MANCHESTER CLIMATE CHANGE FRAMEWORK

(2020-25) | 2022 UPDATE

MANCHESTER CLIMATE CHANGE PARTNERSHIP

Produced by
MANCHESTER CLIMATE CHANGE AGENCY

Contents

Foreword

In 2020, the Manchester Climate Change Partnership developed a high-level strategy for the city to focus action that would help deliver on its climate change ambitions.

The Manchester Climate Change Framework 2020-2025 envisioned a green city with walkable neighbourhoods, clean air, good jobs in successful businesses, warm homes and affordable energy, safe cycling routes and a public transport system that works for everyone.

This is the city we are working to create. As a Partnership, we've been part of this work since 2018. As a city we've been doing it for well over a decade and more. Working together to create the green and healthy city that we all want.

Manchester needs to play its full part in limiting the impacts of climate change. It is just as important to ensure our communities can thrive, our businesses can prosper, and we continue to draw people and businesses to the city to share in our success.

After the real challenges of the COVID-19 pandemic and the current 'cost of living' crisis, it is essential that climate action supports measures to make our homes warmer, improve our health and wellbeing, and enable a 'just transition' that supports fairness as we move from a high carbon to a zero carbon economy.

As we reach the mid-point of the Framework's timeline, we have developed an Update to outline the granular actions needed to achieve the city's first milestone of a 50% cut in its direct energy-related emissions. It focuses that work around several action areas – buildings, transport, and renewable energy generation.

The Update has also provided the opportunity for the Partnership to outline new research and initiatives against the other core objectives of the Framework – reducing our indirect emissions, progressing climate adaptation and resilience, improving health and wellbeing, and supporting an inclusive, zero carbon and climate resilient economy.

We know that many members of the Partnership are on track to meet their own climate targets. However, the data outlined in this Update tells us that Manchester, as a city, is behind where we need to be. Scientific evidence tells us that the climate is already changing, and we are feeling the effects of increased rainfall and hotter summers locally. The Update gives us different pathways of emissions reduction to stay on track to meet zero carbon by 2038 and the actions we need to take now.

Acting now is the right and responsible thing to do. It will also strengthen the appeal of our buildings, investment properties and public spaces as attractive places to work, live, study and visit, both now and in the future. We do not need to compromise the economy to fix the environment. Climate action will drive growth and jobs. In order to remain relevant and commercially viable, we need to be responsible and resilient.

The Update shows that we cannot simply pick one or two key issues for effective climate action. To get back on track we need to address all the areas of action identified.

Manchester Climate Change Agency will continue to report on the city's progress towards our zero carbon target date of 2038 and its carbon budget for the Partnership and Manchester, as it has done for a number for years, and we will identify those further actions as are required by the evidence.

This is not the end of this process – it's a call for wider and deeper collaborative action to do things differently, to do it faster and to move forward on climate action together.

This Update sets out how we will work in partnership with our stakeholders to accelerate action and develop new solutions to tackle climate change. We must build back better and fairer, making sure no one is left behind. We invite you to work with us as we adapt so that our society can flourish for decades to come.

Mike Wilton, Chair of the Manchester Climate Change Partnership

Members of the Manchester Climate Change Partnership:

- Age Friendly Manchester
- Arup
- Bruntwood
- Creative Concern
- Deloitte
- Electricity North West Ltd
- Greater Manchester Arts Sustainability Team
- Manchester Airports Group
- Manchester City Council
- Manchester Metropolitan University
- Manchester Health and Wellbeing Board
- Manchester Climate Change Youth Board
- Manchester Housing Providers Partnership
- Manchester City Football Club
- Our Faith Our Planet – representing the faith sector
- The Carbon Literacy Trust
- The Hut Group (THG)
- The University of Manchester
- Wates Construction Group Ltd

1. EXECUTIVE SUMMARY

1. Executive Summary

The aim of Manchester's Climate Change Framework 2020-25 (the Framework)[1] is that:

Manchester will play its full part in limiting the impacts of climate change and create a healthy, green, socially just city where everyone can thrive.

Its vision is for:

A green city with walkable neighbourhoods, clean air, good jobs in successful businesses, warm homes and affordable energy, safe cycling routes and a public transport system that works for everyone.

The Framework used a science-based targets approach to set a **zero carbon date** of 2038 and a **carbon budget** of 15m tCO_2 for the period 2018-2100 for the city.

It set **four headline objectives**: staying within our carbon budgets; climate adaptation and resilience; health and wellbeing; and inclusive, zero carbon and climate resilient economy. It identified **six priority areas** for action: buildings (existing and new); renewable energy; transport and flying; food; the things we buy and throw away; and green infrastructure and nature-based solutions.

The purpose of this 2022 Update to the Framework is to:

- **Present the findings** of detailed modelling done to identify granular targets for reducing the city's direct emissions by 50%, to help the city stay within its carbon budget.
- **Provide an overview** of ongoing work carried out in support of the Framework's other headline objectives, notably on adaptation to climate change.
- **Recommend specific actions** for delivery at local, regional, and national level by government and the wider public sector, private companies and third sector organisations, and communities and individuals, that will support our transition to a zero carbon and climate resilient city.

The city's direct emissions

Our carbon budget relates to our direct emissions. These 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.

Manchester has not been reducing its direct emissions by the targeted 13% per year and so we are not currently on track to stay within our carbon budget and are at risk of missing our first milestone: to reduce the city's direct emissions by 50% by 2025.

This Update unpacks the sources of our current direct emissions to clarify where we need to focus our efforts to get back on track. It shows that buildings are responsible for 76% of our direct emissions and ground transport for 24%.

It then sets out in granular detail the scale of action needed to reduce our direct emissions from buildings and transport by 50%, and the scale of increase in renewable energy generation needed to support this, using an evidence base provided by the Anthesis SCATTER[2] model.

Scale of action needed to reduce direct emissions by 50%:

Modelling by SCATTER indicates the following scale of action is needed to halve the city's direct emissions:

Buildings

- Over 84,000 homes to be retrofitted
- 21% reduction in energy demand from domestic heating and hot water
- 31% reduction in energy demand from domestic appliances and lighting
- 39% of homes to switch from gas heating to electric heat pumps
- 61% reduction in overall energy demand from commercial premises
- 45% reduction in overall energy demand from institutional buildings
- 58% reduction in overall energy demand from industrial buildings and processes
- 100% of new houses must meet best practice zero carbon standards

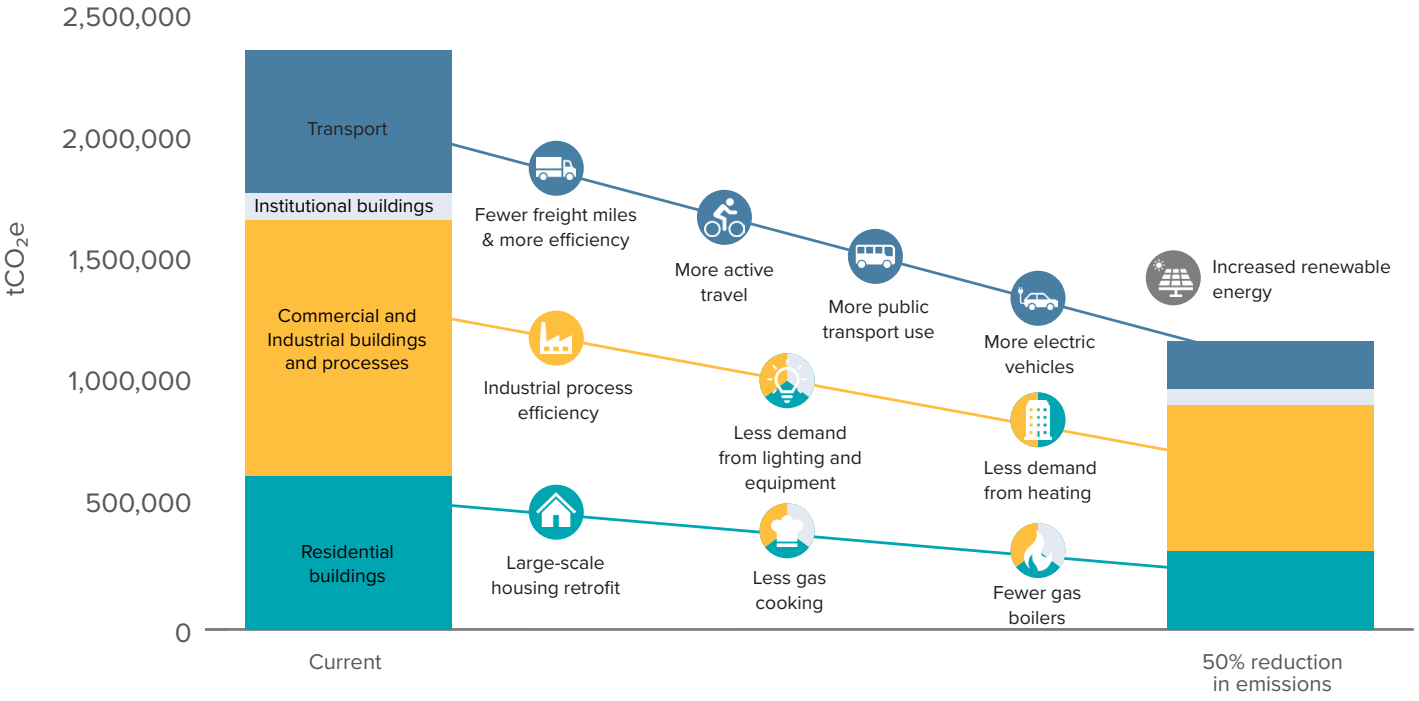
Transport

- 30% reduction in overall distance travelled
- 20% of journeys to be made by active travel – walking/wheeling or cycling
- 20% of journeys to be made by public transport
- 80% of remaining passenger miles that are by cars, vans and motorbikes need to be in electric or hybrid electric vehicles
- 9% reduction in freight mileage and 71% increase in freight fuel efficiency

Renewable Energy

- Access to 1,500 MW of energy from renewable sources:
  - 590 MW from small-scale solar photovoltaics
  - 600 MW from large-scale solar photovoltaics
  - 310 MW from large-scale offshore wind
  - 15 MW from local onshore wind
  - 9 MW from large-scale onshore wind

Graph 1: summary of the scale of action needed to reduce direct emissions by 50%



CO_2e savings

On meeting all the above targets, SCATTER estimates that our annual direct emissions will reduce by approx 900k tCO_2, equating to a 50% reduction from the city's 2020 baseline.

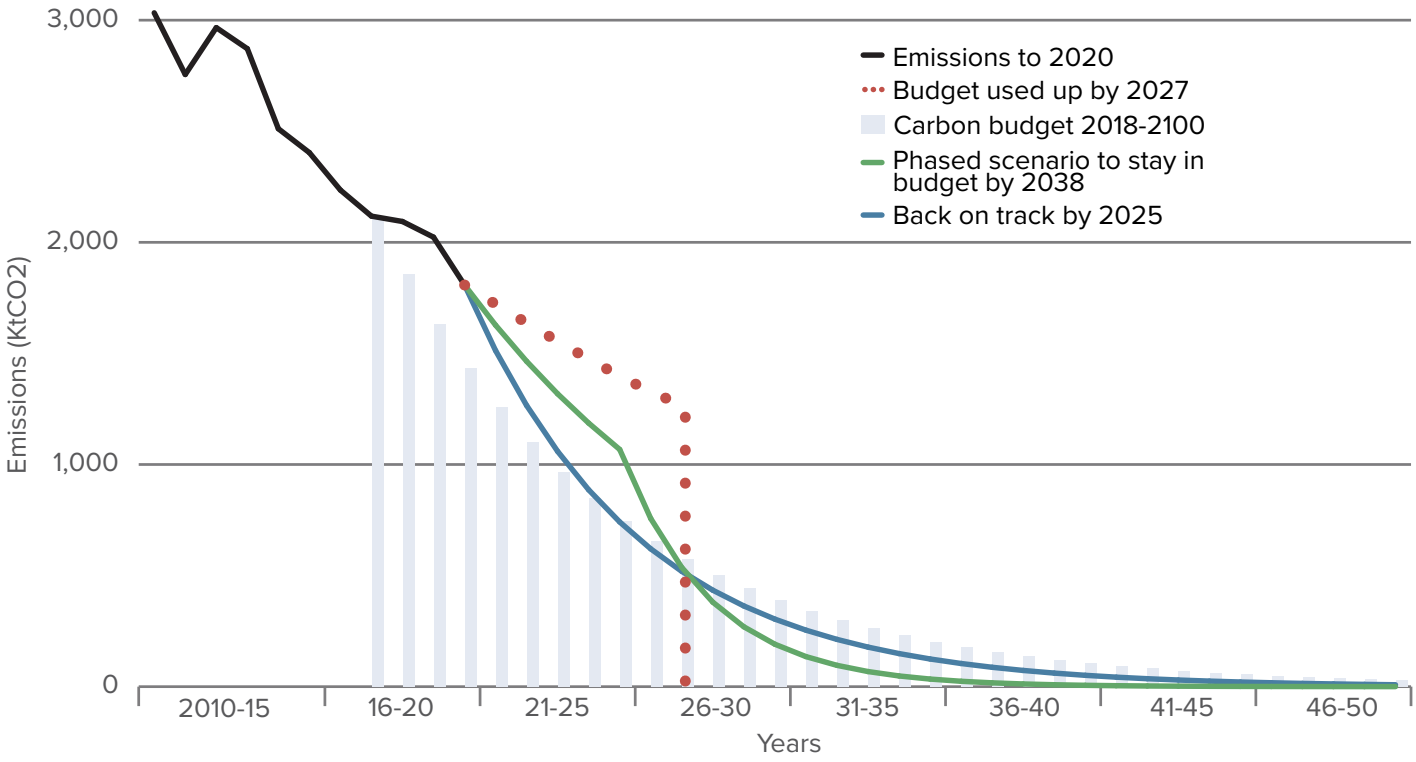
SCATTER estimates the cumulative tCO_2e savings, based on a delivery timeline to 2030, which can be accelerated, will be 4.7m tCO_2e.

Staying within our carbon budget

Given the divergence from our original pathway, graph 2 sets out two scenarios for the city to remain within its carbon budget and reach zero carbon by 2038.

It does not identify a preferred scenario, rather, illustrates that an increased scale and urgency of action is needed to meet our goals.

Graph 2: scenarios for the city to remain within its carbon budget and reach zero carbon by 2038



Consumption-based emissions

The city's indirect, or consumption-based, emissions are those that occur from the services and goods we buy, use, and ultimately dispose of. While they are not included within our carbon budget, indirect emissions are important as they are commonly 60% larger than direct emissions and so contribute to the city's overall climate impact.

Chapter 3.4 provides an overview of research by the University of Manchester to help the city understand its indirect emissions – it estimates the city's footprint was over 3m tCO_2e in 2019 and identifies sectoral hotspots for us to focus on for maximum impact, including construction, food and drink, waste, and wastewater.

Chapter 3.5 presents a new agreement reached by members of Manchester's Climate Change Partnership (MCCP), with support from its Zero Carbon Advisory Group, which notes the importance of tackling aviation emissions through national policy to avoid displacement of emissions from one UK airport to another, and of international industrial collaboration to deliver the technologies and processes needed for zero emission flights.

Adaptation and resilience

While bold action on climate change mitigation (reducing our emissions) is vital, the global and local climate is already changing, and many climate impacts are already 'locked in'[3] and deemed irreversible even under the most ambitious emissions reduction scenarios.

Chapter 4 provides an overview of work by Manchester Metropolitan University and MCCP's Adaptation and Resilience Advisory Group to help the city assess its vulnerability to climate risk, define the characteristics of a climate resilient city, and establish principles to guide both ambition and practical action, including how green infrastructure and nature-based solutions can support these efforts.

Health and wellbeing

The actions we need to take to reduce our emissions and adapt the city to climate change also have the potential to improve the health and wellbeing of Manchester's residents. Equally, actions that improve our health and wellbeing can also help to tackle the climate crisis.

Chapter 5 presents a summary of work by MCCP's new Health and Wellbeing Advisory Group and Manchester's Marmot Taskforce on the link between health inequalities and climate change, including creation of a tailored action plan, and the need for indicators to track climate and health.

Inclusive, zero carbon and climate resilient economy

Meeting our goals on climate action can also help Manchester to establish a more inclusive economy where everyone can benefit from playing an active role in decarbonising and adapting the city to the changing climate.

Chapter 6 provides an overview of activity underway to build demand for, and increase supply of, green skills to make sure that local businesses and residents can make the most of the new opportunities that the shift to a zero carbon city offers.

Co-benefits of climate action

The systemic transitions required to tackle the climate crisis within cities are complex and interlinking. This creates significant challenges in delivery but also means that action to tackle the climate crisis can help us address other priority issues including fuel poverty, food poverty, health inequalities, skills development, and jobs growth.

Throughout this Update, the co-benefits of climate action are highlighted and categorised by their potential to help us reduce our carbon emissions; boost our adaptive capacity; improve the health and wellbeing our communities; and increase the inclusivity, productivity, and sustainability of our economy.

Challenges, enablers and examples of good practice

The transition to a zero carbon, climate resilient city presents significant economic, technical, institutional, societal, and regulatory challenges. This Update highlights a selection of these to provide context to the topics covered and the actions being recommended.

It also highlights where policies at local, regional, and national level are incentivising and enabling actions of a similar type and magnitude to reinforce the feasibility and credibility of the actions being recommended.

Finally, to illustrate that climate action is possible, the Update signposts examples of good practice from within Manchester, the wider city region and across the UK.

Ensuring a just transition

Ensuring that all of Manchester's residents are protected from the impact of climate change, that actions to help the transition to a zero carbon and climate resilient city do not have a negative impact on the most vulnerable people, and that the costs of change do not fall unevenly on those that are least able to afford them, is a constant theme throughout this Update.

The recommended actions have been developed with this in mind and the cost of living crisis is recognised as a key challenge in chapter 7.

Financing the transition

The cost of the transition to a zero carbon and climate-resilient city is significant. The Local Area Energy Plan for Manchester[4] estimates the cost to decarbonise the city's energy system is over £13bn (£4 billion by 2030).

This level of capital investment is beyond the reach of public finances and so private finance is critical to our success. The scale of private funds available is sufficient to support substantial activity, however, new approaches must be developed to unlock this resource.

Chapter 8 summarises the challenges of developing climate measures at sufficient scale, volume, and predictability to attract the private capital investment needed to accelerate progress and achieve the ambitious climate change targets that Manchester has set.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

This Update has co-designed over 175 recommended actions organised into four categories according to where there is agency to act; that is, where there is direct control to deliver, affect or influence the required change or outcome:

- To be delivered locally, where direct control lies in Manchester
- To work on at city-region level, with Greater Manchester partners
- To advocate for national government to do
- To do differently, where there are opportunities to innovate

These actions can be summarised as follows:

We need to **retrofit existing buildings** – our homes, institutions, industrial and commercial premises – to make them more energy efficient; they need to be better insulated, rely less on gas for heating, and use more efficient appliances and equipment.

We need to construct **new buildings** to high and rising standards of low carbon performance, covering operational and embodied energy, which ensures we do not add to the future cost of decarbonisation.

We need to **travel less** and **change the way we travel**, ensuring we chose the right mix of transport for each journey, prioritising active travel and public transport, particularly for short trips.

We need to rapidly reduce our dependency on fossil fuels and **deploy electric vehicles** at scale for both public and private transport.

We need to see a **rapid shift away from fossil fuels** to electricity for heating, transport, and industry. To support this, we need to **increase renewable energy generation**, both locally and at national level.

This needs to be coupled with a **step change in energy efficiency** across all sectors, and increased adoption of **smart grid** technologies and **local storage** to balance energy supply and demand for maximum efficiency.

We need to continue to explore the **role of hydrogen** in our future energy mix, including to support decarbonisation of industry, transport, and heating.

We need to **produce goods and services more sustainably**, moving to a circular economy, alongside becoming more sustainable consumers.

We need to halve our **consumption-based emissions by 2030**, before halving them once again by 2036.

We need to **reduce waste**, including unnecessary **food waste**, and manage unavoidable waste as sustainably as possible, maximising reusing and recycling.

We need to work collaboratively across the aviation industry, with other core cities, national government, and international partners to ensure **aviation emissions** are reduced in line with the Paris Agreement.

We need to **understand our exposure to climate change risk** and make detailed plans that support all our residents, and all parts of our city, its economy and natural environment to adapt.

This includes prioritising action to ensure our **critical infrastructure is resilient** to climate change and ensuring our **most vulnerable communities are protected**.

We need to monitor the **impact of climate change on health and wellbeing** and target policies and measures that improve outcomes for both.

We need to **create demand for green skills** and provide the right training and qualifications to enable employers and residents to capture the new opportunities of the green economy.

We need to ensure all the investments we make are low carbon and resilient to climate change and we need to **develop innovative models to unlock private investment** into both climate mitigation and adaptation.

Key messages

Urgent action is needed to **reduce direct emissions** from our buildings and ground transport, and to increase renewable energy generation, if Manchester is to stay within its carbon budget.

Decisive action is needed to assess the city's vulnerability to climate change and to ensure we are adapting our infrastructure, buildings, economy, and residents to **be resilient to a changing climate**.

Everyone has a role to play – individuals, organisations, local and national government – and there is a great deal we have the power to achieve locally, if we **work collaboratively**.

The cost of transitioning to a zero carbon, climate resilient city cannot be borne solely by the public purse, so we need to find innovative ways to **unlock private finance investment**.

Tackling the climate crisis brings opportunities to **deliver wider strategic ambitions**, including improving people's health, reducing fuel and food poverty, creating new jobs and economic growth, and delivering a greener city for everyone.

Next steps

This Update is a call to action for everyone in Manchester. MCCP will champion delivery of the recommendations set out, but everyone needs to increase the pace and scale of their own activity, and reach out to support and collaborate with others, if we are to succeed in achieving the city's ambitions.

To support the prioritisation of effort, in particular for reducing direct emissions, MCCP has asked Manchester Climate Change Agency (MCCA) to assess the comparative impact of the recommended actions, building on the insights already provided by the detailed emissions baseline and 50% reduction targets in this Update.

MCCP has also asked MCCA to develop options for tracking the city's progress towards its zero carbon and climate resilient goals, in a way that enhances the existing Annual Reports. MCCP members and its independent Advisory Groups will support all these activities.

