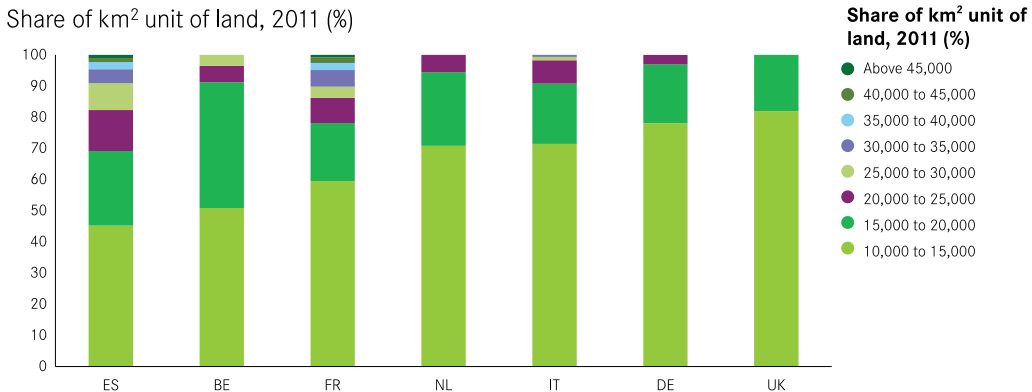
UK cities are not very dense by international standards

The UK is often thought of as one of the most densely populated places in Europe. When using a traditional definition of population density (total population relative to total land area), at 280 people per square kilometre, the UK is third in Europe behind the Netherlands (508) and Belgium (382).¹¹

But this hides significant variation between and within cities, especially when using alternative measures of density, such as those where only the size of the built-up area is taken into account. Sometimes called ‘lived-density’, this better reflects the compact nature of an urban area.

UK cities, especially those outside London, are not particularly dense by international standards. Figure 7 shows the distribution of square kilometre units of land with a population of more than 10,000 for a selection of European countries. In the UK, 86 per cent of these areas have between 10,000 and 15,000 inhabitants, with no area having more than 25,000 per square kilometre. This contrasts strongly with places like Spain, Belgium and France. Even the UK capital ranks below a number of European cities – its most populated square kilometre, in Maida Vale, has just over 20,000 inhabitants, compared with more than 50,000 in cities like Barcelona and Paris.

Figure 7: Compared to other European countries, the UK is not very dense

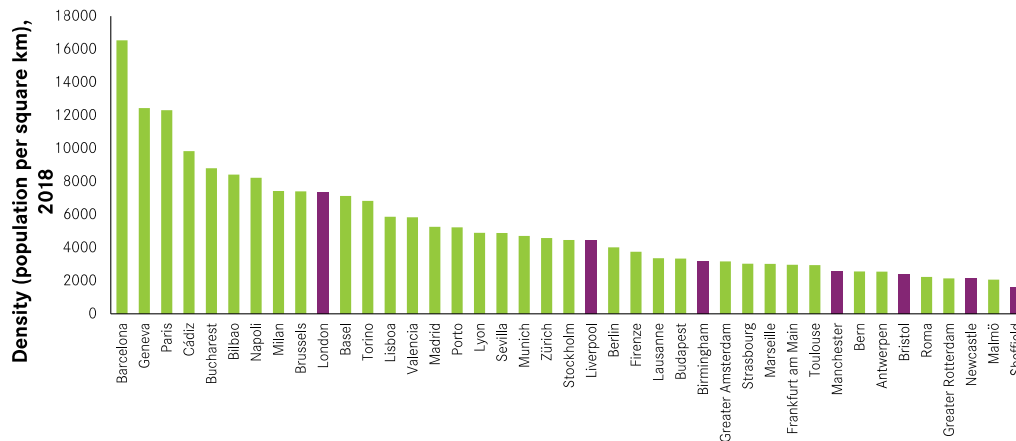


Source: Eurostat, 2011.

London is also less dense than cities like Geneva, Bilbao or Naples; and many UK large cities such as Manchester or Sheffield rank below a number of European cities of similar size, particularly French and Spanish ones (Figure 8).

Figure 8: UK cities are not as dense as many of their European counterparts

Population density per square kilometre, 2011



Source: Eurostat, 2011.

Much development has run counter to achieving net zero

A lot of this has to do with the location, over many decades, of new residential developments in the UK, as they tend to be on greenfield land on the outskirts of cities rather than on brownfield land or in existing built-up areas. Such development increases car dependency.

This has historically been explained by the considerable expansion of the automobile industry in the 1960s, which slashed transportation costs and contributed to urban sprawl

by increasing demand for housing in suburban areas. It has been widely documented in the United States, and holds true in the UK.¹² This was most clearly characterised by new towns such as Milton Keynes, Telford and Warrington, which were designed as low-density, car-dependent urban developments.¹³

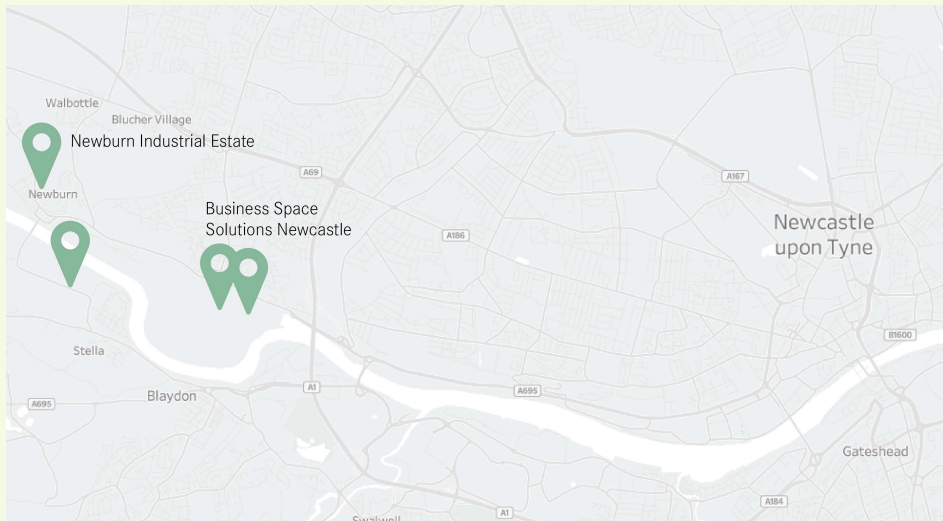
These patterns have continued more recently, despite the UK's net zero goals. Work by the Foundation for Integrated Transport explored the characteristics of a selection of new-built developments across the country, including in cities like Peterborough, Leeds, Newcastle, Warrington and Swindon. It showed that, with a few exceptions, most were car-dependent, located away from jobs and public transport networks, and built at very low-density levels.¹⁴

This critique also holds for commercial space. The many Enterprise Zones and business parks that have been built in recent decades have encouraged car commutes because they are more difficult to serve by public transport (Box 4).¹⁵

Box 4: A example of out-of-town business park development: Newburn Riverside

The Newburn Riverside Business Park is located on the outskirts of Newcastle, by the River Tyne. It is now home to the Waterfront Estate, which combines industrial facilities and offices. When it was built in 2003, it was presented as a landmark example of a sustainable development, on a large decontaminated brownfield site using sustainable design and materials.

But the carbon footprint of this new development is not as good as these greener features may suggest. This is in large part because of its out-of-town location, more than three miles away from Newcastle city centre. The site is adjacent to the A1(M) motorway, and has very low public transport accessibility. This is likely to have encouraged car-based commuting: in 2011, around 85 per cent of workers used a car to get there, compared to an average of 58 per cent in Newcastle City Council area.¹⁶



These patterns have in part been shaped by the economics. Greenfield land on the outskirts of cities tends to be cheaper and less risky for developers to build on, while an out-of-town location is a better fit for some businesses than a more central one.¹⁷

That said, policy has had a role to play in further encouraging these patterns. The current planning system has encouraged the existing pattern of house building, as Box 5 explains.¹⁸ And successive subsidies for out-of-town employment space, such as Enterprise Zones, science parks and other public sector-led developments have encouraged low density, car-dependent development in fringe locations.

Box 5: The role of the planning system

In its current form, the planning system does not produce the most effective results in terms of the quantity of houses being built or the location of new developments.