2.
INTRODUCTION

2. Introduction

Manchester's Climate Change Framework 2020-25 (the Framework)

The aim of the Framework[5] is that:

Manchester will play its full part in limiting the impacts of climate change and create a healthy, green, socially just city where everyone can thrive.

Its vision is for:

A green city with walkable neighbourhoods, clean air, good jobs in successful businesses, warm homes and affordable energy, safe cycling routes and a public transport system that works for everyone.

The Framework used a science-based targets approach to set a zero carbon date of 2038 and a carbon budget for direct emissions of 15m tCO_2 for the period 2018-2100 for the city.

The definition of zero carbon used in the Framework is based on the Tyndall Centre's recommendation and is the point beyond which Manchester's average annual carbon emissions are 97% lower than 1990 levels.[6] This includes carbon dioxide emissions from the energy system only, i.e. the gas, electricity and liquid fuels used to power and heat our homes and businesses and to transport us around the city, described as direct emissions.

The Framework set four headline objectives:

- **Staying within our carbon budgets** – this naturally includes taking action to reduce our direct emissions, but also recognises the need to tackle our indirect emissions (from the things we consume, and which generate greenhouse gases through their production, transportation, and disposal) and aviation emissions.
- **Climate adaptation and resilience** – adapting the city's buildings, infrastructure and natural environment to the changing climate and increasing the climate resilience of our residents and organisations.
- **Health and wellbeing** – improving the health and wellbeing of everyone in Manchester through actions that also contribute to our objectives for emissions reduction and climate adaptation.
- **Inclusive, zero carbon and climate resilient economy** – ensuring we have an economy where everyone can play an active role in decarbonising and adapting the city to the changing climate.

It also identified six priority areas for action:

- Buildings (existing and new)
- Renewable energy
- Transport and flying
- Food
- The things we buy and throw away
- Green infrastructure and nature-based solutions

Manchester Climate Change Partnership (MCCP)

MCCP was established in 2018 and brings together organisations from across the city's public, private, community, faith, health, culture, and academic sectors that share the common goal of helping Manchester to limit its greenhouse gas emissions and build resilience to a changing climate.

Its aim is to work with the Manchester Climate Change Agency (MCCA), Manchester communities and other relevant partners to ensure the city develops and successfully implements a climate change strategy aligned with the latest science and built on the views of city stakeholders.

Its objectives are to work with MCCA and other partners to: ensure the city maintains climate targets aligned to the Paris Agreement; has a robust strategy and implementation plan to meet those targets; champions the delivery of effective climate action across sectors; engages and influences stakeholders and communities to act; provides evidence based reporting on the city's progress towards its climate targets and objectives; and helps to establish Manchester as a world class city for action on climate change.

In line with these objectives, Manchester's Climate Change Framework (and this 2022 Update) comes from Manchester's Climate Change Partnership, as produced by Manchester Climate Change Agency, and provides an independent, science-based plan with targets for the city to play its full part in tackling the climate crisis in a just and equitable way.

Purpose of the 2022 Update

The purpose of this Update is to:

- Provide an overview of work carried out since publication of the Framework in 2020 on the objectives for Adaption and Resilience, Health and Wellbeing, and Inclusive Economy.
- Set granular targets for reducing our direct emissions to help the city stay within its agreed carbon budget.
- Identify detailed and specific actions for all of us to deliver in order that we may successfully achieve our ambition to become a thriving, resilient, zero carbon city.

The Update is not changing the zero carbon date of 2038, the carbon budget of 15m tCO_2, or the Framework's headline objectives and priority areas.

Manchester is not currently on track to stay within its carbon budget. We have not been reducing our direct emissions by 13% per year as targeted and are at risk of missing the city's first milestone: to reduce our direct emissions by 50% by 2025.

This Update sets out in more granular detail the **scale of action needed to reduce our direct emissions by 50%** using an evidence base[7] provided by the SCATTER[8] model developed by Anthesis.

Alongside these targets, the Update presents **detailed, specific recommended actions**, co-created with a wide range of stakeholders, that focus on where there is agency to act; that is, where there is direct control to deliver, affect or influence the required level of emissions reductions.

Four categories have been identified for the recommended actions:

- **To be delivered locally, where direct control lies in Manchester**
- **To work on at city-region level, with Greater Manchester partners**
- **To advocate for national government to do**
- **To do differently, where there are opportunities to innovate**

The Update also shows the impact that our performance to date is having, and could have, on our overall carbon budget. It sets out a series of scenarios for the city – **different pathways of emissions reductions** – to show what needs to be done to stay within our carbon budget by 2038.

All of this is in line with commitments made in the original Framework, and with the objectives of the MCCP – to ensure the city has a robust strategy, targets, and plan, aligned to the latest science, policy, and technology development, to enable us to play our full part in tackling the climate crisis.

Across this Update, we have highlighted:

- **Policy drivers and enablers** – where other local or national policy and initiatives are pushing for a similar type and scale of action.
- **Challenges of implementation** – based on research in the relevant sector and local consultations to ensure common barriers are understood.
- **Co-benefits of climate action** – highlighting the wider positive impacts that reducing our emissions and building resilience to climate change can deliver.
- **Examples of good practice** – illustrating some of the positive action being taken across the city to tackle the climate crisis.
- **Recommended actions** – specific steps that have been developed in collaboration with a range of stakeholders and that can be taken locally, at city region level, and nationally to help achieve the targets.

Key messages

Urgent action is needed to **reduce direct emissions** from our buildings and ground transport, and to increase renewable energy generation, if Manchester is to stay within its carbon budget.

Decisive action is needed to assess the city's vulnerability to climate change and to ensure we are adapting our infrastructure, buildings, economy, and residents to **be resilient to a changing climate**.

Everyone has a role to play – individuals, organisations, local and national government – and there is a great deal we have the power to achieve locally, if we **work collaboratively**.

The cost of transitioning to zero carbon cannot be borne solely by the public purse, so we need to find innovative ways to **unlock private finance investment**.

Moving to a low carbon and climate resilient city brings opportunities to **deliver wider strategic ambitions**, including improving people's health, reducing fuel and food poverty, creating new jobs and economic growth, and delivering a greener city for everyone.

3.
STAYING WITHIN OUR CARBON BUDGETS

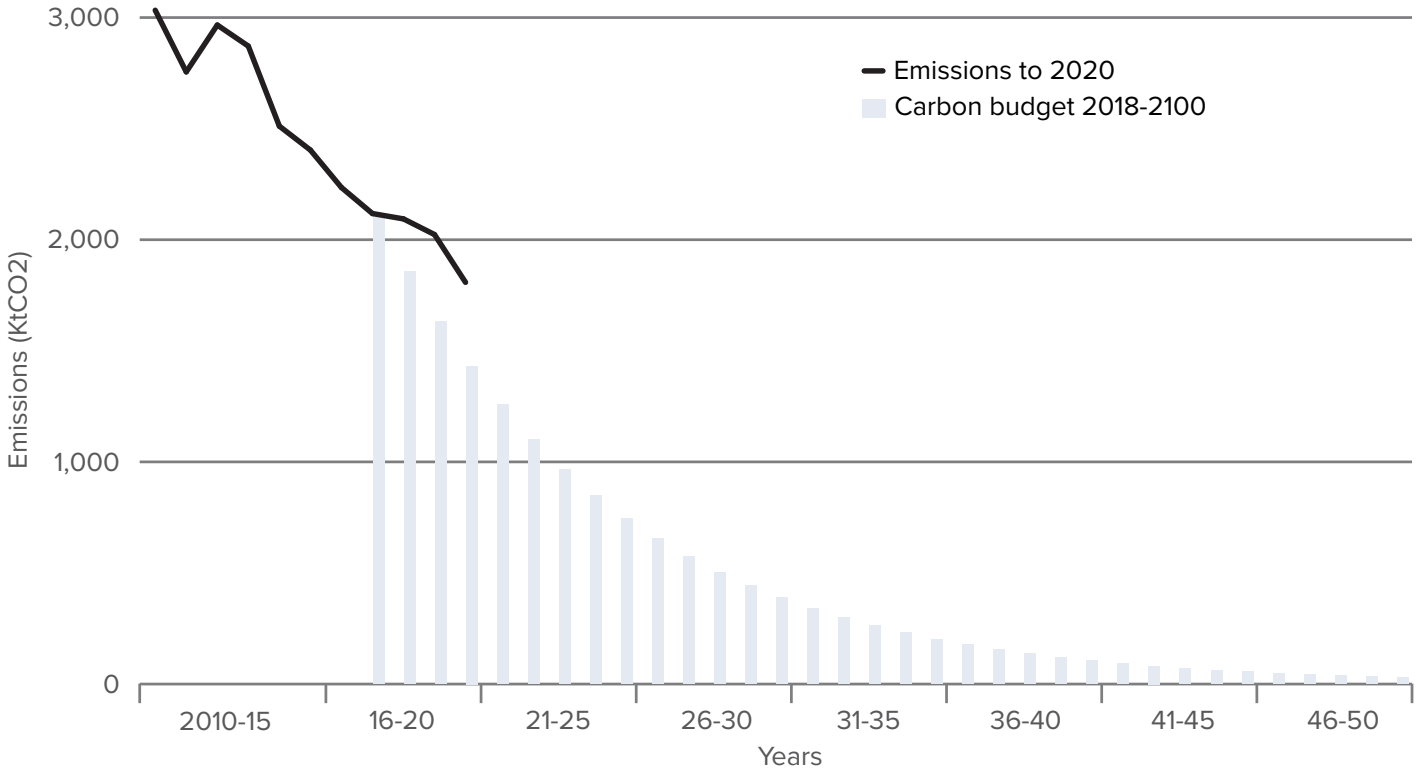
3. Staying within our carbon budgets

Manchester's Climate Change Framework (2020-2025) sets a science-based target for the city to reach zero carbon by 2038 and a carbon budget for direct emissions of 15m tCO_2 for the period 2018-2100. **The first milestone in the Framework is for the city to reduce its direct emissions by 50% by 2025**.

Direct emissions are sometimes described as territorial emissions and include emissions from our buildings and from ground transport inside the city.

Graph 3 shows Manchester's carbon budget (vertical bars) and our actual emissions to 2020 (descending line). The gap between the line and the bars indicates we are not on track to hit our first milestone, which puts staying within our carbon budget to 2038 at risk. This has been reported in the city's Climate Change Annual reports.[9]

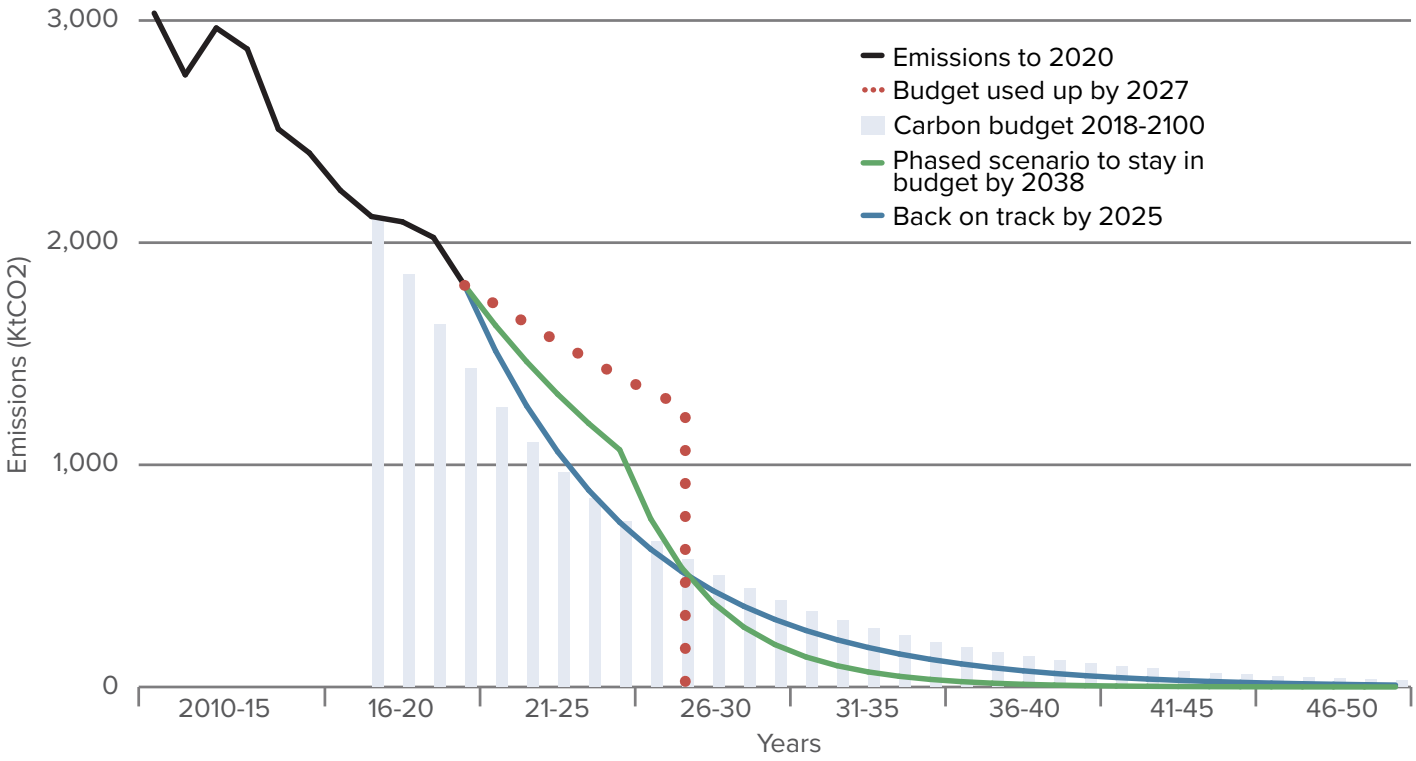
Graph 3: Manchester's carbon budget and actual emissions to 2020



Scenarios for staying within our carbon budget

Graph 4 sets out two scenarios for the city to remain within its carbon budget. It does not identify a preferred scenario, rather, it illustrates the urgency with which we need to act, and the scale of action needed to stay within our carbon budget between now and 2038. It also illustrates what happens to our carbon budget if we fail to take urgent action at scale.

Graph 4: two scenarios for the city to remain within its carbon budget



The smoothly descending **blue line** gets the city back on track to meet the 50% reduction target for direct emissions by 2025.

It requires immediate, large-scale action and investment to deliver a 16% per annum (pa) reduction in direct emissions every year until 2038. It also requires that we make up the expected shortfall to this target during 2020 and 2021, which will be confirmed in future Annual Reports once data is released by UK government. This is a higher annual reduction rate than originally proposed (13%) and much higher than the average achieved pre-pandemic (just under 5% pa).

The staggered **green line** ensures the city stays within its carbon budget to 2038 via a phased approach to emissions reductions.

It recognises the challenges associated with immediately upscaling action to the high level required in the blue line scenario, and so identifies a first phase to 2025 that requires a 10% pa reduction in direct emissions – still a high expectation compared to pre-pandemic averages – to provide time for the city to intensify its efforts to develop the projects, financial investment and delivery systems needed in phase two. Phase two requires a much steeper reduction in direct emissions of 29% pa, every year to 2038.

The dotted **red line** shows we will use up our carbon budget by 2027 if we continue to reduce our direct emissions at just above the average rate the city was achieving pre pandemic (5% pa).

This Update is not advocating for the city to adopt either the blue or green trajectory, it is highlighting the risk to the carbon budget if we continue to decarbonise at our current average rate and illustrating that there are multiple ways for the city to remain within its carbon budget to 2038 – all of which require significant, urgent action from all sectors at a scale we have not achieved before.

Scale of action required to reduce direct emissions by 50%:

Chapters 3.1, 3.2 and 3.3 of this 2022 Update identify the scale of action needed to achieve a 50% reduction in our direct emissions.

These granular targets have been defined by the SCATTER[10] model using an emissions baseline of 1.8m tCO_2, as reported in the city's 2020 Annual Report,[11] to identify actions that will deliver 900k tCO_2 of annual savings.

They apply to new and existing buildings and ground transport,[12] as these are the sources of our direct emissions, and to renewable energy generation as this will be needed to support electrification of our buildings and ground transport. They are accompanied by an estimation of the CO_2e savings that will be delivered if the targets are met – showing how each action contributes to the overall emissions reductions required.

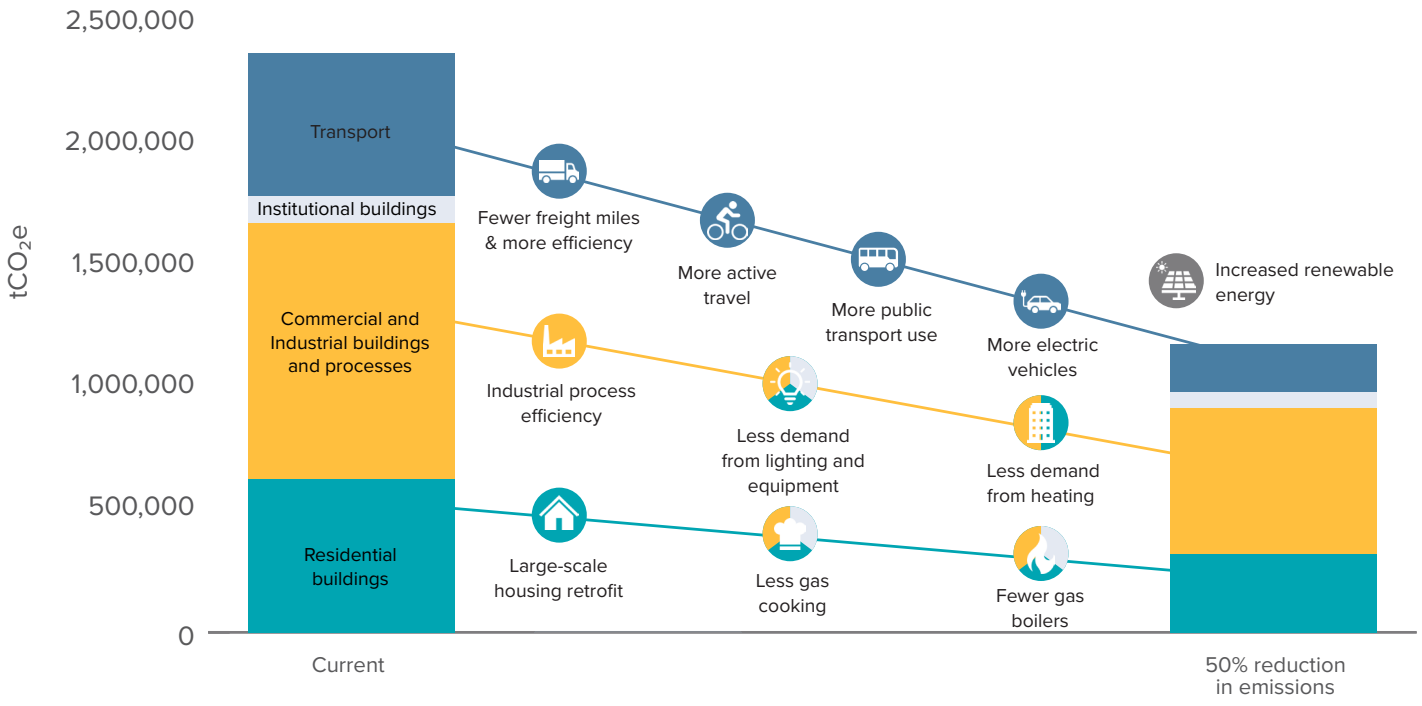
Graph 5: key actions needed to achieve a 50% reduction in direct emissions

The left-hand column shows our current direct emissions and how they are split between ground transport and buildings.

Buildings are disaggregated into institutional,[13] commercial and industrial,[14] and domestic buildings.

The right-hand column shows how each of these categories needs to shrink so that collectively the city's direct emissions reduce by 50%.

The 'zip wires' between the two columns highlight the key actions needed to achieve the required reduction in direct emissions.



3.1 BUILDINGS

3.1 Buildings

Current emissions

Modelling by SCATTER shows the built environment is responsible for 76% of Manchester's direct emissions. Graph 6 below shows how these emissions are broken down.

On the left, the graph shows emissions by building type – split into institutional, commercial/industrial, and residential buildings.

Each of these building types is then broken down to show emissions by end-use in the building: pie charts show, for example, whether emissions come from lighting and appliances or from heating.

Finally, the data is broken down further to show emissions by the mix of fuel used: bar charts show, for example, where emissions from heating come from gas or electricity.

A key observation from this graph is that we are too reliant on gas for heating, across all of our building types.

Institutional buildings

Institutional buildings are public buildings such as schools, hospitals, government offices, highway street lighting, and other public facilities.