It is a ‘plan-led’ system, where landowners come forward with areas for development as part of a ‘call for sites’ process. The land must then be assessed and accepted by the local planning authority, first to be part of the local plan and then to be given planning permission.

The land is rarely in existing built-up areas, mostly because development is easier where homeownership is simpler. Given that built-up suburbs tend to have high levels of homeownership, where plans for densification can be met by a lot of resistance, it is politically less risky to build on the outskirts of cities, for instance on farmland.

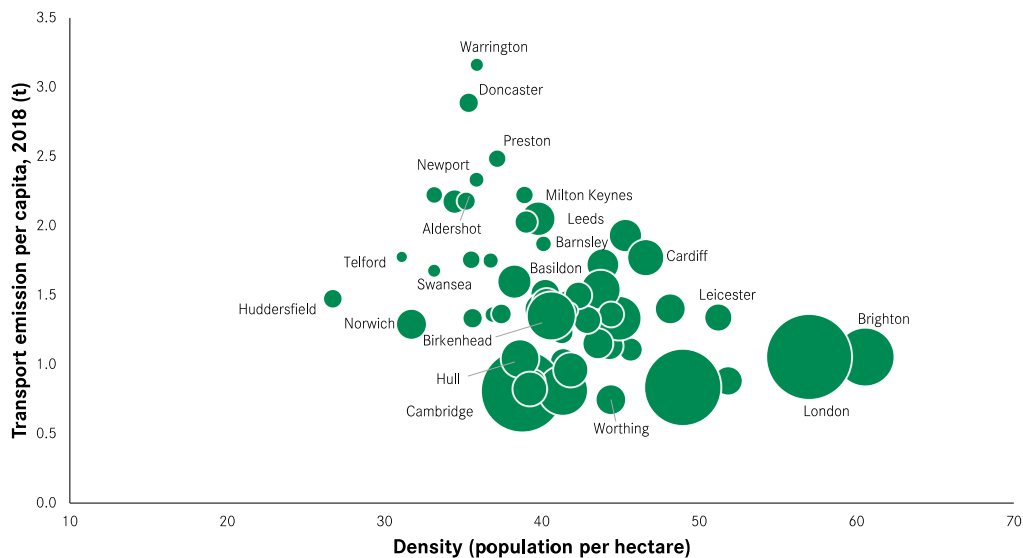
It is easier for developers too. Densifying existing built-up areas, usually on land that has not been allocated for development in the local plan (‘windfall sites’), presents more upfront costs and risks. It often requires developers to purchase and assemble small lots, which is a lengthy process and there is no certainty over the outcome, as the plan can be rejected on a case-by-case basis. This is a major barrier to scaling suburban densification.

This has shaped transport choices in cities

In low-density cities and large towns like Huddersfield and Telford, transport emissions per head are far higher than in cities such as Oxford, London and Brighton (Figure 9). In the latter group, more than half of the population commutes by walking, cycling or public transport.

Figure 9: Higher density leads to higher active travel usage, resulting in lower transport emissions

Transport emissions per capita, 2018 (t) and density, 2011 (population per hectare)



Source: BEIS, 2020. Census 2011. Centre for Cities' own calculations. The bubble size here refers to the take up of public transport and active travel.

This relationship between density levels and transport emissions is clear: modelling by Centre for Cities shows that a 20 per cent increase in density would lead to a 10.4 per cent fall in transport emissions, based on current behaviours – and much of this would be explained by changes in public transport usage.¹⁹ In absolute terms, this reduction would be equivalent to four times Newcastle's current total transport emissions. If density increased by 50 per cent, emissions would go down by 21.7 per cent, a reduction equivalent to the size of London's current emissions.²⁰

It means that a household moving from an area with Telford's density levels (around 30 people per hectare) to somewhere as dense as Brighton (60 people per hectare), would expect to cut their transport emissions per head by 33 per cent on average – moving from 1.8 tonnes of CO₂ to 1.2 tonnes of CO₂.

This relationship between density and transport emissions can be seen in cities and large towns too. Research from abroad has shown that transport emissions per capita are lower in city centres than in suburbs.²¹ And although there is no sub-local authority

emissions data in the UK, data on car ownership points to lower ownership (and so fewer emissions) in denser neighbourhoods.

While there is little difference in car ownership levels between cities and non-urban areas, the gap is much larger between city centres and suburbs. City centre residents own 0.2 cars, on average (defined here as per adult population), but that is doubled for residents of suburban areas (Table 1). In London, for example, there is a large gap between inner boroughs like Islington, Hackney, Camden and Tower Hamlets, where there are fewer than 0.2 cars per person, and outer London boroughs like Hillingdon and Bromley (more than 0.6 cars per person), as shown in Figure 10.

It is also in city centres that car ownership levels have decreased the most in the past 10 years (see Table 1), despite the fact that their populations grew by around 34 per cent around the same period. In Coventry and Oxford, as well as in larger city centres like those in London, Liverpool, Sheffield and Newcastle, car ownership levels went down by more than a third. This further illustrates the fact that people located in denser areas have less need for a car.

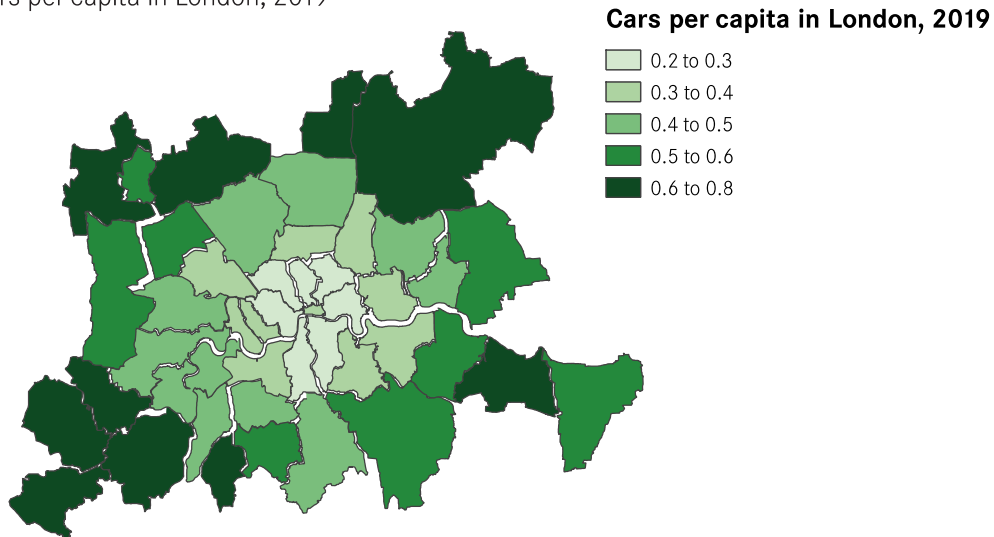
Table 1: Car ownership levels are higher in suburbs than in city centres, and higher again in rural areas

Area	Cars per capita 2019	2010-2019 change	Population change 2010-2019
City centres	0.23	-21%	+34%
Suburbs	0.54	+5%	+6%
Hinterland/outside	0.65	+6%	+6%

Source: DfT, 2020.

Figure 10: Car ownership levels are much higher in outer London

Cars per capita in London, 2019



Source: DfT, 2020

It has shaped domestic emissions too

In recent years, suburban sprawl and the construction of single-family, detached housing has negatively affected domestic emissions. Energy Performance Certificate (EPC) data shows new apartments emit 67 per cent less than new houses – flats built (or converted) in 2019 emitted 0.9 tonnes of carbon annually, while houses constructed in the same year were responsible for 1.5 tonnes.²² This gap has widened in recent years – between 2013 and 2019, emissions from new flats went down by 18 per cent, on average, compared with 11 per cent for new houses (Table 2).

Despite this, houses account for an increasing share of all new builds – in 2019, nearly 80 per cent were houses, up 12 percentage points since 2013 (Table 2). Additional data from the National House Building Council (NHBC) confirms that most new builds are large, detached houses that tend to have a higher carbon footprint. In 2019, this type of home accounted for 30 per cent of all new dwellings, compared with 22 per cent in 2013.²³

Table 2: New houses emit 65 per cent more emissions than new flats

	2013		2019	
	CO ₂ emissions (tonnes/year)	Share of all new build completions (%)	CO ₂ emissions (tonnes/year)	Share of all new build completions (%)
New flats	1.1	33	0.9	22
New houses	1.7	67	1.5	78

Source: EPC domestic register, 2019.

04

How a changing approach to development can help achieve net zero

The UK needs to change its approach to planning and development to achieve net zero. This section sets out modelling on the impact that this change of approach could have on net zero, in conjunction with the take-up of electric vehicles (EVs) the retrofitting of existing houses and the building of more energy efficient new homes.

Modelling the impact of a modal shift on transport emissions

Cutting transport-related emissions often relies on projections showing a significant uptake of EVs and Battery Electric Vehicles (BEVs), in particular. But relying on a shift to cleaner vehicles must not be considered as the only solution (Box 6). Wider benefits can be reaped through modal shift, with an increase in public transport and active travel usage.

Figure 11 is based on modelling by Centre for Cities. It focuses on emissions from commuter journeys and estimates the potential reduction in carbon emissions if cars accounted for only a third of these journeys (as they currently do in London), against more than 60 per cent today.²⁴ It uses modal share data, population projections for all cities, average distance to work and estimates of car emissions per kilometre/passenger by 2035.²⁵

On the last metric, three scenarios have been considered:

1. No change, where there is no significant uptake in the number and share of EVs and BEVs by 2035.
2. An optimistic scenario where, in 2035, BEVs account for two-thirds of the fleet (which is in line with the Government's expected phase out of petrol and diesel cars by 2030).
3. A 'middle ground' scenario where, by 2035, BEVs account for a third of the fleet.

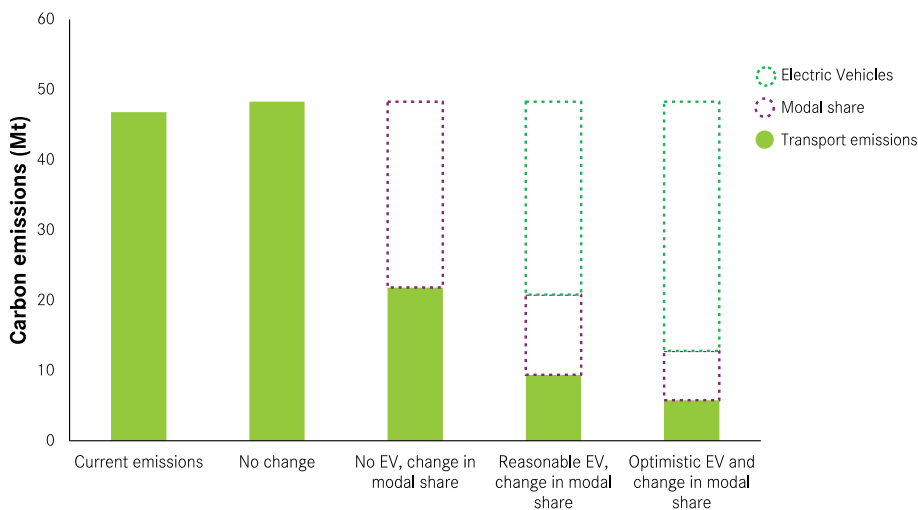
Figure 11 shows a worst-case scenario where neither the composition of the fleet nor modal share changes. In this case, transport emissions are expected to rise as a result of projected population growth, and subsequent increases in traffic levels.

It also shows the extent to which a change in modal share can get cities closer to net zero emissions in the transport sector, regardless of the composition of the fleet. Even in a scenario where there is no significant uptake of EVs, the impact of a change in modal share is clear: car-related emissions would more than halve.

In the best-case scenario, where EVs make up two-thirds of the fleet and cars account for only a third of all journeys, emissions from these journeys would be cut by 87 per cent compared with today's levels. While gains from modal shift are reduced, they still play an important role.

Figure 11: Emissions could halve by 2035 if cars only account for a third of all journeys

Impact of modal share change and EV scenarios in cities



Source: DfT, 2020; Census, 2011. Centre for Cities' own calculations.

The impact of each scenario varies from place to place. In the absence of change, cities and large towns like Coventry or Bristol would see their emissions go up by 20 per cent and 12 per cent respectively, mostly driven by population growth. And, conversely, modal shift would have the biggest impact in cities like Aldershot, Blackburn or Burnley. Emissions in these cities are 60 per cent higher today than they would be if car usage was at London levels.

Box 6: EVs are an important part of the solution, but they should not be seen as the only way to achieve a greener future

The Government recently announced that the sales ban for petrol and diesel engines, initially planned for 2040, would be brought forward to 2030. This is welcome news, as it is expected to cut CO₂ and nitrogen dioxide (NO₂) emissions, especially given the underlying assumption that there will be significant uptake of zero emission vehicles in the run up to 2030. While a transition to EVs would have a number of benefits, they are not the panacea, especially in cities.

First, while they have no exhausts, they still emit harmful fine particulate matter (PM_{2.5}) through brakes and tyre wear, and this is the cause of more than 14,000 deaths a year in cities alone.²⁶

Second, EVs would put a strong burden on local grids, and a lot of electricity cables and power stations would be required.

Third, they still take up a considerable – and valuable – amount of space (the same as for a petrol or diesel car). Data for London shows the average car is parked at least 95 per cent of the time, and 43 per cent are parked on the street.²⁷ A transition to EVs would not free up space for public transport and active travel, bus lanes or segregated cycling infrastructure.

Cities need fewer cars, not just cleaner cars. In the densest urban areas, investment must be targeted towards disincentivising driving. The focus for EVs must be on residual journeys outside dense urban areas where there are no (or few) alternatives.

Box 7: Is remote working the solution to cutting carbon emissions?

It has often been suggested that working from home provides a solution, both in terms of improving air quality and reducing carbon emissions.²⁸ In particular, this has been argued during the Covid-19 pandemic, which triggered a surge in remote-working patterns.

While it might reduce transport emissions from commutable journeys and, in some cases, cut overall emissions, it is important to nuance this argument. Commutes only represent 14 per cent of car trips, so are not the largest contributor to emissions. Density still matters because it determines the average distance of other journeys (such as grocery shopping or leisure), and therefore the likelihood of people walking or using public transport.

This is particularly true where a household moves further away from a city centre to a less dense area because they do not need to go to the office every day. Provided they did not use public transport for their commute, they might save carbon on that journey. However, they may end up using a car more for other purposes. As a result, their total carbon footprint would either remain unchanged or increase, especially if they moved to a larger home that uses more energy.

Such a shift from cars to public transport can be achieved through a number of policy interventions, such as disincentivising car usage by making driving more expensive or investing in public transport infrastructure. But, to be the most impactful and reach a potential transport emission cuts of up to 87 per cent as shown above, many of these policies will need to be underpinned by changes in density. An associated increase in demand that arises in denser environments would, for instance, support the development of new public transport routes or make existing ones more viable, and facilitate the transition away from cars.

This has important implications in terms of housebuilding policies and spatial planning more generally. If the UK is to increase its provision of homes by 2.3 million in the next decade, then it is crucial to build them in the right locations.²⁹ Densifying existing built-up areas will reduce the carbon footprint of both new and existing residents, especially in large cities like Manchester, Birmingham, Leeds or Sheffield, which are currently way below London's density levels. If 10 per cent of Manchester's built-up area matched the levels of west London's densest neighbourhood, it could accommodate an extra 963,000 people, resulting in a 40 per cent increase in density.

This does not necessarily mean building skyscrapers, as examples from London show (Box 8). 'Gentle' density can be achieved, for instance, by constructing four- to six-storey buildings on empty brownfield land within city boundaries.

While in many of these cities there is potential for infill development in city centres, it should not be only the immediate city centre that accommodates extra density. As places of production and consumption, they need to balance residential and commercial space, and inner city, well-connected suburban areas will need to densify.

Box 8: Increase in density and car use – examples from London

In recent years, many areas in London have experienced an increase in density levels well above 20 and even 50 per cent. Some places in Stratford, in the London Borough of Newham, are often used as examples of mid- to high-density living. Census data for 2001 and 2011, at the lower super output area level, shows the neighbourhood by Stratford station saw density increase significantly when the area was chosen to host the London 2012 Olympics. Over that decade, its population nearly doubled. Public transport use rose significantly, from 58 per cent in 2001 to 79 per cent in 2011. This was driven by an increase in density, and investments in public transport links (such as Stratford International station and the expansion of the Docklands Light Railway), with the latter underpinned, in part, by the former. The location of jobs matter too: between these two dates, the proportion of people commuting from Newham to central London has increased by four percentage points.