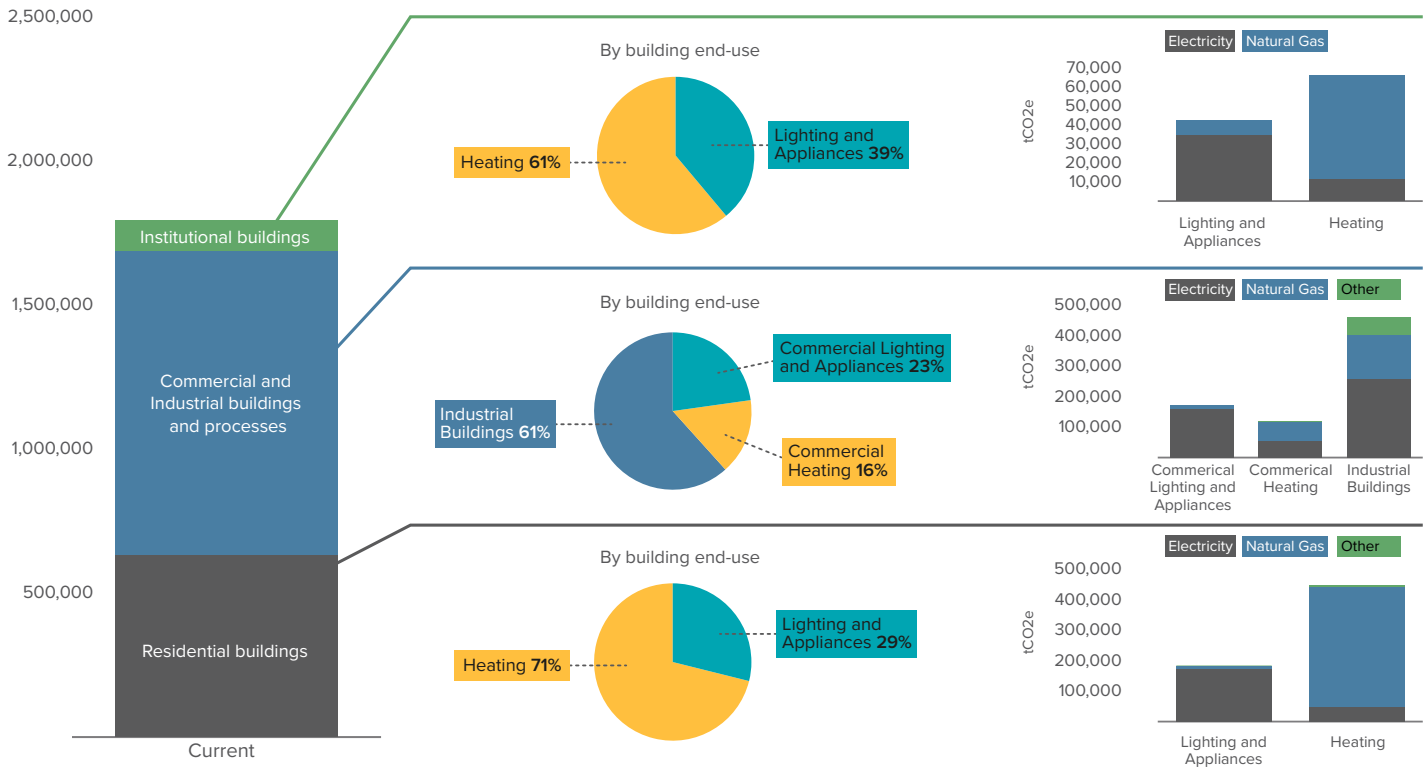
- 4% of Manchester's total carbon emissions are from institutional buildings
    - 61% of institutional emissions are from space heating and hot water
    - 89% of heating is powered by gas and 11% by electricity
    - 39% of emissions are from lighting and appliances

Commercial buildings

Commercial premises are buildings that serve the public including restaurants, offices, hotels, retail stores.

- 12% of Manchester's total carbon emissions are from commercial buildings

Graph 6: emissions break down for the built environment



- 48% of commercial emissions are from space heating and hot water
- 67% of heating powered by gas and 32% by electricity
- 52% of emissions are from lighting and appliances

Industrial buildings

Industrial buildings include all types of manufacturing, processing and logistics operations and also the industrial process contained within them. It also includes the energy used to transport and treat waste and waste water.

- 34% of Manchester's total carbon emissions are from industrial buildings (19% from industrial buildings and facilities and 15% from industrial processes including the energy used in waste and wastewater treatment)
  - 61% of industrial emissions are associated with the buildings
    - 41% powered by gas, 42% electric and 17% petroleum products
  - 39% of industrial emissions come from industrial processes
    - 79% of that is from general manufacturing operations

Domestic buildings

Manchester has over 234,000 domestic properties, housing more than 586,000 residents.[15] The mix of buildings is 39% flats, 34% terraced houses, 24% semi-detached, and 3% other.

- 26% of Manchester's total carbon emissions are from domestic buildings
  - 71% of domestic carbon emissions are from space heating and hot water
  - 92% of domestic heating is powered by gas, 6% by electricity and the remaining by other sources (coal and petroleum)
  - 29% of domestic carbon emissions are from electric lighting and appliances

The ownership of Manchester homes can be split into three categories: 33% owned by their occupants, 39% privately rented and 28% socially rented (7% above national average).

The UK Green Building Council (UKGBC) says that 80% of the homes we will occupy in 2050 are already built.[16] Over half (58%) of Manchester's homes are energy inefficient with an Energy Performance Rating (EPC) of D – G[17] and so are costly to heat, will need to be retrofitted, and are failing to deliver health and comfort to inhabitants.[18]

In 2019, 20% of Manchester's households were fuel poor, more than the English average.[19] Each year, these residents would have to spend £223 more on their energy to keep warm than a household that is not in fuel poverty.[20]

As Manchester grows, it is set to build over 56,000 new homes between 2021-2037;[21] a significant increase that needs to be done in a way that does not add to our building emissions or to the cost of housing retrofit.

In order to reach zero carbon

We need to **retrofit existing buildings** – our homes, institutions, industrial and commercial premises – to make them more energy efficient. They need to be better insulated, rely less on gas for heating, and use more efficient appliances and equipment.

We need to construct **new buildings** to high and rising standards of low carbon performance, covering operational and embodied energy, which ensures we do not add to the future cost of decarbonisation.

Scale of action needed to reduce emissions by 50%:

Modelling by SCATTER indicates the following scale of action is needed.

Domestic buildings

- Over 84,000 homes to be retrofitted
  - 21% reduction in energy demand from domestic heating and hot water
  - 31% reduction in energy demand from domestic appliances and lighting
  - 39% of homes to switch off gas heating and install electric heat pumps

Commercial buildings

- 61% reduction in overall energy demand from commercial premises, including:
  - 17% reduction for heating, cooling and hot water
  - 33% reduction in gas use for space heating, cooling, and hot water
  - 74% reduction for lighting, appliances, equipment and catering

Institutional buildings

- 45% reduction in overall energy demand from institutional buildings
  - 37% reduction for heating, cooling and hot water
  - 63% reduction for lighting, appliances, equipment and catering

Industrial buildings

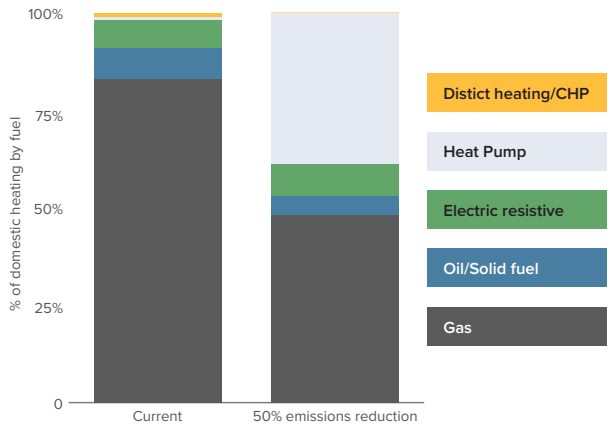
- 58% reduction in overall energy demand from industrial buildings and processes
  - 55% reduction for buildings and facilities including heating, cooling, hot water, lighting, and appliances
  - 63% reduction from industrial processes[22]

New buildings

- 100% of new houses must meet best practice zero carbon standards.

Graph 7 shows how the heating of our homes needs to change to deliver a 50% reduction in direct emissions; the key message being we need to shift off gas to electrified heating, primarily via adoption of air source or ground source heat pumps. In addition, 20% of non-domestic heating systems need to be district heating.

Graph 7: change in home heating to achieve a 50% emissions reduction



CO_2e savings and costs

SCATTER estimates the relative CO_2e savings from delivering all the above targets is **3.4m tCO_2e**.

The timeframe applied by SCATTER in this calculation is to 2030, but Manchester can choose to act faster than this.

Other policy drivers and enablers

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Manchester's Local Area Energy Plan[23] echoes the need for building retrofit at scale, targeting 100,000 homes and 180,000 heat pumps to be deployed by 2038.
- Manchester's Housing Strategy 2022-32[24] commits that 50% of affordable homes built by 2025 will be low or zero carbon and a retrofit programme will be developed for all housing in the city.

- Greater Manchester Combined Authority's (GMCA) 'retrofit GM'[25] headline objective is to retrofit 61,000 domestic retrofits a year, and all non-domestic properties a year, and for all non-domestic buildings to reach an average of Energy Performance Certificate rating of C or Display Energy Certificate B by 2030.
- From April 2018, homes that are privately rented are subject to minimum energy efficiency standards and those with F and G ratings will have to improve.[26]
- The Committee on Climate Change (CCC) says that 19 million heat pumps need to be installed by 2050.[27]
- Manchester's Climate Change Partnership's (MCCP) Roadmap to Net Zero Carbon New Buildings[28] sets targets for operational and embodied carbon emissions, in line with the objective to shift all new builds to zero carbon from 2023 onwards, as articulated in the original Framework.
- GMCA have a goal for all new developments to be net zero carbon by 2028.[29]
- The UKGBC have set out a pathway to net zero for the UK built environment[30] which includes a budget for operational and embodied carbon relating to the construction, operation, and demolition of buildings and infrastructure.
- The increased cost of building to zero carbon standards is calculated to be 6.2% for offices and 3.5% for residential properties[31] and, if considered over the whole life of the building, can likely be offset by increased rental premiums, lower tenancy void periods, lower offsetting costs, and lower operating/ lifecycle costs.[32]
- The cost of retrofitting a new build is 3-5 times higher[33] than ensuring it meets stretching zero carbon standards at the point of design and construction.
- The UKGBC[34] show the importance of including offset payments within the capital cost appraisal for new buildings. Carbon prices will only increase over the next decade, and this will impact the absolute values of buildings.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in decarbonising our buildings, including:

- National and local policy is not currently driving change at the pace and scale required, either in retrofit or new build standards.
- There are competing priorities for policy makers, for example balancing the demand for more housing with the need to increase zero carbon standards in new builds.
- The capital cost of retrofit, lack of grant funding and an under-developed supply chain are discouraging property owners to retrofit.
- For air source heat pumps to be a viable alternative to gas for domestic heating, insulation levels must be improved first.
- The hassle costs, whether perceived or actual, of carrying out major building works like insulation and heating upgrades can discourage and delay action.
- There are limited market signals to stimulate supply chain growth and the provision of skills development, further restricting capacity for action at scale.
- The absence of standardised energy efficiency disclosure makes it difficult to track progress at city scale.
- The UK has one of the highest ratios of gas to electricity across Europe, sometimes known as a 'spark gap', with the price of electricity being close to four times that of gas per kWh.[35] This is due in a large part to the taxation on electricity and, according to OFGEM, the environmental and social obligation costs are over 20% of an electricity bill,[36] compared to less than 2% for gas.[37]

Co-benefits of action

The systemic transitions required within cities to tackle the climate crisis are complex and interlinking. This creates challenges, but also means that action to reduce our carbon emissions can deliver additional benefits to the adaptive capacity of our cities, the health and wellbeing our communities, and the inclusivity and sustainability of our economy.

Adaptation and resilience

- Retrofitting homes helps to ensure residents are better placed to withstand heatwaves and excessively cold spells.
- Increasing the energy efficiency of housing stock can help build local energy resilience and reduce concerns over energy security.
- Energy efficient appliances, including dishwashers and washing machines, can also minimise water use therefore help mitigate against water scarcity.
- Low carbon new builds often incorporate nature-based solutions to climate adaptation in their surrounding areas and so build resilience to a changing climate.

Health and wellbeing

- Housing retrofit can address fuel poverty – increasing the energy efficiency of a home to EPC C can save an average of £223 per year on fuel costs.[38]
- High energy bills can create financial stress and so reducing energy costs can help the prevention of mental disorders (e.g. anxiety or depression).
- Retrofitting measures create warmer, drier homes and thus impact positively on the health and wellbeing of their residents.
- Investing £1 in keeping homes warm is estimated to reduce direct health costs by £0.42.[39]

Inclusive, zero carbon and climate resilient economy

- Upgrading the energy efficiency of Manchester's buildings presents a huge opportunity to boost the local economy.[40]
- Growing the market for green products and services creates opportunities for local companies and local people to diversify and develop new skills and new businesses.
- 9,800 jobs could be supported in the Northwest[41] by an energy efficiency programme in the UK.
- Ambitious retrofit programmes in the public sector and social housing sector build demand for skills and supply chain growth by providing a stable pipeline to enable rapid expansion of market delivery capability.

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are many examples of good practice within Manchester, the wider city-region and across the UK, including:

- Manchester City Council (MCC), the city's universities and its health sector, have committed to achieve zero carbon by 2038 and have action plans in place.[42]
- Since 2009, the percentage of Manchester's non-domestic buildings with an EPC rating between A-C has increased from 34% to 60%.
- Manchester has one of the highest proportions of existing BREEAM 'Good to Outstanding' office stock.[43]
- Over 150 public buildings across Greater Manchester are investing £78m of retrofit funding from UK government to install heat pumps, solar panels, insulation and energy monitoring systems.[44]
- The Carbon Literacy Project has created a toolkit specifically for the social housing sector, which is being used by over 70 providers.
- 'Your Home, Better[45] has been launched in Greater Manchester to support homeowners that are able and willing to pay for retrofit.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

New build

To be delivered locally, where direct control lies in Manchester:

1. **Property developers**, and those who commission new buildings in the public and private sector, to apply the highest zero carbon standards to new developments from 2023.
2. Manchester Climate Change Partnership (MCCP) to engage the developer community in progressing the sector's understanding of the **financial viability** considerations of stretching whole-life carbon standards.
3. Manchester City Council (MCC) to make full use of its existing planning powers, including the Local Plan, to regulate for **whole-life carbon emissions standards** in all new buildings, covering operational and embodied carbon in line with Manchester's Roadmap,[46] the UKGBC whole life carbon roadmap,[47] and the emerging Future Buildings Standard, from 2023 (going faster than UK) and increasing over time.
4. MCC to require a percentage of energy used on site by new builds to be from **renewable energy** or low carbon sources in the locality.
5. MCC to use planning policies to include **carbon offset levies** for developments that do not meet specified zero carbon requirements.

Retrofit

To be delivered locally, where direct control lies in Manchester:

6. **Public sector** organisations to have retrofit programmes in place to reduce the operational emissions from their buildings in line with Manchester's carbon budget, and to disclose energy efficiency performance data.
7. **Private sector** organisations to retrofit their commercial or industrial premises in line with Manchester's carbon budget, and to disclose energy efficiency performance data.
8. MCC to lead development of a **Housing Retrofit Strategy by 2023** that covers all domestic housing, whether owner occupied, private rented or social housing.
9. **Social housing providers** to retrofit their 68,000 homes to a minimum standard of EPC C by 2030.
10. **Private rented sector (PRS) landlords** to allocate funds to assess the energy efficiency of their properties and develop an improvement plan to implement minimum energy efficiency standards (MEES) regulations across all tenures, ensuring all Manchester's homes meet EPC C at a minimum.
11. MCC to **increase capacity for enforcement** of MEES in the private rented sector and explore introduction of a landlord licensing scheme.
12. MCCP members and Manchester Climate Change Agency (MCCA) to support **engagement with Manchester residents** to maximise uptake of home energy efficiency and retrofit actions.

Recommended actions

Retrofit

To be delivered locally, where direct control lies in Manchester:

13. MCC to ensure planning and environmental health teams are fully conversant with low carbon retrofit measures, including air source heat pumps and external wall insulation, to **minimise barriers to their uptake**.
14. **Commercial landlords** to work transparently with tenants to minimise energy use, with requirements clearly set out in green leases.

Retrofit

To work on at city-region level, with Greater Manchester partners:

15. Electricity North West Ltd (ENWL) to work with local partners including MCCP and MCCA to drive **uptake of solar PV** in domestic and non-domestic properties.
16. Greater Manchester Combined Authority (GMCA) to fund dedicated support to the **green technology sector** to maximise economic benefits and job growth to Manchester.
17. Skills providers to develop and roll out **regional upskilling** programmes for retrofit to ensure Manchester residents can benefit from the growth of this emerging market.
18. Private sector organisations to incentivise and support green **apprenticeships**, building local skills for zero carbon.
19. **Social housing providers** to work together via the Manchester Housing Providers Partnership Zero Carbon Group and Greater Manchester Housing Providers Decarbonisation and Low Carbon Asset Management Groups to accelerate retrofit through sharing best practice and collaborative procurement.

New build

To advocate for national government to do:

20. Use national planning policy to better support the transition to zero carbon by adopting **whole life carbon standards** for all new developments, by 2030 at the latest, ensuring a level playing field for all locations.
21. Adopt recommendations set out in the UKGBC Roadmap to ensure national regulations require new buildings to adequately **predict or represent the actual performance** of operational carbon.
22. Update the National Calculation Methodology (NCM), as underpinned by SAP and the EPC methodology, to create a fit-for-purpose **predictive methodology** for energy performance of dwellings, that better reflects in-use energy.[48]
23. Introduce a phased approach to mandatory energy efficiency **data disclosure** through performance-based rating schemes for existing non-domestic buildings in the public and private sector.

Recommended actions

Retrofit

To advocate for national government to do:

24. Adopt a **National Retrofit Strategy**[49] and coordinate through a Retrofit Delivery Authority[50] to set out and deliver a national homes upgrade programme, fully coordinated with local government, industry, and relevant stakeholders.
25. Introduce a requirement for **MEES on all tenures** at point of sale, which includes production of a retrofit assessment, with incremental increases over time from 2025, including funding to support enforcement.
26. More effectively **distribute the environmental levies** placed on gas and electricity to incentive the electrification of heat and encourage low carbon heating uptake[51] and reduce carbon intensity of the energy mix.
27. **Reform EPC** to ensure the data on which it is built remains up to date and reflects the energy mix in the grid at the time of production.
28. Tighten building regulations so that works to **existing dwellings** give clear triggers for energy improvement requirements.
29. Explore ways to bring forward the **cut-off date** of 2035 for the sale of gas boilers in existing homes to align more closely with the 2025 date for new homes.
30. **Develop a 'skills card'**[52] as a quality assurance scheme for heat pump installers, like the Gas Safe scheme.
31. Deliver **upskilling campaigns** for relevant industry sectors (e.g. gas heating engineers) to remove barriers to the uptake of electrified and low carbon space heating, including heat pumps.
32. Introduce **variable stamp duty rates** that are adjusted in line with the energy performance of buildings.
33. **Remove VAT on refurbishment** work where energy performance targets are met.
34. Introduce direct grants and other financial products, e.g. equity release or property based loan, for **low-income households** to support retrofit.
35. **Banking sector** to develop attractive financial offers for homeowners to overcome the high up-front capital costs of deep retrofit, e.g. low interest mortgage extensions and loans where performance targets are met.
36. **Institutional investors** based in the UK to disclose the operational energy and carbon performance of their property portfolios (at asset level) in annual reporting.

Recommended actions

To do differently, where there are opportunities to innovate:

37. Property developers to deploy **digital twin technology** to increase our understanding of the financial viability of applying zero carbon standards to new builds.
38. MCC to explore ways to enable **accelerated planning approval** for early adopters of future energy efficiency levels (with disclosure of performance on completion).
39. Local areas to develop a **place-based approach** to domestic housing decarbonisation that bundles multiple low carbon measures together, e.g. insulation, solar PV, and battery storage, with innovative financial models to attract private finance in to provide the upfront capital investment required.
40. Financial institutions and lenders to increase the availability of **green mortgages** with reduced rates for the most efficient homes to incentivise housing retrofit.
41. Domestic landlords to develop and test the use of **warm rental agreements**, which include energy costs within the rent to incentivise and reward increasing the energy efficiency of properties.
42. Electrical product manufacturers to increase engagement with the Internet of Things (IoT), to enable greater uptake of **smart controls in homes**, helping to balance the grid and lower consumer fuel bills.
43. Commercial building owners/managers to use **digital modelling tools** to simulate and evaluate retrofit options for Heating, Ventilation and Air Conditioning (HVAC) systems; supporting the mainstreaming of these skills across the building services industry.[53]
44. Commercial property owners to **disclose energy efficiency performance data** to fixed standards such as NABERS, UKGBC, or BREEAM to enable benchmarking of building performance and drive retrofit across the sector.

3.2 TRANSPORT

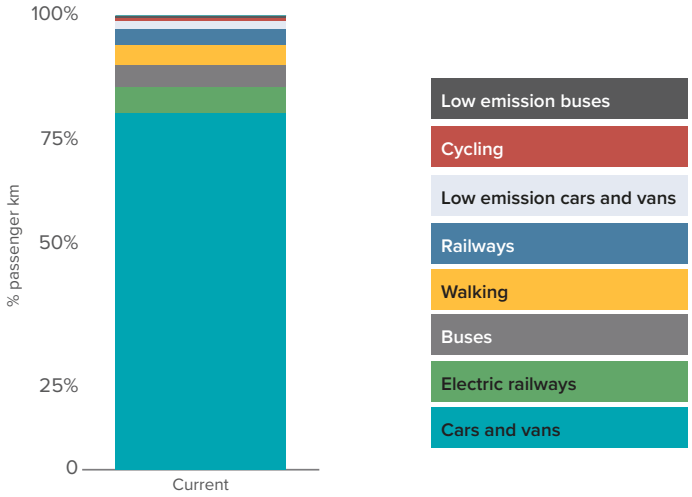
3.2 Transport

Current emissions

Modelling by SCATTER shows that transport is responsible for 24% of Manchester's direct emissions. Within that, 95% of emissions are from on-road vehicles: cars, buses, vans, and motorbikes, predominantly running on petrol and diesel.

Graph 8 below shows the percentage of passenger kilometres (km) travelled in 2018 by mode of transport. This tells us how we travel. The spread of carbon emissions will differ from this graph as some of the km will travelled be via low-carbon modes of transport such as electric cars.

Graph 8: percentage of passenger kilometres (km) travelled in 2018 by mode of transport



Over the last 30 years, transport emissions have not reduced at the same rate as other sources of greenhouse gas emissions. There are several reasons for this, including:

- Increased length of journeys
- Falling relative cost of motoring – 15% down in real terms over the last twenty years
- Increased cost of rail fares – up by over 20% in twenty years
- Increased bus and coach fares – up by over 40% in twenty years[54]
- Shift towards large vehicles – 31% of new car sales are classed as large vehicles compared to 21% in 2010[55]

In Manchester:

- At the end of 2021, there were only 1,450 ultra-low emissions vehicles registered, which is below the national average.[56]
- Most buses are still running on diesel.[57]
- 36% of all trips that start in Manchester are neighbourhood trips under 2km and could be walked in around 20 minutes or less[58] in many situations.
- There remains a shortage of public transport options to tackle Manchester's growing night-time economy in comparison with larger cities like London.