Croydon is another example. In the neighbourhood that surrounds Wandle Park, the population nearly doubled between 2001 and 2011 too. And, given the area just a few hundred metres south did not experience any significant increase, the gap in public transport use is striking. In 2001 both areas had similar modal shares, with around 36 per cent of residents using public transport. However, it rose by 20 percentage points in the former, but barely changed in the latter.

In Stratford and Croydon, higher density levels were achieved through the construction of mid-to-high rise buildings (see Figure 12).

Figure 12: Typical new development in Stratford (left) and Croydon (right)



Source: Google Maps, 2021

Further emissions reductions could be achieved if cities retrofit their housing stock

The Climate Change Committee has made it clear that the UK is unlikely to meet its targets for emissions reductions without retrofitting large sections of the existing housing stock (Box 9).³⁰ This is because the large majority of the buildings that will be there in 2050 have already been built, hence the importance of focusing on existing dwellings.

Energy inefficient housing is disproportionately located in urban areas. Of the total 11.2 million homes that are currently below EPC band C in England and Wales, 6.3 million are located in cities and large towns – some 56 per cent of the total.³¹

Averaged across all cities, only 38 per cent of housing is rated A to C (the three most efficient bands). This is largely down to the nature of the stock, which tends to be quite old and inefficient and has been upgraded at a very slow pace in recent years. However, the age of the properties is not the only factor: in 2019, less than 1.5 per cent of all new homes were rated A, which reflects a lack of ambitious regulations in terms of building performance standards.³²

Box 9: Retrofitting the housing stock – the scale of the challenge

Shifting to low-carbon alternatives will be key to decarbonising the domestic sector (e.g. through electrification), but improving the energy efficiency of homes is likely to play an important role, too. With more than a third of UK housing stock built before the Second World War, homes have poor energy efficiency compared with homes in other countries.

The Clean Growth Strategy, published in 2017, seeks to address this problem with an objective to upgrade “as many homes as possible” to EPC band C by 2035. This would include cavity and loft insulation, as well as double glazing or solid wall insulation. Upgrading homes is expected to significantly contribute to carbon emission reductions (Table 3). However, the benefits go beyond this, as energy-inefficient homes tend to be more expensive to run. On average, a property graded F is five times more expensive than one graded A or B. Even the most common rating (band D) is twice as costly as band A or B.³³

Table 3: The least energy efficient dwellings emit much more carbon

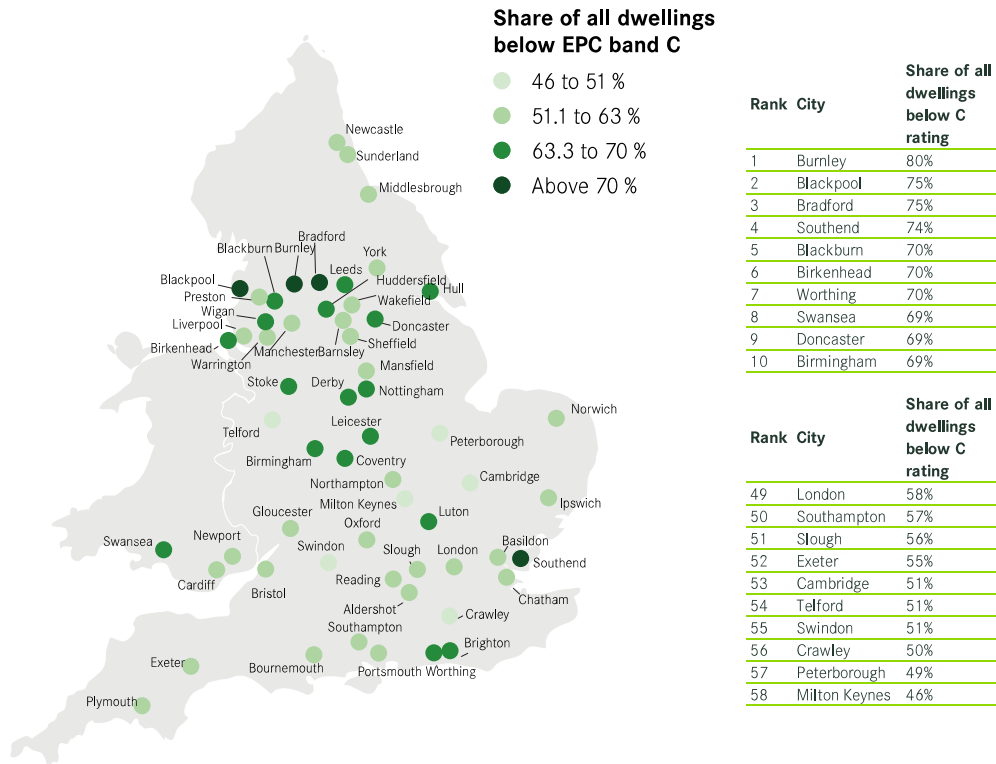
Average carbon emissions for each EPC grade

EPC grade	Average CO ₂ emission per sqm (t)	Average cost per year (£)
A	0.3	396
B	1.7	396
C	3.2	643
D	4.7	921
E	6.5	1,391
F	8.7	2,008
G	12	2,998

Source: EPC Domestic Register, 2019.

There is a geography to this issue. Of the 10 cities and large towns most in need of retrofitting, seven are in the North or the Midlands (see Figure 13). In Burnley, for instance, 80 per cent of the housing stock is below EPC band C. In larger cities, like Birmingham, the share is slightly lower but, in total, half a million properties would need retrofitting. In London it is more than 1.7 million.

Figure 13: In some cities, more than 70 per cent of the housing stock needs retrofitting



Source: EPC Domestic Register, 2019.

Modelling that takes into account the current stock of homes that need upgrading, average emissions from each EPC band, household projections and an ‘ideal’ scenario in which all new builds are rated B from 2022, suggests that retrofitting would help cut domestic emissions by nearly 40 per cent in places like Burnley, Luton and Bradford (Table 4). Even in cities and large towns with a low proportion of homes in need of retrofitting, such as Telford, Crawley and Swindon, domestic emissions could be reduced by nearly 25 per cent compared with current levels.

Table 4: Retrofitting the housing stock could save up to 40 per cent in carbon emissions

City	Potential reduction in domestic emissions – top 10	City	Potential reduction in domestic emissions – bottom 10
Burnley	39%	Coventry	26%
Luton	38%	Wakefield	26%
Bradford	38%	Slough	26%
Swansea	37%	Exeter	26%
Blackburn	36%	Peterborough	25%
Oxford	35%	Basildon	25%
Blackpool	35%	Milton Keynes	24%
Birkenhead	35%	Swindon	22%
Derby	35%	Crawley	22%
Ipswich	34%	Telford	21%

Source: EPC Domestic Register, 2019. Centre for Cities' own calculations. Note: this is a scenario where all new builds until 2035 are in EPC band B.

Modelling the impact of retrofitting on domestic emissions

Further cuts in domestic emissions can be achieved if the right types of homes are built in the right locations. This reflects the benefits associated with building in a more compact way, as blocks of flats tend to have a much lower carbon footprint than houses, particularly those that are detached.

Centre for Cities' modelling shows that if density levels increased by 20 per cent everywhere, domestic emissions would fall by 5.7 per cent on average.^{34 35} This reduction in emissions would be equivalent to more than twice the size of Newcastle's current domestic emissions.

05

Progress against the UK's carbon budgets: how much will cities contribute?

The changes discussed in the previous section of this report, whether they aim to disincentivise car use or upgrade currently energy inefficient housing stock are likely to achieve significant cuts in carbon emissions in the transport and domestic sector, respectively. This section looks at the combined impact of these changes when set against the UK's overall carbon emissions reductions target.

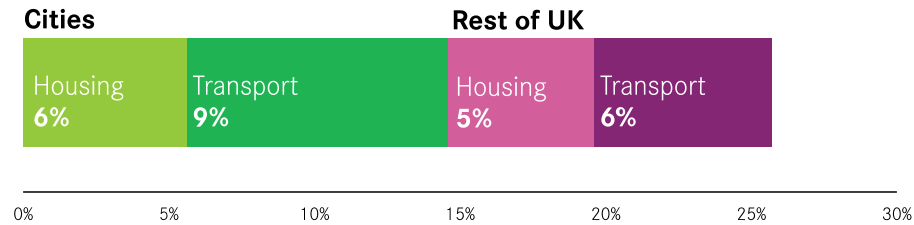
The UK recently enshrined into law its Sixth Carbon Budget for 2035, which includes a commitment to reach a 78 per cent reduction in greenhouse gas emissions compared to 1990. This corresponds to a 63 per cent cut compared to current levels. Translating this objective into annual budgets shows the scale of the challenge: by 2035, the UK's total emissions need to be below 200Mt, compared to more than 500Mt today.

Data analysis suggests that if, by 2035, cars only account for a third of all journeys, and all houses currently graded below EPC band C have been upgraded, then about 26 per cent of the total cuts needed to be in line with a net zero trajectory can be achieved.

It is clear that these changes alone will not be enough to reach net zero. More action will be required in the industry, waste, aviation or shipping sectors, for example. But in terms of the sectors local authorities have some level of control over, such as housing and transport, this analysis confirms that cities and large towns have the potential to disproportionately help the UK meet its emissions target. This is shown in Figure 14: because of their density, cities and large towns will account for 57 per cent of the total cuts achieved, against 43 per cent in the rest of the UK.

Figure 14: Cities can help achieve a disproportionate share of emissions cuts needed

Share of the 2035 annual target that can be met through changes in transport and housing

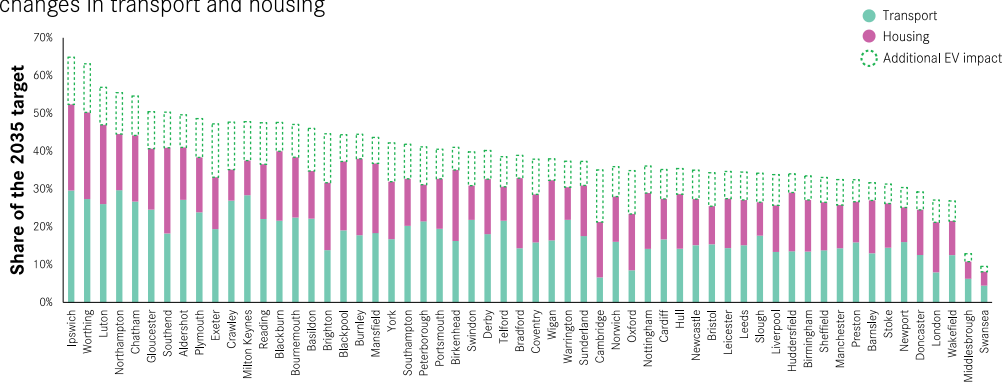


Source: BEIS, 2020. Centre for Cities' own calculations.

Not all places will need to cut emissions at the same pace – nor do they have the potential to do so. Figure 15 below is based on a calculation of local carbon budgets (Box 10) which are then translated into an annual target for 2035. It looks at the impact of the changes discussed in transport and housing, against the overall cuts needed in each city or large town.

Figure 15: Not all cities have the same potential to reach emission cuts

Share of the 2035 overall annual emissions target that can be met through policy changes in transport and housing



Source: BEIS, 2020. Centre for Cities' own calculations.

In Ipswich and Worthing, these changes in housing and transport could account for about half of the total objective, while in Middlesbrough and Swansea, it is less than 10 per cent due to the current composition of emission sources.³⁶

These calculations also confirm which policy levers cities and large towns should prioritise: while London, Cambridge or Bradford will have to put the emphasis on reducing domestic emissions, in Milton Keynes, Aldershot and Northampton (where housing stock is newer because of their post-war creation or expansion), tackling transport emissions will be crucial.

Box 10: How are carbon budgets calculated?

Since cumulative emissions from human activity are the main driver of an increase in global average temperatures, the imperative for the decades to come is to control and reduce the amount of carbon emitted into the atmosphere. The Intergovernmental Panel on Climate Change has estimated that the global total amount of carbon that can be deposited into the atmosphere between now and 2100, with a “likely” chance of staying well below two degrees, in line with the 2015 Paris Agreement, is 900 GtCO₂. This is a carbon budget, which is a measure of the total amount of carbon dioxide that can be emitted into the atmosphere by a given date.

At the national scale, there is not a single carbon budget, as a number of institutions have calculated their own value for the UK based on a wide range of different scenarios- such as the likelihood of limiting global warming to 1.5°C, or the reliance on carbon removal technologies. Researchers at the Tyndall Centre for Climate Change Research have recently developed a local carbon budget tool, using a method called ‘grandfathering’ which downscales the global carbon budget to a UK budget and then to local areas based on their respective recent shares in global and national emissions.^{37 38}

Applying the same method at the scale of the Primary Urban Area can therefore be used to calculate the remaining amount and share of carbon that can be emitted from the UK’s 63 largest cities and towns, in line with the Paris Agreement objectives. The total size of the carbon budget varies from place to place: given its share in national emissions, London’s budget is the largest: the capital must stay within a maximum cumulative budget of 230 MtCO₂, while in other places like Cambridge and Worthing the total budget is much smaller (less than 5Mt).

This calculation confirms that to remain below their respective budget and help the UK achieve its net zero target, the pace of change needs to accelerate significantly. On their current trajectories, most cities and large towns are set to expend their total budget in fewer than seven years from now.

06

How to achieve a fair transition

The transition to a net zero economy presents a number of opportunities. A key tenet of the Green Industrial Revolution, now dubbed the ‘Green Recovery’ in the context of the Covid-19 economic crisis, is that up to 250,000 green jobs could be created through investment in a low-carbon future, whether in transport, housing or industry. The retrofit challenge is a good example. It would help create construction jobs in places that need it most, and that have been most impacted by the economic shock- cities like Burnley, Blackpool or Bradford (Figure 16).

But successfully shifting towards net zero will require managing and mitigating the risks, especially in carbon-intensive sectors where jobs will either be lost or disrupted. Many of these nationally driven policies, whether on the phasing-out of fossil fuels or the further cleaning of industry are unlikely to affect all places evenly. Looking at the distribution of jobs in high-emitting sectors such as mining, manufacturing or transportation shows two things.

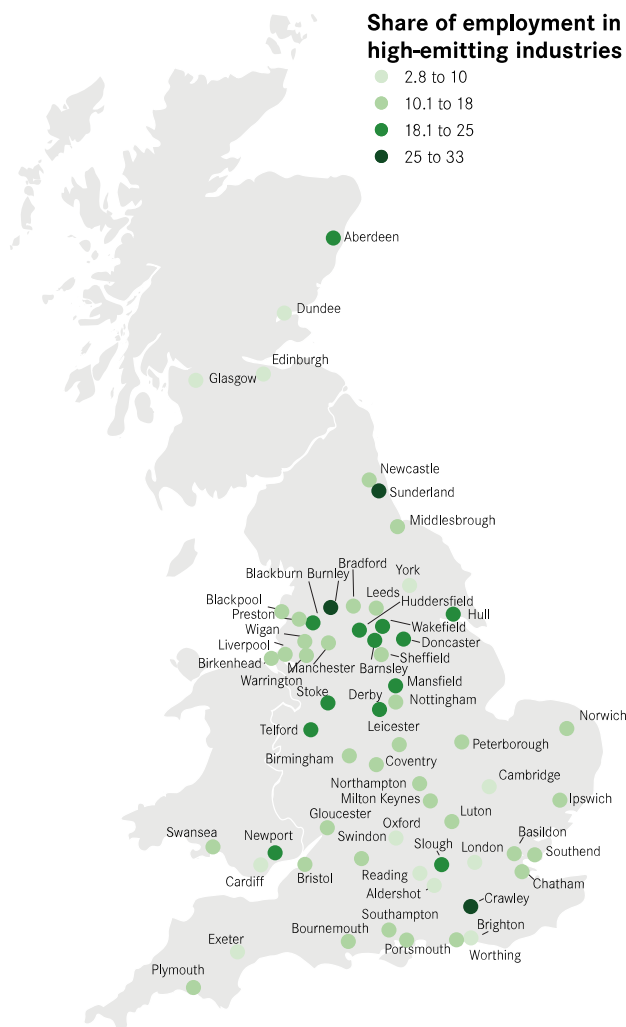
While they represent a higher proportion of all jobs in rural areas (16 per cent versus 12 per cent in urban areas), most (54 per cent) of these jobs are in cities and large towns, especially in the energy supply and transportation sector.