In Greater Manchester:

- Too many short trips are made by car: 88% of trips are shorter than five miles, and more than half of these are made by car.[59]
- We are behind both the UK and the North West per capita average for installing electric vehicle charging infrastructure.[60]

However, there are some positive trends:

- In 2019, 78% of peak morning travel (over 108,000 journeys) into Manchester city centre was made by public transport (63%) or active travel (15%).[61]
- In the decade leading up to 2019, there was a 19% reduction in the number of cars entering the city centre at peak morning travel time (reducing from over 27,000 to under 23,000).[62]
- As a result of changes caused by the COVID-19 pandemic, there has been an increase in hybrid working, which is predicted to cause commuting to fall by 1 in 10 journeys as we move away from the five-day commuting week.[63]
- Between 2010 and 2020, the size of the Metrolink network was tripled, converting many city-centre bound journeys from car to public transport. In 2019 Metrolink accounted for 16% of peak morning journeys.[64]

In order to reach zero carbon

We need to **travel less and change the way we travel**, ensuring we choose the right mix of transport for each journey, prioritising active travel (walking and cycling) and public transport, particularly for short trips.

We also need to rapidly **reduce our dependency on fossil fuels** and **deploy electric vehicles at scale** for both public and private transport.

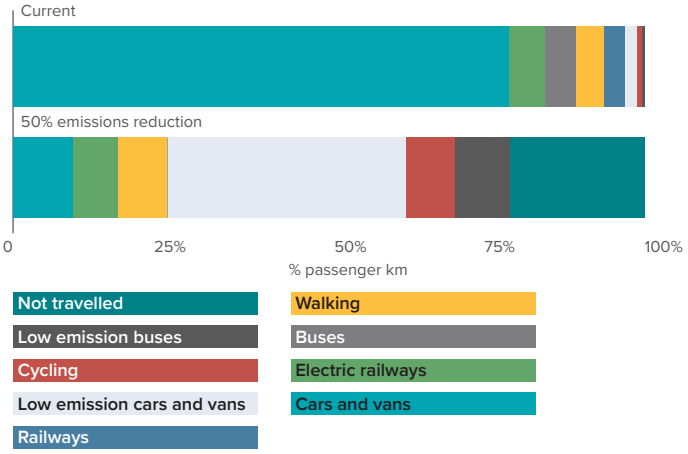
Scale of action needed to reduce emissions by 50%:

Modelling by SCATTER indicates the following scale of action is needed:

- 30% reduction in overall distance travelled – we need to travel less by, for example, accessing services remotely and making more use of use of local facilities and services.
- 20% of journeys need to be made by active travel – walking/wheeling or cycling.
- 20% of journeys needs to be made by public transport.
- 80% of remaining passenger miles that are by cars, vans and motorbikes need to be in electric or hybrid electric vehicles.
- 9% reduction in freight mileage and 71% increase in freight fuel efficiency.

Graph 9 shows the modal shift in passenger miles needed to meet a 50% reduction in direct emissions. In addition to the targets set out above, the graph shows we need to electrify our buses and trains.

Graph 9: modal shift in passenger miles needed to meet a 50% reduction in direct emissions



CO_2e savings

SCATTER estimates the cumulative CO_2e savings from delivering all the above targets to achieve a 50% reduction in direct emissions is **1.3m tCO_2e**.

The timeframe applied in this calculation is to 2030, but Manchester can choose to act faster than this.

Other policy drivers and enablers

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- The City Centre Transport Strategy[65] which is focused on delivering a net-zero carbon transport system and includes the following targets (from a 2019 baseline):
  - Reduce car journeys from 21% to 10% by 2040.
  - Increase public transport trips into the city centre by around 50% for Metrolink, over 50% for bus travel, and around 90% by rail by 2040.
  - Increase walking and cycling trips by around 70%.
- The Manchester Local Area Energy Plan[66] calls for 72,000 electric vehicle charging points to be installed by 2038 at an estimated cost of £40 million.
- The Greater Manchester Transport Strategy 2040[67] sets ambition for:
  - 50% of all journeys to be by public transport or active travel by 2040.
  - One million more active travel and public transport journeys per day by 2040.
  - No net increase in motor vehicle traffic and 200,000 more EVs by 2040.
- The Greater Manchester Streets for All Strategy[68] sets out a vision to ensure that our streets are welcoming, green, and safe spaces for all people that enable more travel by walking, cycling and using public transport and create thriving places that support local communities and businesses.[69]
- Nationally there are commitments for:
  - 50% of all journeys in towns and cities to be walked or cycled by 2030.[70]
  - Sales of cars and vans with only a petrol or diesel engine to cease after 2030 and no sales of new fossil fuel vehicles (including hybrids) after 2040.[71]

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in decarbonising our transport system, including:

- To make walking/wheeling the natural choice, people need safe, inclusive, and attractive routes.
- To enable more people to cycle, there needs to be high quality, connected and safe cycling infrastructure, broad access to bikes and sufficient places to safely park and store them.
- To encourage people to access more services and activities online, instead of travelling, we need to ensure digital skills and technologies are widely available.

- The space needed to deliver more priority for active travel and public transport infrastructure may be constrained in the city centre and some built-up residential areas and will, in some cases, require road space to be reallocated away from general traffic towards the most space-efficient and sustainable modes.[72]
- There are some systemic barriers to using public transport, such as safety and security to lone passengers, particularly women, which need to be addressed to enable modal shift.
- As we switch away from fossil fuels to electric vehicles, the demand for electricity needs to be met by sufficient increased supply.
- Electric vehicles have a higher upfront cost than most petrol or diesel vehicles.
- Switching large numbers of cars to electric reduces direct emissions in operation but results in an increase in embodied carbon through mass production of vehicles and batteries.
- Delivering the infrastructure needed to support behaviour change requires a significant scale and pace of change, which presents challenges in terms of capacity of local government and delivery authorities and will require significant engagement with communities and businesses.
- Revenue funding is needed to maintain integrated transport systems, including maintaining cycle infrastructure and footpaths and operating public and shared transport services, not just the up-front capital cost of infrastructure.

Co-benefits of action

The systemic transitions required within cities are complex and interlinking. This creates challenges, but also means that action to reduce our carbon emissions from transport can deliver additional benefits to the adaptive capacity of our cities, the health and wellbeing our communities, and the inclusivity and sustainability of our economies.

Adaptation and resilience

- Creating new transport infrastructure for active travel and public transport brings the opportunity to increase tree planting and embed sustainable urban drainage systems, building resilience to climate risk within our critical infrastructure.

Health and wellbeing

- Increased active travel improves health and could save the NHS £17bn within 20 years by reducing prevalence of type 2 diabetes, dementia, heart disease and cancer.[73]
- A more integrated and affordable public transport system can save households money on owning and running a car, which will be even more significant as the cost of living rises.[74]
- Reduced use of internal combustion engine cars, vans and motorbikes, through modal shift and the switch to electric vehicles, improves air quality and reduces the negative health effects of air pollution.

Inclusive, zero carbon and climate resilient economy

- The need to create new infrastructure for sustainable travel and electric vehicles is a new opportunity for jobs and growth – for example, a report by Transition Economics for the TUC suggests investing in the electrification of transport could help deliver 59,000 new jobs in the UK.[75]
- An integrated public transport system and active travel network can reduce the undesirable impacts of congestion on business and help drive economic growth.[76]
- By changing how we move goods around the city, particularly in 'last mile' delivery, we can create opportunities for new business. A report by Accenture notes that creating local fulfilment centres to support the 'last-mile' supply chain could create jobs and lower last-mile emissions between 17-26% by 2025.[77]
- Electric vehicles are cheaper to run and usually cheaper to service and maintain.[78]

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are many examples of good practice within Manchester, the wider city-region and across the UK, including:

- The Bee Network aims to provide a fully integrated active travel and public transport system joining together cycling, buses, trams and walking by 2024, with rail incorporated by 2030, to transform how people travel in Greater Manchester.[79]
- A cycle hire scheme[80] with over 1,200 pedal bikes and 300 e-bikes is available across Manchester, Salford and Trafford.
- Greater Manchester has been successful in securing over £1bn from the Government's City Region Sustainable Transport Settlement[81] which will help to deliver the Bee Network's ambitions for an integrated and sustainable transport system providing seamless end-to-end journeys.[82]
- The Carbon Literacy Project and Auto Trader have developed a bespoke training toolkit for the automotive sector[83] which is being rolled out nationally with over 70 organisations involved.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Transport

To be delivered locally, where direct control lies in Manchester:

1. Organisations to adopt policies that encourage **business travel** to be done via sustainable transport options and enable virtual working.
2. Organisations to encourage and **incentivise employees to commute via sustainable modes of travel** (including walking/wheeling, cycling, public transport, and car sharing).
3. Organisations to **shift their fleet to electric vehicles/e-cargo bikes** and install electric vehicle charging points as appropriate to their location, ensuring they avoid encouraging unnecessary car travel into local centres.
4. **Logistics companies** to reduce fuel use, increase fuel efficiency, and explore alternative vehicles including e-cargo bikes for last-mile delivery.
5. **Schools to encourage walking/wheeling and cycling** to school via road safety education campaigns and school street schemes.
6. Public sector organisations to work collaboratively to adopt **sustainable travel polices** for business travel, employee commuting, logistics, and the electrification of fleets.
7. **Residents to change the way we travel**, ensuring we choose the right type of transport for each journey, prioritising active travel (walking/wheeling and cycling) and public transport, particularly for short trips.
8. **Culture, leisure, and tourist destinations** to work together with Manchester City Council (MCC) and Transport for Greater Manchester (TfGM) to deliver more sustainable travel outcomes for major events in the city, and to provide readily accessible information as standard on how visitors can reach them by public transport or active travel, exploring incentives to discourage car travel.
9. Manchester Climate Change Partnership (MCCP) to deliver collaborative **behaviour change campaigns** to encourage its networks to increase use of active travel, public transport, and shared modes of transport, such as car clubs and cycle hire schemes.
10. MCC to deliver more **active travel infrastructure** and develop new schemes that **integrate sustainable transport choices**, including e-mobility, and **smart logistics** into neighbourhoods like the Ancoats Mobility Hub.
11. MCC to adopt the principles of the **15**[84]**-20**[85]**-30**[86]**-minute neighbourhood** within planning policy to ensure residents can access essential services without the need for a car.
12. MCC to **reallocate road space** on appropriate parts of the network to support the delivery of infrastructure for more sustainable modes of transport, including buses, walking/wheeling, and cycling.
13. MCC to gradually **remove inner city centre parking supply** as sustainable travel options are improved and to explore introduction of a workplace parking levy across the city to further encourage modal shift.
14. MCC to implement **reductions in speed limits** across the city to help reduce emissions and support delivery of road safety programmes.
15. MCC to target reductions in the **carbon impact of construction and maintenance** of highways, adopting PAS2080 carbon management standards.
16. MCC to develop and implement a strategy for electric vehicle charging infrastructure, including within car parks and existing residential areas, and set requirements for **electric vehicle charging infrastructure** to be integrated within new residential, workplace and commercial developments.

Recommended actions

Transport

To work on at city-region level, with Greater Manchester partners:

17. Deliver the **Streets for All** Strategy[87] and **Bee Network** ambition for an integrated, affordable, and sustainable transport system, which will join up buses, trams, cycling and walking by 2024 and rail by 2030.
18. Investigate and implement cutting edge **smart transport solutions**, getting the most out of digital technology to improve our understanding of travel patterns, and improve physical and digital integration of low-carbon modes.[88]
19. Increase the number of **zero emissions buses** and transition to an electric bus fleet.
20. Deliver the **GM Clean Air Plan** to improve air quality.
21. **Minimise embodied carbon in new transport infrastructure** and vehicles, under best practice guidance like the PAS2080 carbon management standard, and ensure it is designed to be **resilient to climate change**.
22. **Incentivise sustainable travel** behaviour change and deliver public transport and active travel schemes into and within the city centre, targeting 90% of all morning peak trips to the city centre by public transport or active travel.[89]
23. Work with local authorities to explore introduction of **workplace parking levies** across the city region to encourage modal shift.
24. Support improvements to distribution, delivery, service, and logistics activities that **reduce heavy goods vehicle emissions** using traffic powers, restricting vehicle type, weight, and delivery times in specific areas, as outlined in the Greater Manchester Freight and Logistics Strategy.[90]
25. Deliver **awareness raising campaigns** and initiatives in collaboration with local partners to enable all businesses and residents to take tangible actions to reduce transport emissions.

Transport

To advocate for national government to do:

26. Provide **long-term, multi-year devolved capital funding** to allow Greater Manchester to invest in smart and sustainable transport solutions, including active and public transport and fleet transition.
27. Provide **additional revenue funding for capacity and capability** at the local level to enable planning and delivery of local sustainable transport strategies.
28. Provide **integrated funding for decarbonised transport** as recommended in the National Audit Office report.[91]
29. Review the most effective range of **tax measures**, including VAT, to incentivise active travel and drive uptake of zero emission vehicles.
30. **Reallocate** the national road building budget to road safety and sustainable travel schemes.
31. Work collaboratively with local partners on **reducing emissions across the strategic and local roads networks**.[92]
32. Introduce legislation to **phase out new sales of diesel buses** and coaches by 2035 at the latest, as has been done with cars (2030).[93]
33. Publish the **Local Authority Transport Toolkits** to support identification and assessment of local transport decarbonisation strategies.
34. Reinforce active travel and travel decarbonisation messages in **national behaviour change campaigns** and provide funding for local campaigns to support this work.[94]
35. Introduce grants for second-hand electric vehicle purchases, **helping lower income households** and small businesses.

Recommended actions

Transport

To do differently, where there are opportunities to innovate

36. To enable more flexible and hybrid working patterns, introduce **new flexible travel initiatives** like the Metrolink Clipper Card.
37. Local businesses to work collaboratively to **integrate sustainable last-mile logistics** in the city, e.g. through shared local logistics hubs.
38. Expand options for **electric shared mobility schemes**, including car clubs, bikes, scooters, and e-cargo bikes.

3.3 RENEWABLE ENERGY

3.3 Renewable energy

Current energy mix

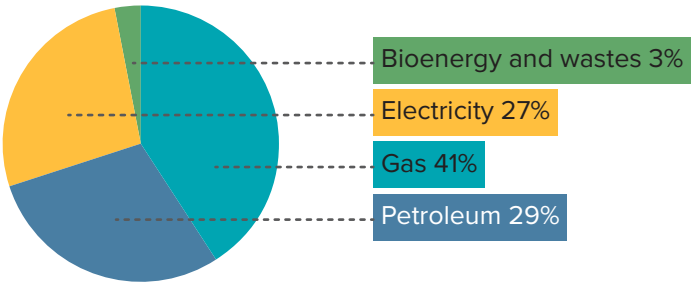
Graph 10 shows Manchester's energy mix for 2019. It is based on data from the UK government's Department for Business, Energy, and Industrial Strategy (BEIS) and covers all activities that use energy: transport, buildings, and industry.

It shows we remain heavily reliant on gas, primarily for heating, and on petrol/diesel for road transport.

As we shift away from fossil fuels to a low carbon future, our demand for electricity will increase. In Manchester it is projected to almost double in the next 15 years.[95]

To support this, we need to create a step-change in the scale of renewable energy that we generate.

Graph 10: Manchester's energy mix for 2019



Renewable energy generation

Over 39% of UK electricity is now generated by renewable sources[96] (Manchester contributes less than 1% of this). Generation of electricity by solar photovoltaics (PV) in the UK has grown rapidly since 2010, increasing capacity from 95 MW to 13,900 MW by the end of 2021.[97]

The production of renewable energy within Manchester's boundaries in 2019 was below the national average at 3% of demand. According to BEIS, the 32 MW generated in Manchester[98] is broken down by technology type as follows:

- 22 MW from 6,800 solar PV installations
- 4.5 MW from 2 x anaerobic digestors
- 5.1 MW from 3 x plant biomass

Data from Electricity North West Ltd (ENWL) shows local production has increased to 115 MW by 2021[99] for all types of distributed energy (solar PV, wind, hydro, combined heat and power, biomass, biogas and waste). Their detailed forecasting of future renewable energy generation emphasises the need for a significant acceleration in deployment of renewables to meet the targets proposed in this Update for our buildings and ground transport.

In order to reach zero carbon

We need to see a **rapid shift away from fossil fuels to electricity** for heating, transport, and industry. To support this, we need to **increase renewable energy generation**, both locally and at national level.

This needs to be coupled with a **step change in energy efficiency** across all sectors, and increased adoption of **smart grid** technologies and **local storage** to balance energy supply and demand for maximum efficiency.

We need to continue to explore the **role of hydrogen in our future energy mix**, including to support decarbonisation of industry, transport, and heating.

Scale of action needed to reduce emissions by 50%

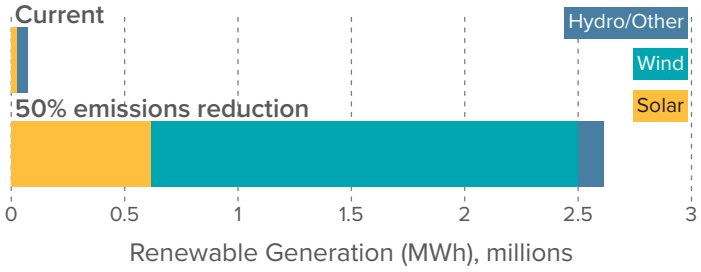
Modelling by SCATTER looks at the future renewable energy mix needed at national level to deliver a 50% reduction in direct emissions and allocates Manchester a share of this. Some of the renewable energy needed by the city will be generated outside the city, hence the references to, for example, offshore wind, in the targets.

Manchester needs access to 1,500 MW of energy from renewable sources, a 35-fold increase from current levels, broken down as follows:

- 590 MW from local, small-scale photovoltaics
- 600 MW from large-scale solar photovoltaics
- 310 MW from large-scale offshore wind
- 15 MW from local, onshore wind
- 9 MW from large-scale onshore wind

Other renewable technologies provide a nominal contribution to Manchester's future renewable energy mix, for example: 0.3 MW from small-scale hydroelectric.

Graph 11: the scale of growth in renewable energy production needed to achieve 50% reduction in emissions



CO_2e savings

SCATTER estimates the relative cumulative CO_2e savings from delivering all the above targets to achieve a 50% reduction in direct emissions is **1.1m tCO_2e**.

The timeframe applied in this calculation is to 2030, but Manchester can choose to act faster than this.

Carbon savings from supply-side measures (such as renewable energy installation) should not be directly compared with demand-side measures (such as retrofitting or installing heat pumps) since this can lead to some double counting of savings. The carbon savings garnered from each type of measure are often interlinked and should be considered separately.

Other policy drivers and enablers

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Manchester's Local Area Energy Plan[100] identifies that 35% of the renewable energy needed by the city can be produced within Manchester, predominantly from small-scale solar PV.
- ENWL's report "Leading the North West to Net Zero"[101] sets out their plans to invest £63.5 million between 2019-2023 to drive down their own emissions and help businesses, customers and colleagues to do the same.
- The UK government's National Energy Security Strategy[102] sets out a plan for secure, clean, and affordable energy for the long term.
- Ofgem are consulting on local energy systems[103] to ensure the country is geared up to support the transition to zero carbon at the lowest cost to the customer, which will require a huge increase in renewable energy generation.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in increasing renewable energy generation, including:

- The electrification of heat and transport will create a significant increase in the demand for electricity that will need to be serviced by renewable energy generation.
- There is a lack of space for large-scale solar or onshore wind in Manchester, which focuses options for in-boundary generation on small-scale solar PV.
- Technical capacity is needed to develop investable energy projects, and this is not readily available in most public or private sector organisations.
- An increase in the decentralised supply of electricity from many local renewable energy generators and batteries of all sizes requires the grid to be modernised.
- The development of smart, local energy markets needs collaborative innovation and investment.
- Steady market and policy signals are needed to grow the supply chain and skills force for renewable technologies to meet demand.

Co-benefits of action

The systemic transitions required within cities to tackle the climate crisis are complex and interlinking. This creates challenges but also means that action to increase our renewable energy generation can deliver additional benefits to the adaptive capacity of our cities, the health and wellbeing our communities, and the inclusivity and sustainability of our economy.

Adaptation and resilience

- Increasing local renewable energy supply provides energy security and resilience against future fossil fuel price increases.
- As the production of renewable energy (solar and wind power) requires negligible amounts of water, it does not contribute to water scarcity concerns.

Health and wellbeing

- Improved energy affordability can deliver health benefits by reducing the risks of illness due to living in inadequately heated homes.
- Renewable energy helps to reduce air pollution and the associated health impacts.

Inclusive, zero carbon and climate resilient economy

- In the UK, low carbon and renewable energy activities generated £46.7bn[104] turnover in 2018, directly employing 224,800 people (full-time equivalents).

Examples of good practice

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Manchester City Council (MCC) is targeting a carbon reduction of 7,000 tonnes a year through investment in large-scale renewable energy generation.[105]
- Manchester Metropolitan University's Fuel Cell Innovation Centre is leading the way in harnessing hydrogen as a productive form of renewable energy. The Centre is engaging with industry on a local, national and international scale to understand the potential of fuel cell technology.[106]
- Greater Manchester Combined Authority's Go Neutral Smart Energy[107] programme aims to accelerate delivery of up to 85MW of solar power generation with battery storage and electric vehicle charging infrastructure through establishment of a call-off framework to streamline the procurement process for public sector organisations.
- The smart energy cities concept[108] links energy systems to data and digital technologies to collect and analyse data in real time and manage city services more efficiently by reduce emissions, improve energy efficiency, and enhance resilience.
- ENWL's Powering Our Communities Fund[109] provides seed funding to support the development of community and local energy.
- The Government have brought forward green relief rates[110] to incentivise uptake and deployment of small-scale solar PV on commercial properties.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Energy

To be delivered locally, where direct control lies in Manchester:

1. ENWL to work alongside Manchester's public and private sectors to **maximise investment** in the city's electricity network enabling an increase in renewable energy generation and a rapid electrification of heating and transport.
2. Manchester City Council (MCC) to **set stretching requirements through the Local Plan** to increase renewable energy generation, for example:
    a. Require a percentage of energy used on site by new builds to be from renewable energy or low carbon sources in the locality.
    b. Prioritise low carbon district heating in population-dense areas and encourage large developments to require heat planning alongside masterplanning.
    c. Allocate land for onshore wind where this is technically feasible.
    d. Ensure policies for housing, transport and energy are considered together, for example through the Local Area Energy Plan.
3. Organisations in the **public and private sectors** (covering commercial, industrial and institutional buildings) to **maximise renewable energy generation on site** and explore off-site generation either through asset ownership or arrangements like power purchase agreements (PPA), with the aim to achieve 100% renewable electricity.
4. Social housing providers, owner-occupiers, and private landlords in the **domestic housing sector** to maximise renewable energy generation on site, including through community energy initiatives.[111]
5. Manchester Climate Change Partnership (MCCP) to **work collaboratively** to increase renewable energy generation capacity across members' portfolios.
6. Industrial sites to explore opportunities for **re-use of heat** that is a by-product of industry.
7. MCC to develop a **green skills action plan** to upskill and expand the green economy workforce, as outlined in the Work and Skills Strategy,[112] ensuring residents can benefit from jobs growth in the renewable energy sector.