Second, there are stark differences between cities and large towns, too, and some will be more impacted than others. With the exception of Crawley, where a third of all jobs are in high-emitting industries (with 24,000 jobs in the transportation and storage industry), the 10 cities or large towns with the highest proportion of jobs at risk of being lost or disrupted are in the North and the Midlands (see Figure 16). Some cities with specific industries are likely to be particularly affected. For example, 36 per cent of all jobs (around 19,000) in mining and quarrying are located in Aberdeen, where a large part of the local economy is dependent on the oil and gas extraction industry.³⁹

This confirms that not all places have the potential to reach net zero emissions at the same time. It might take longer in Aberdeen, Burnley and Crawley to cut down emissions, compared to Cambridge or Oxford, and the latter group of places should therefore be expected to reach net zero emissions sooner.

There are important implications for policy: in the most vulnerable cities and large towns where a higher share of the local labour market is at risk, moving away from a reliance on fossil fuels and carbon-intensive industries will require appropriate interventions, and substantial investment in skills, to help absorb the economic shock.⁴⁰ This may involve, in the short term, providing targeted job support; and in the short to medium term, reskilling and upskilling workers, with a focus on workers whose skills are not immediately transferable, to provide them with the necessary tools to find employment in a greener economy.

Figure 16: High-emitting industries are not evenly distributed across the country



Source: BEIS, 2020; ONS, 2020. Note: the industries defined here as “High-emitting industries” are mining and quarrying, energy production, manufacturing and transportation. Together they account for 57 per cent of carbon emissions.

07

Case studies

Whether on the transport or housing front, a number of cities have already implemented innovative solutions to tap into the benefits of density and reduce their carbon footprint. This section features four case studies from the UK and abroad to help cities tackle their own net zero challenge.

Case study 1: Climate Innovation District, Leeds

Situated on a former brownfield site on the banks of the River Aire, the Leeds Climate Innovation District is a good example of a new low-carbon residential development. It has around 520 homes that are built with insulated timber panels made in an on-site manufacturing plant, to reduce the emissions of each property during construction and when occupied. They need far less heating than traditional homes, as they require no gas central heating system. Electricity is provided by solar panels on the roof, and supplemented by 100 per cent renewable energy.

The location of the development encourages low-carbon lifestyles. Built at 'gentle' density levels (with three- or four-storey buildings), it is within walking or cycling distance from the centre of Leeds. Less than a seven-minute cycle to the station, it is near amenities such as schools and office space. The development features car-free streets, with only a few underground parking spaces provided at an extra cost. This is likely to reduce transport emissions generated by residents.

Researchers from the University of Leeds have designed a tool that assesses the active travel provision and potential of a range of new residential developments in the UK.⁴¹ It shows that, while most other developments are still very much car dependent, the highest bus use is within the Climate Innovation District. Around 39 per cent of commutes are made by walking, cycling or public transport (walking accounts for 37 per cent) and researchers estimate this could rise to 47 per cent (based on existing travel patterns and workplace locations).



Image source: Citu, OpenStreetMap

Case study 2: A model from abroad – Freiburg, Germany

Freiburg is a city in southern Germany that is home to just over 230,000 people. It has long attracted positive press for its sustainable development model.

In the 1970s, when local ‘green’ politics crystallised in opposition to the construction of a nuclear power station nearby,⁴² Freiburg pedestrianised its city centre and expanded local cycling and light rail networks.⁴³ Throughout the 1980s and 1990s, the city pushed this sustainable agenda, as the development of local public transport infrastructure intensified and new housing and planning projects began.

Reducing dependence on cars and building on the benefits of density have been central to Freiburg’s approach. This was achieved through a combination of land-use policies restricting new development along public transport corridors on land immediately adjacent to built-up areas (preventing excessive sprawl) on the one hand, and interventionist public transport policies on the other. Whereas 39 per cent of all journeys completed by residents were in cars in 1982, cars account for only 21 per cent of such journeys today. Despite a booming local economy and growing population, average car mileage in the city fell by 7 per cent across all roads and 13 per cent on residential streets between 1990 and 2006, and per capita transport-related CO₂ emissions concurrently fell by 13 per cent.⁴⁴ The city is now known for its extensive public transport system – around 70 per cent of the population lives within 500m of a tram stop.

Central to Freiburg’s sustainable image is the Vauban neighbourhood, which was constructed in the late 1990s, three kilometres away from the centre of Freiburg and is home to around 5,500 people.⁴⁵ Built on brownfield land using sustainable techniques (such as innovative passive heating, photovoltaics and wastewater management), the development is made of three- or four-storey buildings, achieving ‘gentle’ density levels.⁴⁶ Car ownership is discouraged. Though access for pedestrians and cyclists is protected, roads are discontinuous and parking is limited. In Vauban, car ownership is further discouraged by low speed limits and parking arrangements that are both inconvenient and expensive.⁴⁷ Consequently, the rate of car ownership is below that of Freiburg as a whole; only 48 per cent of Vauban residents, for example, have access to a car, and many of them rely on car-sharing networks.⁴⁸ As a result, Vauban’s residents’ carbon footprint is

much lower than elsewhere in the country: on average, residents emit 0.5 tonnes of CO₂ annually – a figure far below the German average of 9.4 tonnes.⁴⁹

Case study 3: District heating: using the benefits of density to decarbonise homes

Individual gas boilers are the most popular heating system in the UK today, but district heating schemes (sometimes called heat networks) are an alternative solution. Boilers are replaced by a centralised energy supply that redistributes heat to residential and commercial buildings through insulated pipes underground.

District heating is often seen as the most cost-effective way of cutting emissions from buildings (it is estimated to reduce primary energy demand in heating and cooling by 50 per cent). Economies of scale make it more efficient at generating heat, and it has the potential to switch to fully renewable energy sources.

It is particularly suited to dense urban environments, as it needs a certain level of demand to be economically viable. If the heat source is low carbon, district heating brings considerable benefits, as it effectively decarbonises multiple homes at once.

A number of UK cities, including Nottingham, Sheffield and Southampton, have already adopted schemes. London recently announced innovative plans for the Bunhill Heat and Power Network, providing heat for more than 1,300 homes using power from the London Underground.

Compared with other countries, the take-up of district heating is quite low in the UK. Only 2 per cent of homes are connected to a heat network, unlike in Denmark where it is more than 60 per cent. In Copenhagen, for instance, more than 95 per cent of heat is provided through low-carbon district energy networks, and it emits 40 per cent fewer carbon emissions than individual boilers.

If the UK is to achieve its climate target, take-up of these schemes will need to rise. The Climate Change Committee recently stated that a fifth of homes would need to be connected to low-carbon heat networks by 2050, alongside other options like heat pumps.

08

What needs to change?

Progress on carbon emissions targets is unlikely to be ‘place blind’. If the UK is to meet its target of net zero emissions, then it is likely that cities and large towns will drive this transition in the next period as they have greater potential for doing this than other areas. Some cities could even be carbon negative, offsetting the emissions that cannot be cut elsewhere. This has important implications in terms of policy.

For the years to come, the priority will be to phase out carbon-intensive activities, to incentivise the take-up of low-carbon solutions and to improve energy efficiency. A large part of this will be driven by national government interventions: net zero is a national pledge, so it is up to the national government to develop plans and deliver the necessary tools and funding to meet that objective. As such, much action on climate change will happen ‘to’ cities (such as changes in electricity generation) rather than being directly driven by them.

But in the areas of transport and domestic emissions, there is more direct action to be taken. Alongside national government intervention, local policy-makers have the power to bring about change directly to their local area, through their approach to planning and discouraging car usage, for example. But this is currently hampered by a lack of powers and resources, a local government structure that prevents the integration of transport and spatial planning strategy, and a dysfunctional planning system.

The rest of this section summarises what needs to change in cities and large towns if the UK is to achieve net zero emissions by the middle of the century.

1. Spatial planning: devolve more powers at the local level and achieve greater benefits by integrating transport and housing plans

Local governments currently have a number of planning powers that can be used to cut carbon emissions. They can encourage walking and cycling by pedestrianising roads and repurposing space that is currently allocated for cars – for instance on-street parking. Publicly owned car parks in cities could be demolished and replaced with residential

development (either built by the local council or sold to developers) – to disincentivise drivers and cut carbon through increased density.

But this will not be enough. To fully realise the benefits of density, more structural changes need to happen:

a. Changes to governance structures

The current structure of local government does not give mayors and local leaders the institutional capacity to deliver the changes needed in transport, housing and spatial planning policy. This is in part because the powers they have are often fragmented: for example, the current two-tier system is highly inefficient, as district councils are the local planning authority and county councils are the local transport authority. This makes it difficult to coordinate and plan at scale.

This local government fragmentation and the current state of devolution of powers mean that cities and large towns often have too few levers to pull. They often lack statutory powers to act. On transport, for instance, cities and large towns today have low levels of control over the infrastructure, services and funding for public transport. A large majority of cities have few or no powers over public transport journeys and the revenues it can generate. In cities like Birmingham, transport authorities control less than a 10th of all public transport commutes, as infrastructure outside the light rail transit system is not covered by their remit.⁵⁰ This in turn has implications on how cities are spatially planned: only the Mayor of London has powers to create a statutory spatial plan that integrates transport and spatial planning. This allows, for instance, the creation of a tool called Public Transport Accessibility Level, used to optimise residential density according to public transport provision.

This needs to change. If cities and large towns are to reduce our carbon footprint by planning more intelligently, powers and resources must be sit with a single authority that covers transport and housing so it can plan new developments alongside the existing public transport network, and vice-versa. This would involve:

1. In mayoral combined authorities, making organisational changes to move powers down from Whitehall and up from local authorities, so all mayors have the same statutory spatial planning powers as the Mayor of London.
2. Outside of unitary authorities, replacing the two-tier local government system with a single-tier system where powers over transport and planning are joined.

b. Changes to the UK's approach to development

Reform of the planning system

In its current state, the discretionary planning system prevents efficient land use outcomes by making it harder, riskier and therefore costlier for developers to identify opportunities in existing built-up areas and on brownfield land. Densifying existing built-up areas, often on land that has not been allocated for development in the local plan ('windfall sites') is a lengthy and costly process that requires developers to purchase and assemble small plots of land, with no guarantee of planning permission. The result is that in many cities and large towns, most new residential development occurs where land is cheaper and land ownership is simpler, on the outskirts of cities – often 'leapfrogging' green areas into car-dependent estates.

Many of these issues could be avoided by a shift towards a flexible zoning system: not only would it shorten the process and accelerate the construction of new homes (that tend to have a lower carbon footprint because they are more energy efficient), it would also incentivise suburban densification by reducing risk for developers and allowing them to capture value uplift in land closer to city centres. Land would be allocated much more efficiently as a result. It would be up to local planning authorities to use the zoning system to locate 'medium to high' residential developments near train stations for instance, and prioritise development on inner city brownfield land.

Direct incentives to build on brownfield land

In addition to changes to the planning system, other mechanisms have the potential to incentivise the development on brownfield land. The Brownfield Land Release Fund announced last December is a welcome initiative, as it allocates £100 million funding to councils (and an additional £67 million for the West Midlands and Greater Manchester combined authorities as part of the Brownfield Fund) to prioritise housing development on previously-used land. It should be extended, to allow a maximum number of local councils to successfully bid for funding to help make brownfield development relatively more attractive compared to greenfield development.

2. Transport: Move away from car dependency and incentivise the take up of low-carbon solutions

Emissions from road transport, and cars in particular, are a good example of a negative externality: the cost of driving and parking a polluting car is too low compared with the environmental costs that are then passed on to society. Drivers lack incentives to switch to cleaner vehicles and other transport modes, and the clean alternatives such as zero-emissions vehicles remain too expensive.

This will involve a number of nationally driven interventions: the Government must deliver on its pledge to phase out petrol and diesel cars by 2030. The upcoming Transport Decarbonisation Plan, delayed until summer 2021, must set out an intermediate milestone for 2025, as there is a risk that most of the remaining carbon budget that can

be allocated to car emissions will be used before the ban kicks in. The recent commitment to £1.3 billion funding for EV charging infrastructure is welcome news, but more must be allocated to help people become less dependent on cars.

Alongside national government intervention, cities should use the powers they have to support active travel, encourage public transport use and disincentivise car use. This can be done by:

- **Adopting schemes like Clean Air Zones (CAZs)** which charge the most polluting vehicles in the central zone of a city. These are expected to be particularly effective at addressing the residual, short car journeys that could easily be switched to other modes.⁵¹ In London, the CAZ-style scheme introduced two years ago, set to be expanded in October 2021, has brought about significant air pollution and carbon emissions reductions.⁵² Other schemes like Workplace Parking Levies and Park and Ride must also be considered.
- Using the 2017 Bus Act powers to **introduce bus franchising**, as Greater Manchester intends to do. This would give city leaders powers to control bus routes, make them more reliable, bring down costs for passengers through a simpler ticketing and fare system, and clean up the fleet. The Government should also extend these powers to other areas outside mayoral combined authorities.
- **Investing in active travel alternatives.** This includes making the measures that were put in place during the pandemic permanent (such as the pedestrianisation of central areas or pop-up cycle lanes) where they have had a positive impact.
- **Encouraging people to return to public transport and restore confidence in mass transit** which may have been eroded by the pandemic, for instance via a large public awareness campaign.
- **Investing in public transport infrastructure to expand the network.** All cities must improve the efficiency of their public transport systems, but additional infrastructure is needed in particular in already strong and growing city centres where systems are already at capacity and journey times are slow, for example in Manchester, Birmingham and Leeds. The Transforming Cities Fund goes is a welcome initiative, but in many places further investment will be required. The National Infrastructure Commission recommended a £31 billion investment for new transport infrastructure in cities outside London up to 2040. This should be allocated in priority to large cities like Manchester and Birmingham. This, combined with policies that increase the cost of driving, is likely to reduce congestion, increase the passenger capacity and make journeys faster and more reliable.

3. Existing homes: accelerate the retrofit agenda

A significant proportion of all carbon emissions comes from homes. This means the net zero target is unlikely to be met until most of the 11.3 million inefficient properties are upgraded to EPC band C or above – a challenge that is predominantly in cities.

This will require significant investment from the Government and should include:

- **Reintroducing the Green Homes Grant scheme**, a £2 billion programme which offered households grants up to £5,000 (£10,000 for low-income households) to install energy efficiency measures in order to cut both energy bills and domestic carbon emissions. The scheme was scrapped in March 2021, just six months after it was launched, and only about 49,000 efficiency measures have been installed. The main issue was the way the scheme was designed. Short timescales (the budget was meant to be entirely spent between September 2020 and March 2021) meant that the industry was not ready to deliver at scale nor willing to invest given the absence of policy certainty in the long run. The upcoming Heat and Building Strategy needs to establish a clear strategy to decarbonise homes, and address the shortcomings of the Green Homes Grant scheme, by providing a long-term, more stable framework.
- **Reforming residential taxes** by adjusting property tax to the EPC of the dwelling to reflect its energy consumption. This is because subsidies alone will not be enough to incentivise homeowners to retrofit, as in most cases they will not cover the full installation costs of the measures needed. Such a ‘green offset’ could also provide more systematic incentives for homeowners to retrofit their property.⁵³ Other tax measures, including VAT cut on renovation and low-carbon installations, should also be considered.
- **Bringing forward the Future Homes Standards regulation** (now delayed to 2025), in order to ensure new homes are compliant with stricter energy efficiency standards and will not have to be retrofitted in the future.

Local authorities will also have a role to play: the £500 million Green Homes Grant Local Authority Delivery has not been scrapped, and must be used to install low-carbon heating and retrofit homes with an EPC below E for low-income households. Local planning authorities can also use building regulations and trading standards to impose higher standards on energy efficiency and carbon emissions– either at the building design stage before homes are granted planning permission, or for properties that are under their direct control, such as public buildings and council housing.