Recommended actions

Energy

To work on at city-region level, with Greater Manchester partners:

8. ENWL to work with partners across the city region to deliver a **smart, flexible, low carbon, energy grid** in Manchester.
9. ENWL to continue to work with BEIS, Ofgem and other District Network Operators to **ensure local electricity networks are resilient** to the changing climate and respond to local need.
10. Greater Manchester Combined Authority (GMCA) to work with ENWL to support **resource and strategic planning for network capacity applications** across the ten districts.
11. GMCA to support the development of **local energy markets**[113] that coordinate the generation, supply, storage, transport, and consumption of energy from decentralised energy resources, involving network utilities and energy companies.
12. GMCA to support the development of a **pipeline of renewable energy projects** as set out in Manchester's Local Area Energy Plan, ensuring coordination across the city region.[114]
13. GMCA to promote the '**Go Neutral Smart Energy**'[115] framework to all public sector bodies in Manchester and to explore opportunities for the expansion of similar initiatives to other sectors.
14. GMCA to support **owner occupiers** who are 'able to pay' to incorporate renewable energy projects into domestic retrofit through 'Your Home, Better'.[116]
15. GMCA to work with MCC, MCCP, Manchester Climate Change Agency (MCCA) and others on delivering **campaigns to residents and businesses** to encourage installation of renewable energy generation.
16. ENWL to fund cooperative and **community energy** schemes for renewable energy generation[117] with support from public sector organisations.
17. **Bee Net Zero**[118] partners and the **Energy Innovation Agency**[119] to support Manchester businesses to install renewable energy capacity and diversify or grow in the renewable energy and low carbon sector.
18. Higher education sector to develop and roll out a **regional upskilling** programme for renewable energy generation and local energy markets.

Recommended actions

Energy

To advocate for national government to do:

19. Increase the availability of **development finance and capacity** to local areas to accelerate creation of renewable energy projects suitable for green funding (e.g. through UKIB).[120]
20. Bring forward **subsidy schemes** to support local energy generation and battery storage.
21. **Change the environmental levies** on energy bills into a levy based on carbon impact, in line with the recommendation from the Climate Change Committee.[121]
22. Continue to explore the **role of hydrogen in our future energy mix**, including to support decarbonisation of industry, transport, and heating.
23. Clarify or include energy projects as a suitable category in **future lending terms for PWLB**[122] to enable local authorities to access low-cost investment finance for energy projects.
24. **Increase powers and resources** for local authorities to deliver systems-based, area-wide planning for zero carbon, including the infrastructure and incentives needed to increase renewable energy generation.

Energy

To do differently, where there are opportunities to innovate:

25. Use open access **digital technology** to enable residents and businesses to assess the suitability of their property for renewable energy generation to help increase deployment.
26. Launch a **local climate bond**,[123] based around the UK Green Taxonomy criteria that raises finance for local renewable energy projects.
27. Innovate and advocate for research into **small-scale wind generation** that could be deployed across the city.

3.4 CONSUMPTION-BASED EMISSIONS

3.4 Consumption-based emissions

To better understand the broader climate change impact of the city's consumption of goods and services and take action to develop more sustainable consumption practices for the city's residents and organisations.

Introduction

Our consumption-based emissions are sometimes called indirect emissions. They occur from the services we consume and the goods that we buy and ultimately dispose of.

The Framework addresses three main categories of consumption-based emissions: food, the things we buy and throw away, and aviation.

They are significant as they can be 60% greater[124] than our direct emissions but are more difficult to assess accurately, particularly at city-scale, and so target-setting and granular monitoring is not yet possible.

As part of building a thriving and sustainable city, we need to promote sustainability within our food systems, and resource productivity within our businesses. We need to encourage more circular business models and the use of more sustainable materials in all sectors, and the elimination of waste by designing it out at source.[125]

We also need to become more sustainable consumers of food, goods, and services as we recognise the impact that our behaviours have on the city's goals to address climate change.

Update on research and initiatives

Since publication of the Framework, Manchester Climate Change Agency (MCCA) and members of Manchester Climate Change Partnership's (MCCP) Zero Carbon Advisory Group[126] have collaborated with city partners on the following research and initiatives, all of which have fed into the Recommended Actions that follow at the end of this section:

Incorporating food into Manchester's climate change response

The University of Manchester has addressed the inclusion of food systems in Manchester's sustainability policymaking[127] in two reports.

The first report[128] states that, historically, food systems have been absent from sustainability policymaking at both national and local levels, and they continue to be absent in strategies such as the UK government's "10-point Plan for a Green Industrial Revolution".[129] This is despite the food system's[130] crucial role within the UK economy, and its extensive contributions to climate change, equivalent to 35% of the UK's greenhouse gas emissions.

It notes that the food system impacts directly on public health, with the current nature of food provisioning acting as a driver of chronic disease and food poverty. As such, food system interventions that address these issues can produce multiple co-benefits to our health and wellbeing, the local economy, and global climate.

It argues that, although Manchester produces relatively little food, its position as a major urban centre means that it plays a significant role in generating demand for food and shaping food consumption practices. By engaging with the activities and infrastructures associated with food consumption, such as the provision of meals in public contexts, food processing in our retail and hospitality sectors, and food delivery and distribution services, Manchester can leverage its position to catalyse food system transformation.

The second report[131] makes ten recommendations, based on six case studies, aimed at supporting the implementation of a more equitable, zero-carbon food system in Manchester, and concludes that further work is needed to specify coherent pathways for food system reform, particularly to support Manchester's climate change goals.

Manchester Food Board Strategy

Manchester Food Board[132] is an independent membership group with representatives from across Manchester's economic, health, environment, housing, farming, and social sectors. One of its strategic priorities is to 'Reduce the carbon impact of the food system by elimination of avoidable food waste, excess packaging and ineffective utilisation of natural resources'.

The research undertaken by the University of Manchester described above was supported by, and has been fed into, the refresh of the Manchester Food Board (MFB) Strategy. This work is identifying actions for the public, private, and voluntary sectors; for communities and individuals; for Manchester Food Board; and for regional and national partners that will reduce the climate impacts of our food system, organised under the following priorities:

- Reduce food waste
- Consume more sustainable diets
- Increase the number and improve the quality of food-growing spaces
- Increase the diversity and sustainability of food and drink operations
- Develop shorter food supply chains
- Reduce unnecessary product packaging and single-use plastics
- Support agroecological food production and management practices
- Promote responsible advertising and the promotion of healthy, sustainable food

These actions will align with those for the wider objectives of MFB's Strategy, which include improving food security, promoting a vibrant food economy, and facilitating collaboration, research, and innovation.

Decarbonising consumption

The University of Manchester has examined how decarbonising consumption could support Manchester's COVID-19 recovery.[133] Its work brought together academic and grey literature alongside insights generated from two workshops with academics, organisations and citizens held in October 2020 to delve deeper into each of these topics.

The report highlights that cities tend to focus their zero carbon efforts on production-based emissions: those that occur within their boundaries or those associated with their energy supply. This approach leaves a large gap, if it is the sole focus, as it ignores the emissions arising from the consumption of goods and services within the city when these emissions are generated elsewhere. Cities such as Manchester, with an import-based economy, effectively outsource a large amount of their carbon emissions to areas where goods and services are produced if they do not also address these consumption-based emissions.

The work estimates that the carbon footprint of Manchester's consumption-based emissions is at least 1.5 times larger than its production-based footprint, standing at 3.3m tCO_2e in 2017 (an update of this calculation by the University of Manchester shows it to be 3.12m tCO_2e in 2019; with an average per capita footprint of 5.6 tCO_2e).

The work identifies several hotspots[134] for direct emissions where action should be focused to deliver the greatest impact; these include food and drink, construction, manufactured goods, waste and wastewater, and transport beyond the city. It then outlines specific areas for action against each of these hotspots – some immediate 'low-hanging fruit' and some more comprehensive and ambitious changes.

The actions are not exhaustive, rather they signpost a direction and set out an agenda for further detailed work for policy makers, academics, and the wider Manchester community.

In order to reach zero carbon

We need to **half the city's consumption-based emissions by 2030**, before halving once again by 2036.

We need to **produce goods and services more sustainably**, moving to a circular economy, alongside becoming more **sustainable consumers**.

We need to r**educe waste** production, including unnecessary **food waste**, and manage unavoidable waste as sustainably as possible, maximising reuse and recycling.

Other policy drivers and enablers

Whilst this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Greater Manchester's Sustainable Consumption and Production Plan[135] adds detail to the five-year Environment Plan with four priority areas and target indicators:
  - Moving to a circular economy – 38% reduction in industrial emissions by 2025 and a 50%-77% reduction by 2038.
  - Managing waste as sustainably as possible – 65% recycling rate for municipal solid waste and no more than 10% to landfill by 2035.
  - Reducing avoidable food waste – working towards the Government's Resources and Waste Strategy ambition of eliminating avoidable waste of all kinds by 2050.
  - Moving to a sustainable lifestyle – reduction in residual waste sent to landfill and incineration.
- DEFRA's Resources and Waste Strategy[136] has been designed to accelerate the transition to a circular economy, to support an effective domestic recycling infrastructure and to tackle the challenges of plastic pollution and food waste. It targets:
  - Introduction of a deposit return scheme by 2023
  - Legislation for mandatory separate food waste collections by 2023
  - 75% recycling rate of packaging by 2030
  - 65% recycling rate for municipal solid waste by 2035
  - Municipal waste to landfill 10% or less by 2035
- DEFRA's 25 Year Environment Plan[137] also targets a doubling of resource productivity by 2050.
- The Environment Bill[138] includes recommendations to improve waste and resource efficiency, requiring all businesses and non-domestic premises to arrange for the collection of glass, metal, plastic, paper and card and food waste for recycling or composting.[139]
- The Future of Urban Consumption in a 1.5ºC World[140] by C40 Cities states that the consumption-based emissions of cities need to half by 2030, before halving again by 2036, and finally stabilising at 0.7t CO_2e per capita by 2050. It identifies a range of interventions to help reduce indirect emissions from key sectors including:
  - Clothing and textiles – reduce the number of new clothing items bought each year and reduce supply chain waste.
  - Technology – optimise lifetimes of IT equipment.
  - Food and beverage – reduce household waste, lower meat and dairy consumption, reduce supply chain waste.
- A recent Food Strategy policy paper[141] sets the objective to reduce greenhouse gas emissions and the environmental impacts of the food system, in line with the UK's net zero commitments and biodiversity targets and preparing for the risks from a changing climate.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in transitioning to a zero carbon, climate resilient city, including:

- Shifting the farming system[142] from large scale land and crop productivity, and high dependence on pesticides, towards more sustainable practices and more diverse food production can pose technological, financial, and skills challenges.
- Plant-based foods are often perceived to be more expensive[143] than their non-vegan or vegetarian counterparts.
- 81% of citizens are concerned about climate change, however, only 37% realise the connection with wasting food.[144]
- Cities often have little direct influence over indirect emissions;[145] for example, it is not possible to control the carbon intensity of power used in the manufacturing process of an imported product, or how that product is transported.
- Manufacturing businesses within a value chain often have limited power to change a product's design or packaging; the shift to more circular economies requires collaboration across parties[146] within these chains.
- Indirect emissions are more difficult to estimate and monitor[147] for cities and individuals, meaning that identifying actions and tracking progress is not as accessible as for direct emissions.
- Individual consumers cannot change the way the global economy operates on their own, however, they can exercise some choice[148] over what they buy.
- The pandemic and online shopping has led to an increase in consumption.[149]

- Meeting circular economy goals requires simultaneous innovations in business models, manufacturing and digital technologies, and changes to the way we interact socially.[150]

Co-benefits of action

Adaptation and resilience

- Increasing local food production helps build the city's resilience to disruptive events in the global supply chain[151] often caused by climate change, which increasing food security.
- Agroecological farming practices[152] protect our soil, restore biodiversity, reduce water stress, and produce more nutritious food.
- Adaptation measures can help to reduce negative impacts of climate change on the food system and ecosystems.[153]
- Businesses moving towards more circular business models will reduce their exposure to market volatility and supply chain disruption often caused by climate change.

Health and wellbeing

- The move to a more sustainable food system[154] can aid in tackling food poverty by providing equal access to healthy, affordable, and appropriate meals for all.
- Community participation in local food growing can facilitate physical activity as well as healthier food options. Participation can also reduce stress, improve mood, and increase confidence.[155]
- Eating local, seasonably produced food, consuming more vegetables, and choosing more sustainable meat and fish, can help to reduce the risk of death associated with heart disease, diabetes and stroke, and tackle obesity.

Inclusive, zero carbon and climate resilient economy

- The Our Manchester Industrial Strategy[156] positions the development of our low carbon technology sector and clean growth across all sectors as a priority. These actions will help to reduce both direct and indirect emissions and create local job opportunities.[157]
- Supporting local SMEs not only reduces emissions associated with logistics but also helps to circulate wealth in the local economy.
- Increasing recycling rates has the potential to create more jobs. If a target of a 70% recycling rate is reached in the UK, 50,000 new jobs[158] could be created.

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are many examples of good practice from within Manchester and the wider city region, including:

- Manchester Healthy Schools[159] and Growing Manchester[160] are among the many local projects supporting residents and communities to grow their own food and cook healthy, sustainable meals, helping to reduce food waste.
- Manchester City Council's procurement practices include a 10% weighting for environmental performance to help reduce emissions through the supply chain.
- Plastic Free GM is a campaign to ask businesses, organisations, and individuals to pledge to eliminate avoidable single use plastics.[161]
- Three Renew Shops have been opened across Greater Manchester in a partnership between GMCA and Suez. They sell pre-loved household items that have been donated by residents at their local waste recycling centre.[162]
- Bee Net Zero[163] connects businesses in Manchester to expert advice and support on sustainable product and packaging design, material efficiency in operations, and business model and value chain innovation to support the circular economy.
- Tools such as Corporate Value Chain Standard[164] help businesses to better measure and manage indirect emissions through supply chains.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Indirect emissions

To be delivered locally, where direct control lies in Manchester:

1. Public, private and third sector organisations to **implement sustainable food policies and procurement practices** to encourage more sustainable diets, and to reduce food miles and unnecessary food waste.
2. Food and drink businesses to implement **food waste reduction plans** and increase the amount of surplus consumed via food technology redistribution services such as Olio.
3. Manchester City Council (MCC) to **increase access to food growing spaces** at local level for individuals, communities, and businesses, for example through the Local Plan.
4. MCC to lead delivery of commitments made in the **Glasgow Food and Climate declaration**.
5. MFB to complete an exploratory study into **shortening the supply chains** of food used by people of ethnic minority backgrounds in Manchester and to investigate the improvement of sustainable sourcing for ethnically diverse foods.[165]
6. Manchester's **hospitality and food service** sector to reduce food waste, with support from campaigns like WRAP's Guardians of Grub.[166]
7. Manchester residents to reduce food waste and stretch budgets, with support from campaigns like WRAP's **Love Food Hate Waste**.[167]
8. Businesses to apply **sustainable design to products and packaging** and improve the **resource efficiency** of their operations and value chains, to minimise indirect emissions and eliminate waste at source. This is particularly relevant to the manufacturing, textiles, construction and food and drink sectors.
9. Manchester Climate Change Partnership (MCCP) to work collaboratively on the adoption of **sustainable procurement** practices, with particular focus on supporting local SMEs to reduce their carbon footprints.
10. Residents to become more **informed consumers**, reducing their purchases of new clothing, consumer electronics and other manufactured goods and services.
11. All organisations and individuals to **minimise water use**, protecting this valuable resource and reducing the emissions associated with transporting and treating it.
12. All organisations and individuals to **reduce waste production** and increase **reuse** and **recycling** rates.
13. Retailers to help reduce plastic waste by supporting consumers with **reusable water bottles** through campaigns like Refill.[168]
14. MCCP members to work together to **promote sustainable lifestyles** through their employees, and outreach networks.
15. Manchester Climate Change Agency to continue with academic partners to **improve our understanding of the city's consumption-based emissions**, including via the University of Leeds work using economic data.

Recommended actions

Indirect emissions

To work on at city-region level, with Greater Manchester partners:

16. Manchester University **NHS Foundation Trust** (MFT) to lead by example through the healthy enhancement of food and drink provision for patients, staff, and visitors within canteens, vending and retail outlets on NHS sites.
17. Bee Net Zero partners to continue to **help local businesses go green**, with targeted support for small and medium-sized enterprises.
18. Greater Manchester Combined Authority (GMCA) to help drive down overall rates of waste production and **drive-up rates of reuse and recycling**, including food waste.
19. GMCA to deliver the commitments in the Sustainable Consumption and Production Plan and encourage sign-ups to **Plastic Free GM**.[169]

Indirect emissions

To advocate for national government to do:

20. **Fund business support** programmes and initiatives that enable organisations of all sizes and in all sectors to take effective action to reduce their indirect emissions and shift to a circular economy.
21. Develop a **standardised labelling system** to inform consumers about the environmental and climate impacts of goods, extending the electronics rating system to other products, including food.
22. Deliver national **behaviour change campaigns** to encourage consumer behaviour change around goods and services associated with hotspots for consumption-based emissions.
23. Support development of **more trackable and accurate data** on indirect emissions and increase requirements for them to be included in **financial disclosures**.
24. Ensure the UK maintains high quality food standards that minimise climate impacts in **trade deals**.
25. Ensure that **regulatory frameworks are coherent** and fit to support a move towards a more circular economy.[170]

Indirect emissions

To do differently, where there are opportunities to innovate:

26. Deliver **materials innovation** for the circular economy, with particular focus on plastics (including food packaging) and textiles.
27. Increase uptake of **data-enabled technology** to enable supply chain partners to share product information, optimise product life, trace raw materials, track and reduce waste.

3.5 Aviation

We want the emissions from all flights from Manchester Airport to be fully aligned with the Paris Agreement. We believe this means operating within a limited carbon budget for UK aviation, as part of a wider international budget.

Current emissions

While aviation emissions, i.e. emissions from aircraft, are not part of Manchester's carbon budget, it is recognised that aviation emissions must be tackled as part of ensuring that the city, and the UK overall, play their full part in delivering the Paris Agreement.

The 2021 Manchester Climate Change Annual Report[171] outlined the impact of the COVID-19 pandemic on aviation, with emissions from flights departing Manchester Airport reducing by 91% in 2020 compared to 2019, and emissions from flights departing from all UK airports falling by 75% over the same period.

Now that lockdowns and travel restrictions have lifted, we fully expect to see some upturn in aviation emissions to be reported in the 2022 Annual Report.

In order to reach zero carbon

We need to **work collaboratively** across the aviation industry, with other core cities, national government, and international partners to ensure aviation emissions are reduced in line with the Paris Agreement.

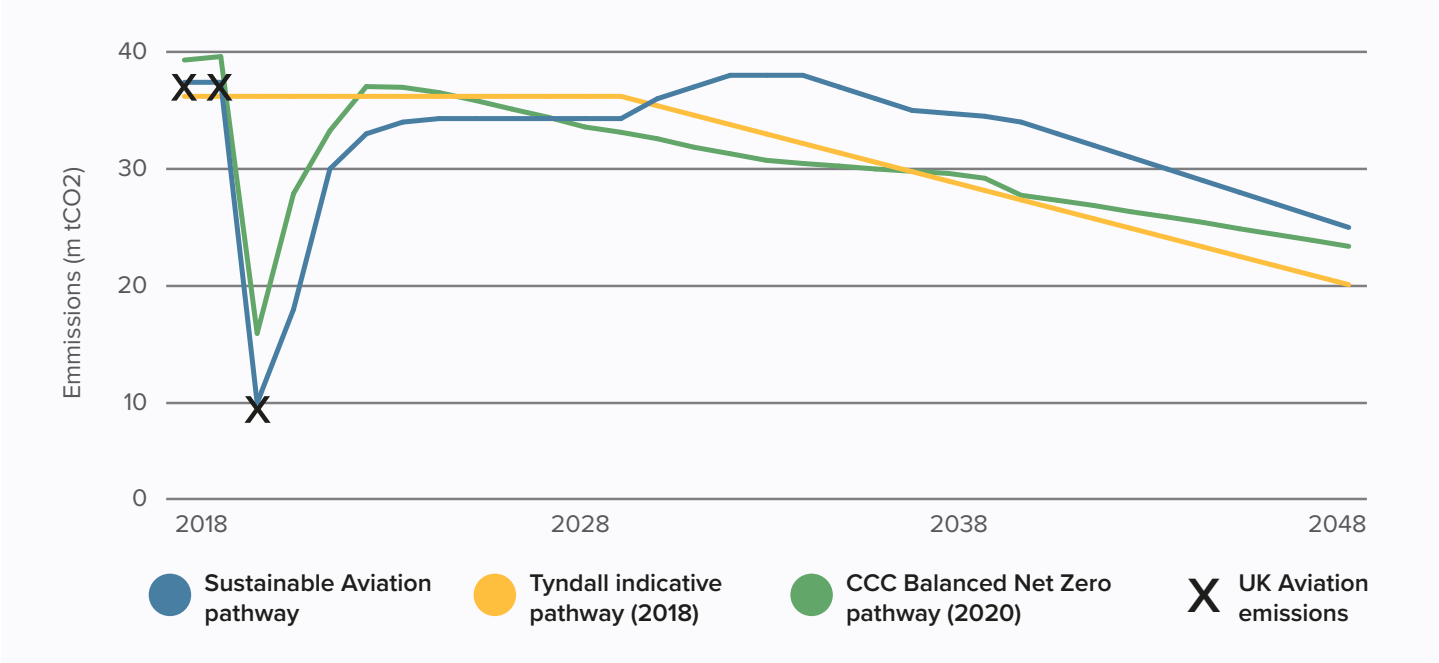
We need to **enable and encourage residents and businesses to make informed choices** about their travel behaviours, including an understanding of the climate impacts.

Other policy drivers and enablers

While this update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Decarbonisation Roadmap: A Path to Net Zero[172] – a report from Sustainable Aviation, a coalition of UK airlines, airports, and manufacturers, that outlines how the UK aviation industry can achieve net zero by 2050 including through sustainable aviation fuels, introduction of known and new more efficient aircraft, and better air traffic management and operating procedures. Interim targets were also published.[173]
- Flightpath to the future: a strategic framework for the aviation sector[174] – sets out the commitment to include international aviation and shipping emissions in the UK's sixth carbon budget (2033-2037) for the first time.
- The Sixth Carbon Budget[175] from the Climate Change Committee (CCC) – recommended that aviation emissions in 2030 should be 20% below 2019 levels, without carbon offsetting or removal.
- The UK government's Jet Zero Strategy[176] sets a goal for net zero UK aviation emissions by 2050, acknowledging there are multiple pathways to achieve this. It commits to five-year delivery plans structured around three principles (international leadership, delivered in partnership, and maximising opportunities) and six measures (system efficiencies, sustainable aviation fuels, zero emission flight, markets and removals, influencing customers, and addressing non-CO_2); introduces a CO_2 emissions reduction trajectory to 2050; sets a target for all domestic flights to reach net zero by 2040 and for all airport operations to be zero emission by 2040; and commits to have at least five UK sustainable aviation fuel (SAF) plants under construction by 2025 and a SAF mandate in place with a target of at least 10% SAF by 2030. Finally, it commits to monitor progress on an annual basis, followed by a major review every five years, and undertakes to maximise opportunities to deliver wider benefits in jobs, skills, and investments that these new technologies will bring.
- The COP26 Declaration by the International Aviation Climate Ambition Coalition[177] emphasises that international action on tackling aviation emissions is essential given the global nature of the sector and that co-operation by states and aviation stakeholders is critical for reducing the aviation sector's contribution to climate change.

Graph 12: the emission reduction pathways proposed for UK aviation



Graph 12 shows the emission reduction pathways proposed for UK aviation by the CCC and Sustainable Aviation, alongside the indicative pathway developed by the Tyndall Centre.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in decarbonising our aviation, including:

- Reconciling a city's climate change responsibilities with having a major international airport that brings significant employment, business, cultural and tourism benefits, within its boundaries.
- Regional policies that unilaterally impose costs in one region that are not shared nationally or internationally can distort the aviation market, resulting in emissions being displaced to another city, as travellers choose a different airport, rather than creating a reduction in aviation emissions. As such, decarbonising aviation must be tackled collectively at a holistic national and industry-wide level.

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are examples of good practice within Manchester, and across the UK, including:

- Jet Zero Council[178] – is a partnership between industry and government with the aim of achieving zero emission transatlantic flights within a generation and delivering new technologies and innovative ways to cut aviation emissions. Manchester Airport Group are represented on this Council and the Jet Zero Strategy was published in July 2022.[179]
- The infrastructure to access the airport, and Airport City, has been made more accessible via public transport and walking and cycling, including a new pedestrian and cycle bridge over the motorway link, enabling more sustainable transport choices to be made when travelling to/from the airport.
- In 2022, Manchester Airports Group (MAG)[180] became the first airport operator to be named a Financial Times European Climate Leader two years in a row and was the only one to feature on the list. In 2021, MAG was named the highest performing transport organisation, ranking 37th out of 300. In response to the Jet Zero Strategy, MAG has announced a series of new pledges on education, research, technology, sustainable aviation fuel and airspace modernisation to help drive the industry towards net zero aviation.

MCCP Agreement

To support the common aim of establishing Manchester Airport, and the city of Manchester, as a national and international leader in sustainable aviation, Manchester Climate Change Partnership has worked together to develop and commit to the following agreement:

To work with the UK Government and other stakeholders to ensure that emissions from flights are kept within a carbon budget for UK aviation that is fully aligned with the Tyndall budget and the Paris Agreement (the "UK Aviation Budget"). This includes flights by Manchester citizens, businesses and other organisations, and all flights from airports in which the city has a stake.

As with the Manchester Climate Change Framework as a whole, the following principles underpin our approach to this sub-objective:

- The principle of urgency, to ensure that high impact actions are taken in the short term to minimise cumulative emissions and their climate effects.
- The precautionary principle, to ensure that we are confident of remaining within the UK Aviation Budget by only adopting proven measures, while also supporting research into innovative approaches.
- The principle of equity, to ensure fair access to transport and an equitable distribution of the remaining global carbon budget.

To meet this sub-objective, we will pursue the following actions:

- Empower citizens, businesses, and other organisations to understand the climate impact of their aviation practices and take action to reduce it.
- Engage and collaborate with national government, regulatory agencies, other cities and the industry to ensure aviation emissions remain within the UK Aviation Budget.
- Monitor progress through emissions reporting and budgeting, track the contribution of mitigation measures, and periodically review the underpinning science.
- Recommend actions to ensure that the city plays its fair part in keeping aviation emissions within the UK Aviation Budget, while mitigating the risk of redistributing flights, emissions and associated social and economic benefits.

In support of this agreement, Manchester Climate Change Agency will engage with members of the Core Cities network, especially those with an airport within their boundaries, to develop a common approach to aviation emissions.

4. ADAPTATION AND RESILIENCE

4. Adaptation & Resilience

To adapt the city's buildings, infrastructure, and natural environment to the changing climate and to increase the climate resilience of our residents and organisations.

Introduction

Bold action on climate change mitigation is vital, as described in the previous section of this update. However, the global and local climate is already changing, with many climate impacts already 'locked in'[181] and deemed irreversible, even under the most ambitious emissions reduction scenarios.

Climate change creates risks for our communities, buildings, critical infrastructure, wider economy, and natural environment; yet we do not fully understand the impacts we face at local level and so cannot plan and prioritise effective action.

The costs relating to climate disasters, such as flooding and wildfires, are unplanned and largely unaccounted for on most balance sheets in the public and private sector. We need to monetise the impact of climate change[182] to help incentivise action that builds resilience and avoids stranded assets.

To adapt well, a holistic approach must be taken, where measures that build resilience are integrated with actions that reduce emissions across all sectors, with particular focus on protecting the most vulnerable.

The climate is changing now

The latest evidence report[183] that feeds into the UK's Climate Change Risk Assessment[184] sets out the following observed changes to England's climate:

Average annual temperature:

- Increase of 0.9ºC from mid-1970s to mid-2010s

Annual mean rainfall:

- Increase of 4.5% from mid-1970s to mid-2010s

Sunshine:

- Increase of 9.2% from mid-1970s to mid-2010s

Weather extremes:

- UK-wide increase in extreme heat events
- Little evidence yet on changes in extreme rainfall

Sea level rise:

- UK-wide increase of ~1.4mm per year since 1901 (16cm to date)

In addition, the Climate Change Committee's (CCC) Independent Assessment of UK Climate Risk[185] identifies that:

- Global and UK average land temperatures have risen by around 1.2°C since the 1850-1900 period.
- Episodes of extreme heat are becoming more frequent, with the chance of a hot summer like 2018 now up to 25% per year, compared to less than 10% a few decades ago.
- 5.2 million homes and businesses are now at risk from flooding.

Future projections for the UK's climate,[186] as modelled by the UK Met Office, tell us to expect:

- Hotter, drier summers with +5.6°C summer mean daily temperature
- Warmer, wetter winters with +28% winter mean precipitation
- More frequent and intense weather events, including heatwaves and floods

The picture locally is the same, with climate changes being felt in Manchester and projected to increase and intensify:

- Flooding is Manchester's biggest climate risk:
  - Approximately 10,000 homes are at flood risk in Manchester[187]
  - Storm Christoph in January 2021 led to 3,000 properties across Didsbury and Northenden being evacuated[188]
  - In February 2022, the UK's Met Office named three major storms in one week for the first time
  - These events saw Manchester experience disruption to critical infrastructure services, including increased sewer flooding incidents[189]

Rising temperatures are an increasing risk for the city:

- July 2022 saw the highest maximum recorded temperature in Manchester at 38°C,[190] and the UK Met Office issued its first 'extreme heat' weather warning[191]

- Periods of water scarcity are projected to become more prevalent:
  - During 2018, 2020 and 2021 the North West experienced extremely hot, dry weather coupled with significantly increased demand for water over the summer,[192] leading to temporary use bans in Manchester

The evidence for the third UK Climate Change Risk Assessment (CCRA3) identified eight top risks for England[193] based on the urgency of additional action, the gap in adaptation planning across the UK, imminent opportunities for integrating adaptation action into upcoming major policy commitments, and the opportunity to avoid lock in where major developments are taking place now. These are:

- Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards.
- Risks to soil health from increased flooding and drought.
- Risks to natural carbon stores and sequestration from multiple hazards, leading to increased emissions.
- Risks to crops, livestock and commercial trees from multiple climate hazards.
- Risks to supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks.
- Risks to people and the economy from climate-related failure of the power system.
- Risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings.
- Multiple risks to the UK from climate change impacts overseas.

The Climate Change Committee's progress report[194] to Parliament in 2022 also raised the increasing need for adaptation action across the UK economy and key sectors, and urges the Government to:

- Take urgent steps to ensure the UK is ready for our changing climate
- Demonstrate how the top eight priority risks are being addressed
- Set out how adaptation is being integrated into policy across all departments
- Develop a detailed monitoring and evaluation framework

Green infrastructure and nature-based solutions

Green infrastructure (GI) and nature-based solutions (NBS) are identified as one of six priority areas in Manchester's Climate Change Framework.

The city's green infrastructure includes our public green spaces, parks, gardens, trees and woodlands, rivers, canals and lakes, growing spaces, green roofs and green walls, and sustainable urban drainage systems, for example ponds, rain gardens, ditches and swales.

The term nature-based solutions refers to the sustainable management and use of natural features and processes to tackle challenges such as climate change, water pollution, biodiversity loss, and disaster risk management.

GI and NBS have an essential role to play in helping Manchester to meet its climate change objectives, both adapting the city to the changing climate (by helping to manage flood risk and heat stress) and helping to reduce our CO_2 emissions (to stay within our carbon budget we need to become a net remover of carbon).

They are addressed within this section of the Update as they are a critical part of helping the city to adapt to climate change and build resilience to extreme weather events.

In order to adapt

We need to **understand our exposure to climate change risk** and make detailed plans that support all our residents, all parts of our city, its economy and natural environment to adapt.

This includes prioritising action to ensure our **critical infrastructure is resilient** to climate change and ensuring our most **vulnerable communities are protected**.

We need to ensure all the investments we make are resilient to climate change and we need to develop innovative models to **unlock new private investment** for adaptation.

Update on research and initiatives

Since publication of the Framework, Manchester Metropolitan University, Manchester Climate Change Agency (MCCA) and members of Manchester Climate Change Partnership's (MCCP) Adaptation and Resilience Advisory Group[195] have collaborated on the following research and initiatives:

Manchester's climate risk: a framework for understanding hazards & vulnerability[196]

This work identifies the key weather-related hazards in Manchester and how these will be amplified by climate change.

It sets out the direct impacts these hazards are likely to have on the city's people, communities, health, energy consumption, water supply, buildings, economic activity, transport and other critical infrastructure, and natural environment.

In doing so, it establishes a structure to support a comprehensive assessment of the city's vulnerabilities to climate change and an evaluation of our capacity to respond to these threats.

It recognises that we must intensify our collective effort to understand the complex interactive implications of a changing climate, in order that we can prioritise where adaptation action will have the most benefit and calls for a comprehensive risk assessment to be carried out at city-scale.

Manchester Climate Ready: risk, resilience, and adaptation[197]

This work outlines the global to local policy drivers on climate adaptation, proposes a broad vision for progressive climate resilience in Manchester, identifies the key characteristics of such a resilient city, and seven principles to guide both ambition and practical action.

It sets out the following vision for a climate resilient Manchester:

Our vision for a more climate resilient Manchester will enhance the capacity of the entire city – our buildings, infrastructure, green and blue space, businesses, and people – to adapt to future climate shocks and stresses.

Our pursuit of climate resilience will be aligned with other progressive agendas that aspire to create a healthier, happier, and a more socially just city, and to produce sustainable, inclusive, and green economic growth.

The work also details a series of characteristics of a climate resilient city; where action reduces the systemic causes of vulnerability; is pursued by the whole of society; is informed by a comprehensive assessment of climate risk; takes account of future risk; targets interventions toward those most in need; ensures a legacy of climate resilience; avoids unintended adverse consequences ('maladaptation') and 'lock-in' to decisions; delivers adaptation measures beyond the city's boundaries; and capitalises on the co-benefits of climate adaptation interventions.

It identifies seven principles to catalyse coherent action and to assess progress:

1. Enhance leadership and strategic capacity to pursue progressive resilience and adaptation action across the city.
2. Develop detailed understanding of the implications of, and vulnerabilities to, exposure to climate change.
3. Embed progressive climate resilience ambition and action across the city, including governance, policy, and practice.
4. Enable individuals, communities, service providers and businesses to adopt and integrate adaptation measures.
5. Embed and enhance green and blue infrastructure to support climate resilience and adaptation.
6. Ensure our urban environment, including buildings and urban infrastructure, is climate resilient.
7. Encourage research, innovation, and reflective practice to support our progress in creating a more resilient Manchester.

The work also identifies specific actions against each of these principles for different stakeholders to follow.

Manchester Climate Ready (MCR) website[198]

To help bring action to life, a range of examples of adaptation measures will be published from members of the Manchester Climate Change Partnership.

MCCA is also working with:

The Met Office on:

- A City Pack[199] to forecast climate projections at local level and to highlight the importance of addressing climate risk.
- A heat mapping tool to give the city a better understanding of its exposure and vulnerability to heat over time.

The University of Exeter on:

- A Local Climate Adaptation Tool[200] (LCAT) that is intended to recommend adaptation action that will support improvements in health and wellbeing.

Other policy drivers and enablers

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- Manchester's Green and Blue infrastructure strategy refresh[201] embeds the role of our natural environment in supporting climate resilience and adaptation.
- Greater Manchester's Strategic Flood Risk Assessment[202] provides a framework for flood risk management across the city-region, including identification of key strategic flood risks plus existing and planned interventions.
- Greater Manchester Resilience Strategy 2020-30[203] sets out the vision for a resilient Greater Manchester; the Greater Manchester 5-Year Environment Plan[204] includes a priority to ensure 'our resilience and adaptation to climate change'; and Places for Everyone[205] refers to climate resilience and adaptation throughout.
- The Climate Change Act (2008)[206] provides a framework for mitigating and adapting to climate change. It requires the completion of a five-yearly Climate Change Risk Assessment (CCRA),[207] with a National Adaptation Programme establishing how risks will be addressed. Additionally, the Act provides an 'Adaptation Reporting Power' requiring public bodies and infrastructure operators providing key services to report actions being taken to address climate impacts.
- The Glasgow Climate Pact emphasises the urgency of scaling up climate adaptation through local, regional, and national planning.[208]
- The Environment Agency's Flood and Coastal Erosion Risk Management Strategy[209] and Strategy Action Plan[210] sets out how they will deliver a £5.2 billion capital investment programme allocated to flooding and coastal erosion by 2027.[211]
- The UK Infrastructure Bank's Strategic Plan[212] sets out how it will explore projects that make the UK's infrastructure more resilient to climate change and better adapted to future risks – including the impact of climate change on financial assets.
- The Bank of England published its first climate stress tests in 2022,[213] highlighting the need for UK banks and insurers to act on climate change to avoid climate-related losses.
- Greening Finance: A Roadmap to Sustainable Investing[214] is suggesting that mandatory requirements to the pension and investment sectors, to assess and disclose climate risk on portfolios, will help shift financial flows to align with a net-zero, nature-positive economy.
- The Government's green taxonomy[215] will help to tackle greenwashing by providing a framework for sustainable financial disclosure.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in transitioning to a zero carbon, climate resilient city, including:

- There are limitations in information and awareness of climate risk and a lack of clarity on ownership of risk management and response.
- DEFRA's survey What does a well-adapted England look like?[216] found that people in Greater Manchester need more information on the risks associated with climate change and the type of actions they can take. This lack of awareness applies across sectors.[217]
- Quantifying the risks and costs associated with climate change is in its infancy with gaps in standardised data and reporting. This makes it difficult to quantify the benefit of adaptation and resilience measures which would incentivise action.
- A future with a changing climate contains innate uncertainty and makes adaptation complex in terms of planning, setting targets for and catalysing action. This particularly impacts on private investment into adaptation, which are costly and resource intensive, and need confidence in climate risk modelling[218] to unlock.
- Currently, the largest share of investment into resilience goes into the post event- emergency response and recovery, much of which is held by the public sector.[219] This needs to be expanded to include de-risking investment to attract private finance.[220]
- Adaptation measures can take time to plan and implement, especially for infrastructure and nature-based solutions, which means change has to happen quickly to avoid 'lock-in' to high levels of risk in 2050 and beyond.[221]
- Adaptation metrics are essential for tracking progress[222] but current data and tools are partial and fragmented[223] which makes benefits difficult to assess.
- Future Homes Standards and building regulations[224] are not proposing to cover climate adaptation measures within new and existing buildings, focusing only on reducing greenhouse gas emissions.

Co-benefits of action

The systemic transitions required within cities are complex and interlinking. This creates challenges but also means that action to increase our resilience to climate change can deliver additional benefits to reducing our emissions, improving the health and wellbeing of our communities, and delivering an inclusive and sustainable economy.

Staying within our carbon budget

- Nature-based solutions that build resilience to climate change can also deliver zero carbon benefits in the form of carbon sequestration.
- Without consideration of the future weather and climate conditions, aspects of the UK's transition to zero carbon are at risk of failure.[225]

Health and wellbeing

- Adaptation and resilience that is targeted through a comprehensive risk assessment will deliver benefits to those communities most at risk, including from heat stress, flooding and extreme weather events.
- Nature-based solutions that build resilience can also provide access to good quality green space, which supports health and wellbeing and enhances quality of life.
- Increased tree coverage in urban areas can help to mitigate extreme heat and therefore reduce the associated health impacts.

Inclusive, zero carbon and climate resilient economy

- Action to build climate resilience helps to grow the green technology and services sector, which brings growth and job opportunities for Manchester, especially in sectors such as construction, water, infrastructure, and nature conservation.[226]
- Businesses that have adapted to climate change and built resilience will be less likely to experience disruption and the costs associated with this.
- Investing in resilience is good for business[227] with estimates indicating cost-benefit ratios up to 1:10. Recent research[228] shows that this topic is high on the agendas of CEOs with 79% adjusting supply chains to reduce risk.

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are many examples of good practice within Manchester, the wider city-region and across the UK, including:

- Northern Gateway development:[229] now called Victoria North,[230] on the River Irk, is investing over £16m into flood mitigation and river works alongside major enhancements to the existing green spaces.
- Mayfield development:[231] will include a new multifunctional city park that provides recreation space, manages flood water, and increases biodiversity.
- Manchester City Council's Climate Change Action Plan[232] has set a target of net 1,000 new trees, 1,000 new hedge trees and four community orchards a year on known schemes on public or partner land.
- Manchester City Council's Highways team are integrating Sustainable Urban Drainage (SuDS) into schemes such as 'Glade of Light' Manchester Memorial Gardens to treat and attenuate flows before discharging into the nearby River Irwell.
- The GrowGreen[233] project has delivered a new community 'sponge park' in West Gorton, which demonstrates how nature-based solutions such as swales, bio-retention tree pits, rain gardens and permeable paving can be used to address climate issues like surface water flooding.
- Manchester is a signatory to the Edinburgh Declaration on post-2020 global biodiversity framework,[234] which tackles the twin challenges of climate change and biodiversity loss by integrating nature-based solutions into city planning.
- The Greater Manchester Environment Fund[235] is bringing together public, private, and philanthropic funders to tackle urgent environmental challenges facing the city region.
- The IGNITION[236] project is exploring innovative funding and delivery mechanisms to increase Greater Manchester's green infrastructure over the next two decades.
- Greater Manchester is part of both the Resilient Cities Network[237] and the UNDRR's Making Cities Resilient 2030 (MCR2030) programme.[238] It has been recognised as a MCR2030 Resilience Hub[239] and is working to enhance city-to-city collaboration and inspire other communities to reduce risk and build resilience.
- The Business of Resilience programme[240] is an industry-led taskforce working to identify current strengths and future international opportunities for the UK's resilience industry.
- The Coalition for Climate Resilient Investment[241] develops and pilots practical tools, solutions, and financial instruments to support a more efficient integration of physical climate risks in investment decision-making.
- Financing Nature Recovery UK[242] outlines a new roadmap to unlock barriers and deliver high-integrity environmental markets that drive private investment and nature recovery across the UK.
- The Race to Resilience,[243] is a UN-backed global campaign to catalyse a step-change in ambition for climate resilience, putting people and nature first in pursuit of a resilient world where we don't just survive climate shocks and stresses, but thrive in spite of them.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Adaptation

To be delivered locally, where direct control lies in Manchester:

1. Manchester should set a **high level ambition for adaptation** to mirror the city's target to reach zero carbon by 2038.
2. Manchester City Council (MCC) to lead a **detailed climate risk and vulnerability assessment** of the city and produce an **adaptation plan**, directing priority action towards increasing the resilience of our critical infrastructure and most vulnerable communities, and ensuring that nature-based solutions are given sufficient time to develop their adaptive services.
3. MCC to ensure that its **planning, housing, and infrastructure policies and project appraisal** incorporate climate adaptation and resilience, in line with Green Book standards, including through deployment of nature-based solutions, to avoid increasing exposure to risk through capital expenditure and new developments.
4. MCC and Greater Manchester Resilience Forum to assess the current and predicted future costs of damage caused by climate change and extreme weather events to the city's critical infrastructure, residents and local economy, to support the **business case for increased investment in adaptation** and resilience measures.
5. MCC to ensure capital expenditure is made resilient to climate change and to help develop innovate ways to **unlock private capital investment** into adaptation and resilience.
6. Public sector organisations to **transparently report** on what they are doing to mitigate the risks of climate change to their services and how these risks are being governed, in line with TCFD[244] reporting standards.
7. **Manchester Climate Change Partnership** (MCCP) to work collaboratively on assessing climate risks and building resilience, both at organisational level and through value chains, sharing learning with wider partners.
8. Manchester Climate Change Agency (MCCA) to work with local partners to explore ways to **raise awareness of climate risk to communities**.