Endnotes

- 1 In 2018, less than 2 per cent of the UK's overall emissions were naturally removed from the atmosphere. Recent changes to the methodology in the Greenhouse Gas Inventory including higher estimates of peatland emissions show that the land-use and forestry sector is moving from a net sink to a net source of emissions.
- 2 At least in terms of a production-based footprint. This does not include emissions from consumption of goods or services that have been imported from elsewhere.
- 3 In 2019, coal accounted for just 2 per cent of UK electricity generation (Source: Carbon Brief, 2020).
- 4 DfT, 2019.
- 5 Oxford's low transport emissions are aided by the city's culture of cycling. This though would be much harder to maintain if Oxford had the same footprint as Telford.
- 6 See for instance The New Climate Economy Report (2014). Better Growth, Better Climate.
- 7 DfT, 2020.
- 8 Centre for Sustainable Systems, 2020.
- 9 Averaged across all cities, 62 per cent of the total housing stock is below EPC band C. This is explored further in the next section of the report.
- 10 The presence of steel and chemical industries affects Swansea and Middlesbrough's production-based carbon footprint, but it is likely that the scale would be different on a consumption-based footprint, if, for instance, goods and materials produced in Swansea but consumed in London were included in the latter's total footprint.
- 11 UN World Population Prospects, 2019.
<https://statisticstimes.com/demographics/countries-by-population-density.php>
- 12 See, for instance, Glaeser, E., Kahn, M. (2003), Sprawl and urban growth, National Bureau of Economic Research.
- 13 Campaign for Better Transport (2014), car dependency scorecard.
- 14 This is the case in London. Research published in 2020 by the Centre for London has shown that recent housing developments have increased car dependency instead of reducing it. They are more likely than pre-existing housing to feature car parking, and as a result the new residents are more likely to use their car on a daily basis. In addition to 'pro-car' principles, such as minimum parking requirements, part of the problem is the length and arbitrary nature of the planning system, and the fact that many development decisions do not take into account residents' future travel choices. An example of that is the Battersea Power Station development, which was given permission in 2013 with higher car parking requirements than recommended, despite being located near the future extension of the Northern line. See: Centre for London (2020). Building for a new urban mobility.

- 15 See Swinney, P. and Sivaev, D. (2013) *Beyond the High Street. Why our city centres really matter*, London: Centre for Cities.
- 16 Census, 2011.
- 17 Serwicka I and Swinney P (2016): *Trading places: Why firms locate where they do*, London: Centre for Cities
- 18 See Breach, A (2019), *Sleepy Suburbs*, London: Centre for Cities.
- 19 The modelling uses density (defined as the ratio between population and size of the built-up area) and transport emissions, controlled by the following variables: city centre density, average distance to work and public transport accessibility.
- 20 This is echoed in a number of existing research. In a US study, Glaeser and Kahn (2003) have found that “holding family income and size constant, gas consumption per family per year declines by 106 gallons as the number of residents per square mile doubles” (Glaeser, E. and Kahn, M (2003). *Sprawl and Urban Growth. Handbook of Regional and Urban Economics*).
- 21 For instance, Glaeser (2003) found that in metropolitan areas like New York, the average urban family consumes more than 300 fewer gallons of gas per year than their suburban counterparts. Glaeser, E. and Kahn, M (2003). *Sprawl and Urban Growth. Handbook of Regional and Urban Economics*
- 22 CO₂ emissions estimates are based on standardised assumptions about dwelling occupancy and energy use.
- 23 NHBC (2021), *New Home Statistics Review*.
- 24 Averaged across all cities, 63 per cent of people commute by car – this ranges from 34 per cent in cities like London and Cambridge to 76 per cent in Telford and Swansea. In the latter group of cities, average distances to work are also longer (Source: Census, 2011). The patterns are unlikely to have changed drastically in recent years, according to bus ridership data and traffic levels in cities.
- 25 In order to estimate the potential cuts in emissions from all car-journeys, the values have been extrapolated based on the share that commutes and business trips represent out of all car journeys, around 35 per cent (DfT, 2020).
- 26 Enenkel, K. and Quinio, V., 2019, *Cities Outlook*, London: Centre for Cities.
- 27 Centre for London (2020), *Reclaim the kerb, The future of parking and kerb management*.
- 28 See for instance RTPI (2021), *Net Zero Transport, The role of spatial planning and place-based solutions*. See also www.globalactionplan.org.uk/news/remote-working-vital-post-lockdown-to-keep-air-pollution-low-with-87-of-workers-wanting-to-continue-to-do-so
- 29 Barton C. and Garton-Grimwood G. (2018) *Housing targets: Can we predict future need?* House of Commons Library Analysis, 2 October 2018.

- 30 Climate Change Committee (2019). UK housing fit for the future.
- 31 Despite being the best available data on housing energy-efficiency, EPCs are an imperfect measure. As not all properties have an EPC, this is likely to be an underestimate of the total number of dwellings that need retrofitting.
- 32 EPC Domestic Register, 2019.
- 33 The problem is that the cost of investment for retrofit measures is often too high to be offset by savings on energy bills. This will need to be addressed.
- 34 This is echoed in a number of US-based research, where benefits of density are even more pronounced. For instance, Glaeser shows: “The average single-family detached home consumes 88 per cent more electricity than the average apartment in a five-or-more-units building. The average suburban household consumes 27 per cent less electricity than the average urban household”. The difference in scale may be explained by the fact that many UK dense, central urban areas have older, poorly-efficient housing which tends to distort the impact of density. See Glaeser, E., Kahn, M. (2003). Sprawl and urban growth. National Bureau of Economic Research.
- 35 The model used is the following: Domestic CO₂ = BUA density + dwelling area per capita + % of dwellings below C
- 36 In Swansea and Middlesbrough, industry accounts for a respective share of 83 per cent and 74 per cent of carbon emissions.
- 37 Following the methodology used in the Carbon Budget Tool, the total carbon budget for the UK used here is 2,239 Mt CO₂.
- 38 See <https://carbonbudget.manchester.ac.uk/>
- 39 See for instance IPPR (2020), Net Zero North Sea: a managed transition for oil and gas in Scotland and the UK after Covid-19.
- 40 This is the focus of the North Sea Transition Deal which aims at helping the oil and gas industry decarbonise while protecting jobs and supporting the green transition in the industry, for instance towards hydrogen production or Carbon Capture and Storage.
- 41 See more at <https://actdev.cyipt.bike/lcid/buildings,jts/#13.05/53.7942/-1.54178>
- 42 Talmage, C., et al. (2018), ‘Measuring Neighborhood Quality of Life: Placed-Based Sustainability Indicators in Freiburg, Germany’, Urban Science, 2/4, p. 5.
- 43 Buehler and Pucher, ‘Sustainable Transport in Freiburg’, p. 52. When it was created, the pedestrianised zone was the largest in Germany.
- 44 Buehler, R. and Pucher, J. (2011), Sustainable Transport in Freiburg: Lessons from Germany’s Environmental Capital, International Journal of Sustainable Transportation, 5/1, p. 51.
- 45 Talmage, Measuring Neighborhood Quality of Life, p. 6.
- 46 Friends of the Earth (2019), Planning for less car use. The density of the Vauban neighbourhood is some 95 dwellings per hectare – far above even the most densely

populated London boroughs.

- 47 Hamiduddin, I. (2015), Social sustainability, residential design and demographic balance: neighbourhood planning strategies in Freiburg, Germany, *Town Planning Review*, 86/1, p. 41.
- 48 Ibid., p. 42.
- 49 Ritchie, H. and Roser, M. (2020), CO₂ and Greenhouse Gas Emissions, *Our World in Data*.
- 50 Jeffrey, S. and Enenkel, K. (2019), *Getting moving*, London, Centre for Cities.
- 51 In England, a quarter of all car journeys are under one mile, with an extra 18 per cent between one and two miles (DfT, 2020).
- 52 Evaluation of the Ultra-Low-Emission-Zone (ULEZ) in London shows that in just two years, nitrogen dioxide levels fell by 37 per cent and carbon emissions by 6 per cent compared to a scenario where there was no ULEZ.
- 53 As recently suggested in their report- see Cheshire, P. and Hilber, C. (2021), *Home Truths. Options for reforming residential property taxes in England*.

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