Adaptation

To work on at city-region level, with Greater Manchester partners:

9. **Greater Manchester Pension Fund** to actively work towards a greater percentage of its investment portfolio being divested from fossil fuels and defined as environmentally sustainable and climate resilient, as set out in the UK Green Taxonomy.[245]
10. Greater Manchester Combined Authority (GMCA) to engage with the National Infrastructure Commission to explore the early adoption of **national resilience standards**.

Recommended actions

Adaptation

To advocate for national government to do:

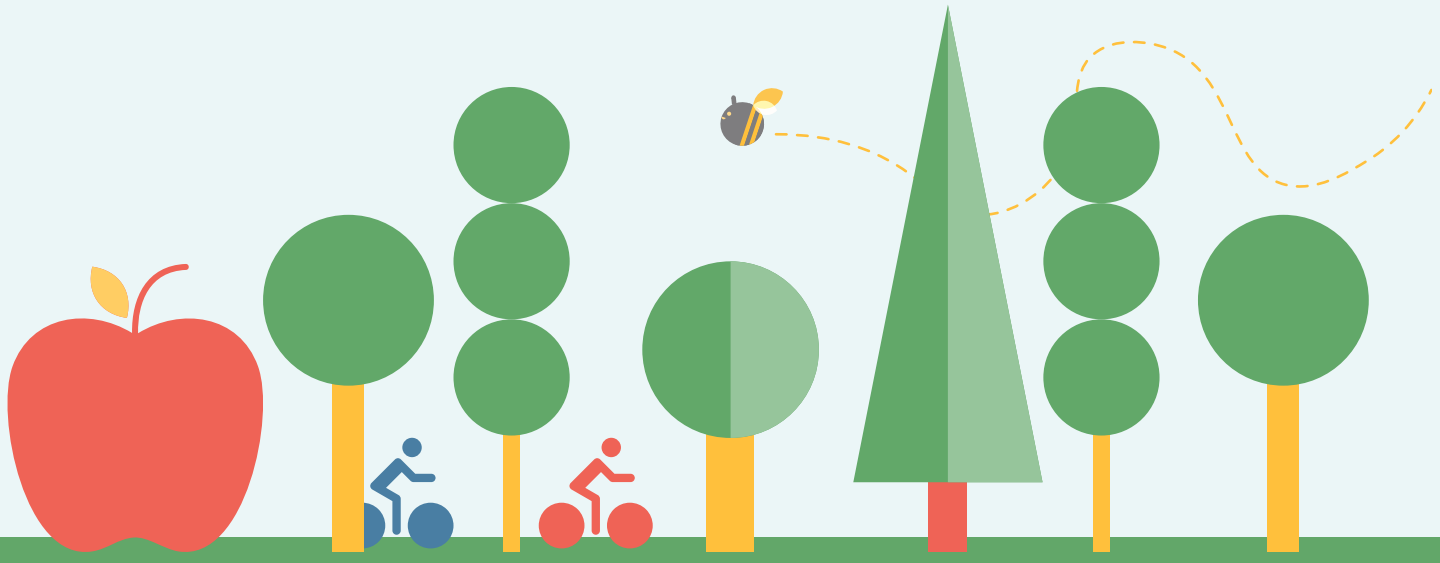
11. Set a **high level ambition for adaptation** to mirror the UK's target to reach net zero by 2050 as called for by the Climate Change Committee.[246]
12. Set out a **National Resilience Strategy** to focus on the UK's ability to anticipate, assess, prevent, mitigate, respond to, and recover from known, unknown, direct, indirect, and emerging climate risks.[247]
13. Strengthen the ownership and accountability of the cross-Whitehall **National Adaptation Strategy** to drive adaptation principles across government policy and strategy.
14. Ensure climate resilience is factored into all **public capital spending**, including the National Infrastructure and Construction pipeline of £650 billion investment by 2030.[248]
15. Develop national **adaptation and resilience infrastructure standards** as called for by the National Infrastructure Commissions report: 'Anticipate, React, Respond'.[249]
16. Use the **Green Finance Strategy** to set the frameworks for more integration of investment into measures for resilience, emission reduction and nature restoration.
17. Develop more **localised climate risk and vulnerability data** to guide investment and decision-making, as recommended by The World Bank report.[250]
18. Require infrastructure operators to develop and maintain long term **resilience strategies** that meet resilience standards.[251]
19. Put in place longer term support to continue the work of **Flood Re**,[252] a joint initiative between the Government and insurers, making flood cover part of household insurance policies more affordable.
20. **Expand mandatory TCFD**[253] reporting to the public sector.[254]
21. Make **TNFD reporting**[255] **mandatory** for both the public and private sector once published.

Adaptation

To do differently, where there are opportunities to innovate:

22. HM Treasury to commission a review on the **economics of climate resilience** to better understand the costs and benefits, and drive smarter public-private investment into adaptation.[256]
23. HM Treasury to develop an **Environmental Investment Tax Relief** to incentivise investment into environmental outcomes including adaptation and resilience.
24. Advocate for national action to support the **Commission for Climate Resilient Infrastructure's** call for physical climate risks to be systemically integrated into infrastructure project appraisal and spending by 2025.[257]

5.
HEALTH AND WELLBEING



5. Health and Wellbeing

To improve the health and wellbeing of everyone in Manchester through actions that also contribute to our objectives for CO_2 reduction and adaptation and resilience, with particular focus on those most in need.

Introduction

The Climate Change Framework states that the actions we need to take to reduce our CO_2 emissions and adapt the city to climate change also have the potential to improve the health and wellbeing of Manchester's residents. Equally, actions that improve our health and wellbeing can also help to tackle the climate crisis.

The Framework calls for new strategic initiatives to accelerate action and remove barriers that are limiting further action, and notes they need to be focused on the people and communities where climate action has most potential to improve health and wellbeing.

The UK's Climate Change Committee (CCC) echoes this in its 2020 report Sustainable Health Equity: Achieving Net Zero UK,[258] which gives evidence to show that climate change will lead to more unpredictable systemic shocks that will impact population health.

The effects of climate change on health and wellbeing will be cumulative, becoming more severe and unpredictable over time if left unaddressed, and they will commonly impact our most vulnerable communities first and worst. Impacts will be both direct and indirect.

Direct impacts are created by our changing climate increasing exposure to heat and cold, UV radiation, air pollution, pollen, emerging infections, and extreme weather events such as flooding and its associated water-borne diseases.

- Poor air quality kills 28,000 to 36,0000 people in the UK each year.[259]
- Heatwaves cause an average 8% increase in emergency hospital admissions on the top 5% of hottest days in the UK. For every 1°C increase in temperature over 20°C, ambulance callouts for the NHS increase by 1%.[260]
- While floodwater poses a relatively small risk of drowning, people who are unable to relocate after a flood are at risk of ill health from living in damp homes. The experience of flooding can also generate severe mental health impacts that may outlast the immediate impacts of the flood itself.

Indirect impacts of climate change on population health and health inequalities are much more complex and systemic but are increasingly being recognised in global reports[261] and include: under-nutrition related to food insecurity; increases in the price of food, water and domestic energy; increased poverty, unemployment and anxiety; respiratory illnesses from cold damp homes; and rising levels of obesity due to lack of physical activity, provision or good quality greenspace or active transport infrastructure.

Update on research and initiatives

Since publication of the Framework, Manchester Climate Change Agency (MCCA) has collaborated on the following research and initiatives:

Manchester's Marmot Health Inequalities Taskforce:

The Greater Manchester Health and Social Care Partnership commissioned the Institute of Health Equity to deliver: 'Build Back Fairer in Greater Manchester: Health Equity and Dignified Lives',[262] which was published in June 2021.

It recognises an urgent need to do things differently to build a society based on the principles of social justice; to reduce inequalities of income and wealth; to build a wellbeing economy that puts achievement of health and wellbeing at the heart of government strategy; and, notably, to build a society that responds to the climate crisis at the same time as achieving greater health equity.

It highlights that both direct and indirect impacts of climate change are a threat to health and health inequalities, and that immediate action to reduce greenhouse gas emissions can also improve health and reduce existing health inequalities.

Following this, in 2022, the Manchester Marmot Health Inequalities Task Group was established to review the report's recommendations and create a tailored action plan for the city,[263] which Manchester Climate Change Agency (MCCA) has supported.

Health and Wellbeing Advisory Group:

MCCA has worked with the Manchester Health and Wellbeing Board to establish an independent Health and Wellbeing Advisory Group[264] to support the work of Manchester's Climate Change Partnership (MCCP).

It includes representatives from Manchester Public Health Team, Manchester University NHS Foundation Trust, Manchester Local Care Organisation, Greater Manchester Mental Health NHS Foundation Trust, Manchester Population Health Team, NHS GM Integrated Care Organisation, Manchester City Council Infrastructure and Environment Team and City Policy Team and Salford University.

The Group has fed into this Update, and the Manchester Marmot Health Inequalities Task Group, and agreed to focus its efforts on developing a set of indicators to track the impact of climate change on health inequalities in Manchester, bringing together existing metrics to add new insights wherever possible.

Co-benefits of action

The systemic transitions required within cities are complex and interlinking. This creates challenges but also means that action to improve health and wellbeing can deliver additional benefits in reducing our carbon emissions, increasing the adaptive capacity of our cities and the inclusivity and sustainability of our economies.

Staying within our carbon budget

- Energy efficient, low emission housing helps to reduce fuel poverty and creates warm, dry homes that improve health and wellbeing.
- Cycling and walking/wheeling (active travel) improves air quality and health outcomes, reducing pressure on the NHS.
- Sustainable and resilient food systems help to deliver more affordable, nutritious diets and reduce food poverty.

Adaptation and resilience

- Addressing the health impacts associated with heatwaves, cold spells, storms, and flooding is part of adapting to extreme weather events and building resilience to climate change.
- Creating neighbourhoods with access to good quality green space, improves health and wellbeing and increases our resilience to climate change through nature-based solutions.

Inclusive, zero carbon and climate resilient economy

- Incorporating health and wellbeing into our measures of economic success can support more inclusive local economic growth.
- Building environmentally sustainable health care systems and facilities creates a health care system resilient to climate change that can best support the economic growth and development of the city.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Health & Wellbeing

To be delivered locally, where direct control lies in Manchester:

1. The city's health sector to work collaboratively to carry out a **vulnerability assessment** that maps at hyperlocal level where climate change will exacerbate health inequality so that action can be prioritised and targeted.
2. Manchester Climate Change Agency to work with the Health and Wellbeing Advisory Group to **develop city-scale indicators** to track and report the impacts of climate change on health inequalities.
3. Manchester City Council to incorporate health equity and climate action into its **policies and strategies** in a consistent and transparent manner and implement methods to measure their impact.
4. Manchester's Marmot Health Inequalities Taskforce to **lead implementation** of the city's action plan.
5. Manchester Climate Change Partnership (MCCP) to support partners across Manchester to **share knowledge and action** on decarbonisation and adaptation of the health sector.
6. Health sector partners to **maximise uptake of Carbon Literacy** courses and toolkits co-produced with the NHS to support climate mitigation and adaptation activities, in line with Greener NHS[265] and Delivering a Net Zero Health Service.[266]
7. **MCCP's Health and Wellbeing Advisory Group** to expand this list of recommended actions to encompass collaborative action across Greater Manchester and a clear set of asks of national government.

6.
INCLUSIVE, ZERO CARBON AND CLIMATE RESILIENT ECONOMY

6. Inclusive, zero carbon and climate resilient economy

To ensure that Manchester establishes an inclusive, zero carbon and climate resilient economy where everyone can benefit from playing an active role in decarbonising and adapting the city to the changing climate.

Update on research and initiatives

The Framework identifies several strategic actions relating to carbon literacy, green skills, and the green economy, which are updated below.

Carbon Literacy

The Carbon Literacy Project[267] was established in Manchester and is globally unique, having been recognised by the UN at COP21 in Paris as one of 100 worldwide Transformative Action Programmes.

Carbon Literacy is defined as 'An awareness of the carbon dioxide costs and impacts of everyday activities, and the ability and motivation to reduce emissions, on an individual, community and organisational basis'.

The training is a structured way to help citizens understand how climate change will affect them and to provide the knowledge and skills needed to lower their carbon footprint. It is delivered through communities, workplaces, and educational institutions with sector-specific courses and toolkits tailoring the learning to, for example, local authorities, social housing providers, universities and colleges, and the healthcare and automotive sectors.

As every job becomes a green job,[268] Carbon Literacy can help to unlock new opportunities for local people by providing the knowledge and skills that will be needed in every workplace. As part of Manchester's collective commitment to low-carbon culture, over 5,400 citizens have been trained and certified as Carbon Literate since 2012.

Green skills

Manchester's new Work and Skills Strategy[269] recognises the skills gaps in the low carbon sector and the challenges this presents to achieving our climate change goals. It also notes the opportunities presented for the local workforce, including through upskilling/reskilling. Work has begun on a green skills plan to support businesses and residents with a focus on the skills needed for retrofitting buildings and low carbon transport.

Greater Manchester's Green Economy report[270] explores this further and identifies the biggest opportunities lie where green technologies are approaching mass-adoption stage, such as electric vehicles, low carbon heating, and renewable energy; noting this will bring changes to the volume, make-up, and skill levels of hundreds of different occupations, especially in construction, manufacturing, and logistics.

Across the North West, businesses and universities are collaborating develop the UK's first regional skills plan[271] to support both younger generations and those already in work into new, green jobs as they emerge, ensuring business and industry have access to the talent they need to successfully transition to a net zero economy.

Green economy

In Greater Manchester the low carbon and environmental goods and services sector[272] includes over 3,100 companies with over 58,000 employees and sales of over £8.6bn. It grew by over 27% (by sales) in the five years between 2015/16 and 2019/20 and represents over 14% of Greater Manchester's business base (by GVA) and over 3% of total employment. This is larger than the Advanced Manufacturing, Digital, Creative, and Science, Research and Development sectors combined and outperforms a host of global cities including Milan, Portland, Copenhagen, Seattle, Stockholm, and Berlin.

The Local Government Association has estimated that by 2030 the UK will need over 690,000 jobs directly in the low carbon and renewable energy economy, with this figure rising to over 1.1m by 2050. Their interactive report: Local green jobs – accelerating a sustainable economic recovery[273] enables analysis of these figures at local authority level with sectoral breakdown.

Bee Net Zero

Business support organisations across the city region have taken a collaborative approach to make Greater Manchester the easiest place in the UK for every business to become a green business.

Bee Net Zero[274] provides support and guidance to help organisations make the transition to zero carbon, including setting out ten key steps to achieving net zero, simple actions that can be taken immediately to reduce carbon footprints, and help to find more targeted business support and funding.

The partnership includes the Greater Manchester Local Enterprise Partnership, Combined Authority, and Chamber of Commerce, The Growth Company, Business in the Community, Pro Manchester, Transport for Greater Manchester, Electricity North West, the national SME Climate Hub, and Manchester Climate Change Agency.

City Business Climate Alliance

Manchester Climate Change Agency (MCCA) and Manchester Climate Change Partnership (MCCP) are working with CDP,[275] C40 Cities,[276] and the World Business Council on Sustainable Development[277] on the City-Business Climate Alliance[278] (CBCA) initiative.

Manchester is one of eight cohort cities alongside Dallas, Durban, Lisbon, New York, Stockholm, Tel Aviv and Vancouver; and MCCA is helping to draw expertise and insight from across this partnership to support production of this Update and MCCP's activities around net zero new buildings, commercial retrofit, and setting/reporting on science-based targets.

Other policy drivers and enablers

While this Update is setting ambitious targets for action, there are a range of related policies at local, regional, and national level that are driving and enabling change of a similar magnitude and pace, including:

- The Our Manchester Industrial Strategy[279] and Greater Manchester Industrial Strategy[280] both address the need to capitalise on the employment and growth opportunities that responding to climate change will present.
- Greater Manchester's Local Skills Report and Labour Market Plan[281] recognises 'clean growth' as a frontier sector and is supported by the Green Economy Skills Intelligence report.[282]
- The UK's Ten Point Plan[283] for a green industrial revolution identifies growth sectors and targets adding up to 250,000 jobs in our low-carbon industries by 2030.

Challenges

There are significant economic, technical, institutional, societal, and regulatory challenges in creating an inclusive, zero carbon and climate resilient economy, including:

- Skills and training providers are naturally cautious about investing in skills development for 'future jobs' where the market demand is uncertain.
- Employers generally want to be able to recruit skilled staff at exactly the point they need them. However, the skills system needs time to respond to market changes.
- Development of new green technology areas like electric vehicles, low carbon heating, or nature-based solutions often outpaces the skills system.
- The growth of financial, technology, and digital companies has increased competition for STEM skills, which are needed in many low carbon roles.
- The perception of jobs in the green economy is often limited to ones that link directly to the environment and so the full range of options is not well understood.

Co-benefits of action

The systemic transitions required within cities are complex and interlinking. This creates challenges but also means that action to improve the inclusivity and sustainability of our economy can deliver additional benefits to our climate mitigation and adaptation and our health and wellbeing.

Staying within our carbon budget

- Organisations with strong climate targets can secure a competitive advantage with investors and consumers who are increasingly seeking greater accountability and transparency on climate action.
- The growing market for products and services that reduce emissions or have a lower carbon footprint enables business diversification and growth and creates opportunities for new local jobs and skills in the green economy.

Adaptation and resilience

- Organisations that address their exposure to climate risk, both 'at home' and through their global value chains, are more resilient to climate shocks and more aligned to the evolving demands of investors.
- The growing market for products and services that help us adapt to a changing climate enables business diversification and growth and creates opportunities for new local jobs and skills in the green economy.

Health and wellbeing

- Organisations that can demonstrate strong environmental, social and governance criteria have a competitive advantage in talent recruitment and retention.[284]
- The growing marketing for products and services that improve our health and tackle climate change enables business diversification and growth and creates opportunities for new local jobs and skills in the green economy.

Examples of good practice

Although the challenges are great in transitioning to a zero carbon, climate resilient city, there are many examples of good practice from within Manchester, the wider city region as well international, including:

- One Manchester[285] is creating 125 part-time and flexible jobs for unemployed people to develop skills in the green economy.
- The Low Carbon Academy has supported over 2,200 individuals across more than 1,000 businesses in Greater Manchester to become upskilled in the retrofit market.

Recommended actions

To achieve our climate goals, action needs to be taken urgently and by everyone – by government at local and national level, by institutions and organisations in the public, private and voluntary sector, and by residents and communities across the city.

These recommended actions have been co-designed with stakeholders across the city to provide clear guidance to all sectors on how they can play their full part in tackling the climate crisis. They should all be read in the context of the need for urgent action at scale.

Climate resilient economy

These actions can be summarised as follows:

1. Organisations in all sectors to set high level ambitions for decarbonising and building climate resilience into their operations and value chains, accelerating change and **stimulating demand for low carbon skills**.
2. Manchester Climate Change Partnership (MCCP) to use its collective spending power and influence, for example through including social value in procurement, to help **create local opportunities for green skills growth**.
3. Organisations to **empower employees** to support the transition to a zero carbon, climate resilient city, through initiatives like the Carbon Literacy Project.
4. **Skills providers** to support new entrants to the green economy as well as providing opportunities to upskill/reskill for those already in work, targeting assistance where it is most needed to support a just transition.
5. Education sector and skills providers to **align provision of new training with growing market need**.
6. **Education sector** to support young people to gain a better understanding of the range of opportunities and career pathways in the green economy.
7. MCCP to accelerate the climate action of its members through a **peer-to-peer learning** programme and to leverage specialist expertise from organisations across the city into **city-scale challenges**, following the blueprint of the Roadmap for Net Zero Carbon New Building.[286]

7. ENSURING A JUST TRANSITION

7. Ensuring a just transition

A core principle of the Climate Change Framework is to ensure that all of Manchester's residents are protected from the impact of climate change and that actions to help the transition to a zero carbon and climate resilient city do not have a negative impact on the most vulnerable people, ensuring the costs do≈not fall unevenly on those that are least able to afford them.

Rising cost of living

This Update to the Climate Change Framework comes at a time of economic uncertainty and significant increases to the cost of living.

For Manchester residents, we recognise that:

- High inflation is likely to reduce disposable incomes and spending power.
- More residents may be pushed into poverty, and residents already in poverty may find it significantly harder to recover.
- Residents on the fringes of eligibility for support may be amongst the worst affected.
- Nearly 20% of households are now fuel poor.
- Over 12% of United Utilities customers are accessing financial support.
- Over 11% of households are struggling with food insecurity and the number of food providers has almost doubled since 2017.

For Manchester business, we recognise that:

- Inflation has caused upwards pressure on wages, the cost of raw materials and energy, and is increasing business costs. Supply chain disruption is also contributing to price inflation.
- Decreased consumer confidence and squeezed household budgets are leading to fewer sales, particularly impacting the retail, hospitality, culture, and leisure sectors.
- A potential Real Living Wage increase is a positive ambition for the city but may put pressure on some business sectors to make that commitment and meet other inflationary pressures.

For the public and voluntary/charitable sectors in Manchester we recognise that:

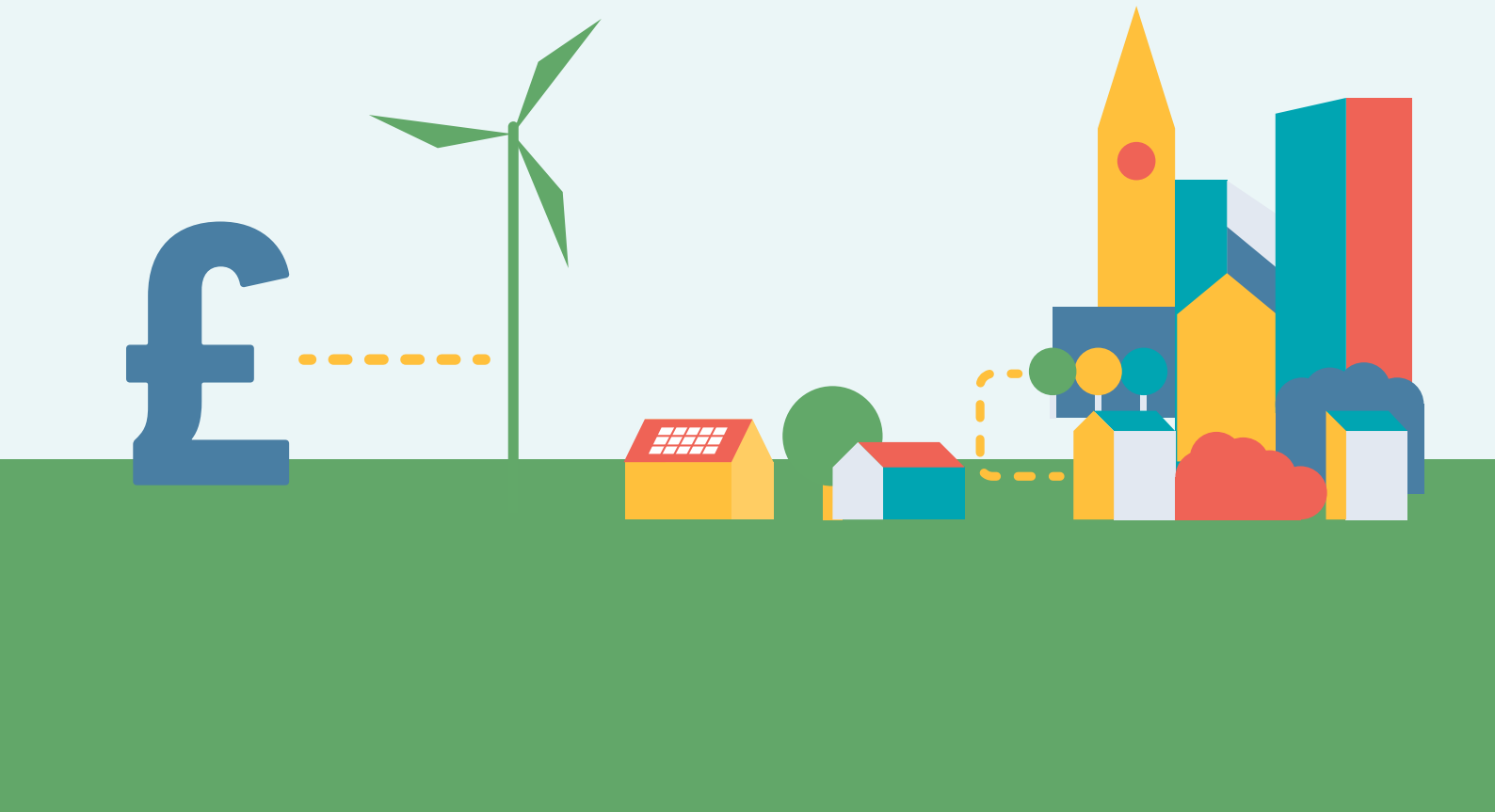
- Price inflation is affecting budgets (especially relating to fixed costs like energy) and project viability, as well as lowering the relative value of funding awards provided.
- Uncertain funding reduces the ability of organisations to plan ahead and deliver services to support residents, communities and business.

Recommendations in this Update

The recommended actions outlined in this Update reflect the latest understanding of how we can tackle both climate change and wider socioeconomic challenges, including the rising cost of living, together; ensuring we deliver multiple benefits. For example:

- Insulating properties creates warmer, healthier homes that are cheaper to heat and that create fewer greenhouse gas emissions.
- Improving the efficiency of product design and manufacturing processes reduces the cost of material and energy inputs to industry.
- Transitioning to a zero carbon, climate resilient city creates opportunities for innovation, diversification and growth for business, and opportunities for new jobs and skills for local people.

8.
FINANCING THE TRANSITION



8. Financing the transition

The cost of the transition to a zero carbon and climate-resilient city, is significant. Manchester's Local Area Energy Plan[287] estimates the cost to decarbonise Manchester's local energy system is over £13bn (£4bn by 2030).

Unlocking the scale of finance needed to make our cities zero carbon and climate resilient, in a way that works for everyone, will be key to accelerating progress and achieving the ambitious climate change targets that Manchester has set.

The challenge

The City Investment Analysis Report[288] from the UK Cities Climate Investment Commission (now 3Ci) describes the challenge in this way:

The transition of our existing carbon intensive systems to net zero will require significant up-front capital and presents unique challenges for UK cities.

- **Scale:** it is estimated that around £200bn will be needed to achieve the zero carbon pledges made by the UK's Core Cities and London Councils.
- **Urgency:** implementation must accelerate as soon as possible to meet the targeted zero carbon deadlines.
- **Complexity:** the systemic transitions required within cities are complex and interlinked and are unlikely to be achieved successfully through individual decision-making.

The quantity of capital that must be deployed is beyond the reach of public finances and, if the funding gap is met only by citizens and businesses, there will be damaging impacts on the poorest sections of society, which is a counter to the intended just transition.

Private sector finance and reporting

Private sector finance is critical in addressing climate change and the scale of private finance available is sufficient to support substantial progress towards our zero carbon ambitions. However, there are significant hurdles to overcome and new approaches must be developed to unlock this resource.

This may include bundling climate measures together, coordinating delivery with multiple stakeholders and blending finance from different sources, for example grant-based funding and returns-based funding.

'Financing Green'[289] creates huge opportunities for UK financial institutions.[290] However, the mechanisms to drive investment into green outcomes are new and need to be developed at scale to produce a rate of return that is attractive.

Financial benefits must be aggregated to support repayable finance and improvements in fuel poverty, health outcomes and carbon emissions must be evaluated and harnessed together in a precise financial framework.

Standardisation of reporting, governance, billing, and legal structures will be required to encourage private investor confidence and allow aggregation for scaled investment.[291]

Despite these challenges, the city scale presents an attractive and substantial proposition for investors to bring together projects at sufficient scale, volume, and predictability.

The Green Finance Institute, The UK Infrastructure Bank and 3Ci[292] are working to support local areas, including Manchester, to develop investable pipelines of climate activity and the new financial mechanisms that will be needed to deploy them.

Gold standard for zero carbon investment

In its second phase of work, 3Ci and the Connected Places Catapult[293] are working in partnership with local authorities, industry, and the investment community to develop a gold standard for zero carbon investment, exploring the skills, capacities, and infrastructure that local areas need to develop projects and attract private finance.

Unlocking the scale of finance needed to make our cities zero carbon and climate resilient, in a way that works for everyone, will be key to accelerating progress and achieving the ambitious climate change targets that Manchester has set.

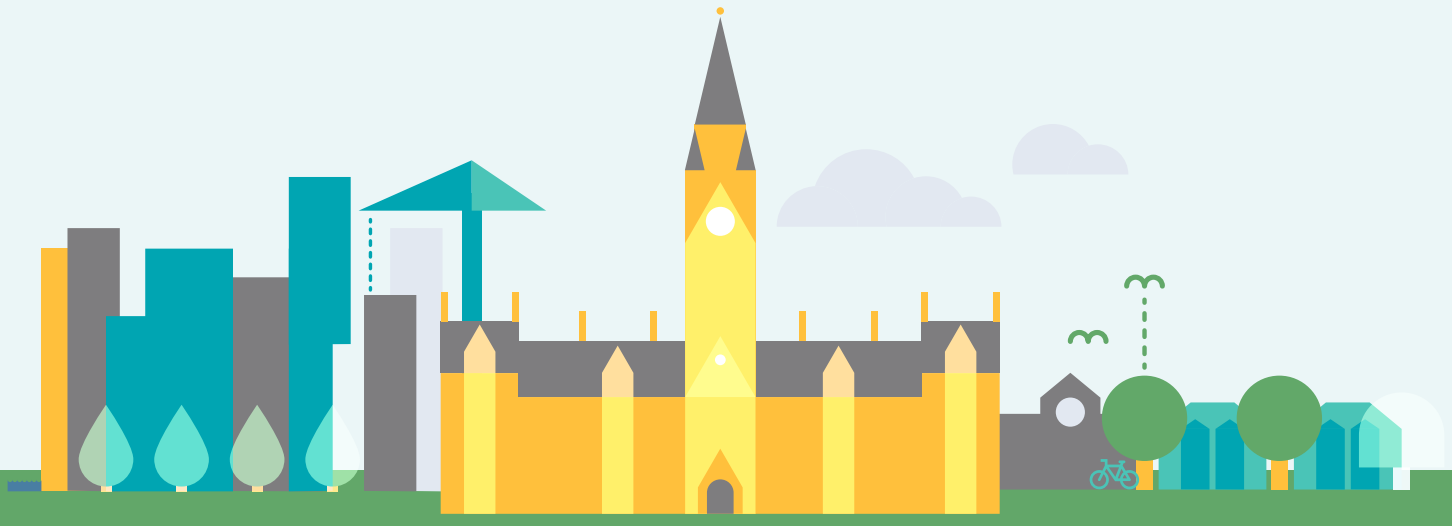
Manchester Climate Change Agency (MCCA) secured Manchester's ongoing engagement with this work, with Manchester being one of three focus cities in this second phase. The outcomes will help the city to develop robust business cases and investment models that give the confidence, scale and longevity needed by the investor community[294] to unlock private finance at scale into local climate action. But more work is needed.

Greening Finance

Alongside this, the government's Green Finance Strategy[295] and 'Greening Finance: a Roadmap to Sustainable Investing'[296] also recognise the role of the financial sector in delivering climate and environmental objectives, by setting out a series of steps for businesses and investors to factor climate risk into mainstream financial decision making:

- To green portfolios through aligning activity to the UK Green Taxonomy.[297]
- To disclose data on the risks and vulnerability climate change poses to business through the Taskforce on Financial-related Climate Disclosures (TCFD).[298]
- To plan for the transition to a zero carbon future through publishing Transition Plans.[299]

9.
THE ROLE OF LOCAL ACTION



9. The role of local action

The UK's Climate Change Committee addressed the role of local action in its 2020 report 'Local authorities and the sixth carbon budget'.[300] It explains that action to reduce the country's emissions has, to date, largely been achieved through national policy to phase out fossil fuels in electricity production.

This decarbonisation of the grid has required a small number of actors supported by local supply chains in specific places. However, many of the urgent changes and decisions that are needed now to reduce our emissions and adapt to climate change, have a strong local dimension. Decarbonising buildings, transport, and industry, and building our resilience to climate risk all need delivery at a local scale.

To support this, local authorities have a key role to play. Typically, they are responsible for between 2% and 5% of their area's emissions, through delivery of their services and operations, management of their own estate, and procurement. However, they have influence over about a third of local area emissions through their planning and transport policies; housing, regeneration, and economic development activities; education and skills services; community involvement; and partnership working and leadership role.

In addition to these local powers, Greater Manchester Combined Authority holds devolved responsibilities including for health and social care commissioning, and aspects of justice and employment policy.[301]

Collectively, these are powerful levers, but they are not sufficient to deliver on Manchester's climate ambitions due to the existence of policy and funding barriers, and gaps in key powers that prevent systems-scale or holistic approaches that will transform whole places, not simply seek emissions reductions in separate sectors.

National government needs to remove these barriers and work at pace to support local delivery of climate action, including by increasing local capacity; making funding more certain and longer-term; streamlining policy across departments; and ensuring that Greater Manchester's 'trailblazer' devolution deal provides the required powers and funding for strategic planning and operational delivery of both mitigation and adaptation measures at scale, and at the pace needed to meet the 2038 zero carbon target (ahead of the national commitment of 2050), in a way that meets local priorities.

The need for local-national co-ordination, and greater local action, is expanded upon in the following recent reports:

- The UK government's Net Zero Strategy: Build Back Greener[302]
- The National Audit Office's Achieving Net Zero[303]
- UK100's Power Shift: Research into Local Authority Powers Relating to Climate Action,[304] Local Net Zero Delivery Report: Local Powers,[305] and research into a National-Local Net Zero Delivery Framework[306]

In addition to local and city-region authorities, the individuals, businesses, and organisations in a local area have a key role to play in tackling the climate crisis as over half of the emissions cuts needed in the UK are dependent on concerted action by all of us.

10. ACTIONS FOR RESIDENTS AND BUSINESS

10. Actions for residents and business

To realise our potential to become a leading city for action on climate change we need every resident and organisation to take urgent and sustained action.

To support this, the Climate Change Framework published in 2020 proposed 15 actions[307] to help people get started, take action, inspire and influence others, and ask for help.

The 2022 Update has involved multiple conversations with residents and business to understand more about the actions that are being taken, the barriers that are being encountered, and the support that is needed to do more.

These conversations have informed the Recommended Actions contained within this Update and will continue after its publication.

Residents

A recent poll by the UN Development Programme[308] found that two-thirds of people across the world say climate change is a global emergency, with that figure increasing to over 80% in the UK.

The UK Government's public attitudes tracker in Spring 2022 found that 84% of people are concerned about climate change[309] and the Office for National Statistics survey in May 2022 found that 62% of adults in Great Britain expect rising UK temperatures will directly affect them by 2030.[310]

A small survey was carried out in Manchester in Autumn 2021 to support this Update and echoes these results:

- 84% of people said they were worried about the effect of climate change on their home, work, or family.
- 57% of people said they were worried about the future impact of climate change in their local area.

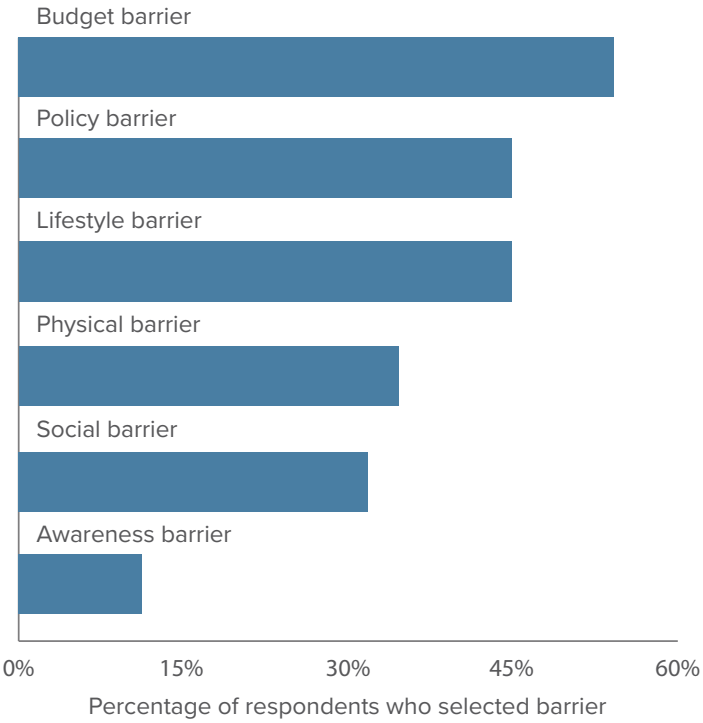
The results also align with those from the consultation for the Our Manchester Strategy refresh, carried out in summer 2020, which received 3,800 responses and reset the city's goals to include creating a zero carbon city as one of its five top priorities.

Our 2021 survey went beyond attitudes to climate change and asked about actions that are being taken against the priority areas in the Framework. It found that more than half of respondents had switched to renewable energy, were driving less and cycling or walking more, buying fewer clothes, trying not to waste food, recycling, and talking to others about climate change. Less than 10% of respondents had installed solar panels or had an electric or hybrid car. Full details of the survey results can be found in the Anthesis evidence base.[311]

The 2021 survey also explored the barriers to action for residents based on the following commonly cited issues:

- **Technical awareness:** despite the increased general awareness of climate change, there is a lack of knowledge of the specific changes that need to be made.
- **Lifestyle:** finding the time to fit climate action in with existing obligations and family routines, and how easy it is to accommodate within everyday life.
- **Budget:** the actual cost of change can limit action, as can the perceived cost of change.
- **Policy:** local, regional, and national policies can act as a barrier if they do not support individuals to act.
- **Physical:** lack of infrastructure and facilities, or access to a technology, can prevent individual action.
- **Social:** includes lack of buy-in from the community, a perceived lack of influence and the belief that individual action will not make an impact.

The survey responses show how each these of barriers is affecting action in Manchester:



These barriers were fed into the evidence base[312] for this Update, and Anthesis produced an expanded list of actions for residents, which will be explored in practice with local communities by Manchester Climate Change Agency and the Council's Neighbourhoods Team.

Business

A survey by the British Chamber of Commerce and Drax in 2022 reported that 68% of respondents found COVID-19 and lockdown restrictions have made them more environmentally conscious.[313] A Business Leader's survey of small and medium-sized enterprise (SME) owners, also in 2022, showed even stronger support for climate action with 91% saying they believe it's important to be sustainable.[314]

Business has a key role to play in helping to tackle the climate crisis, including:

Scale of emissions reduction potential: Companies can enact emissions reduction activities, which will not only reduce their own emissions, but also support Manchester as a city to reduce its emissions.

Innovation: Businesses can trial new technologies and business models. By investing in innovative solutions, we can test new models and work to scale them across the city.

Influence customers, clients, and employees: Companies can influence behaviour change among the people and networks they engage to encourage others to act.

Influence supply chain: Using their purchasing power, companies can influence their local and global supply chains to take meaningful climate action by reducing emissions and increasing resilience.

Develop local solutions: Companies can provide new solutions to local issues by investing and creating new products and services that respond to local need.

Create local jobs: Companies can grow through embedding resource efficiency and circular economy practices, and by diversifying into the green technologies and services sector, creating new local jobs that will be more resilience to future climate changes.

However, like residents, businesses face barriers to making these changes, including:

- **Lack of finance:** The British Chamber of Commerce found that lack of finance was one of the top barriers to climate action;[315] although this is sometimes a perceived rather than an actual barrier.
- **Technical understanding:** Without a detailed understanding of their emissions, and the risks and opportunities that climate action offers, companies struggle to understand where to prioritise their reduction strategies and investments.[316]
- **Policy uncertainty:** Companies need clear regulation and a stable policy environment to help drive innovation and the growth of new markets.[317]
- **Delivery and skills:** Companies need the right skills and talent to deliver emissions reductions and build resilience, and there is a shortage of supply across sectors.[318]

These opportunities and barriers, along with feedback from a small survey and a workshop with large companies in 2021, were fed into the evidence base[319] for this Update, and Anthesis produced an expanded list of actions for business, which will be explored in practice with local companies by Manchester Climate Change Agency and our Bee Net Zero[320] partners.

11. STAKEHOLDER ENGAGEMENT

11. Engagement with stakeholders

Manchester Climate Change Agency (MCCA) has engaged with numerous stakeholders through a variety of channels over the last twelve months to ensure a diverse range of input has been incorporated into the recommended actions in this 2022 Update of the Framework.

Engagement with residents and businesses

Manchester's first Climate Assembly was held in autumn 2021 to feed into this Update and was supported by the Zero Carbon Cities project.[321]

The Assembly workshops resulted in creation of a 'Mandate on Climate Action'[322] which was taken to the COP26 Conference in Glasgow in November 2021.

A survey of residents and businesses was also carried out in autumn 2021 to understand:

- The types of positive climate action that are already being taken in the priority areas in the Framework – buildings, energy, transport, the things we buy and things we throw away, food, and green infrastructure and nature-based solutions.
- The types of barriers being encountered when trying to adopt more sustainable behaviours and the kind of support that may be required to overcome these challenges, including practical and financial assistance, shifts in local and national policy, and a change in public perception.

In addition, detailed conversations with residents have been carried out via MCCA's In Our Nature community engagement programme, which have involved understanding the climate priorities of several diverse communities across the city.

MCCA is also part of a coalition of business support organisations operating across Greater Manchester, including the Chamber of Commerce, Business Growth Hub, Business in the Community and Pro Manchester, who engage with hundreds of companies, particularly small and medium-sized enterprises, on a regular basis and have a detailed understanding of the challenges and opportunities that climate change provides. To expand this understanding, MCCA held a workshop with large businesses in Manchester in summer 2021.

The results of all these conversations have showed that the residents and businesses of Manchester want to take action to tackle climate change, are already doing much to reduce their carbon footprints and need help to do more.

They recognise that their ability to do more will be enhanced by more ambitious local and national policy and by increased and targeted investment in sustainable infrastructure such as active travel networks. They also see the benefits of climate action in terms of reduced energy bills, healthier lifestyles, new business opportunities and access to more greenspace.

All these insights have fed into the recommended actions within the Update.

Manchester Climate Change Partnership

Manchester Climate Change Partnership (MCCP) is a cross-sectoral partnership of organisations that are engaged in helping the city become zero carbon and climate resilient. It includes representation from across the city's communities and its private, public, health, faith, culture, sport, property, social housing, and academic sectors.

As such, the Partnership has brought a diverse and inclusive range of voices to the Update and have fed into its design and delivery on a regular basis including in July, September, and November 2021; and January, March, May and July 2022.

In addition, MCCP has several Advisory Groups[323] that have provided expert input and academic challenge to the Update including the:

- **Zero Carbon Advisory Group** – includes the University of Manchester's Tyndall Centre and Sustainable Consumption Institute, Manchester Metropolitan University, Friends of the Earth and Anthesis.
- **Adaptation and Resilience Advisory Group** – includes the University of Manchester, Manchester Metropolitan University, the Greater Manchester Resilience Unit, the Environment Agency, and Groundwork Manchester.

- **Health and Wellbeing Advisory Group** – includes the Manchester Public Health Team, Manchester University NHS Foundation Trust, Manchester Local Care Organisation, Greater Manchester Mental Health NHS Foundation Trust, Manchester Population Health Team, NHS GM Integrated Care Organisation, Manchester City Council Infrastructure and Environment Team and City Policy Team and Salford University.

Wider stakeholder engagement

MCCA has engaged with a wide variety of stakeholders throughout development of this Update, to ensure technical expertise and input from many sectors.

This includes engagement with:

- Manchester Climate Change Youth Board[324]
- Manchester Housing Providers Partnership
- Manchester Strategic Housing Board
- Manchester Health and Wellbeing Board
- Manchester's Marmot Health Inequalities Taskforce
- Manchester Food Board
- Manchester Zero Carbon Skills Group
- Manchester Zero Carbon Communities Group (In Our Nature delivery partners)
- Manchester City Council:
  - Council Leader, Executive Member for Environment and Climate Change and Senior Management Team
  - Environment and Climate Change Scrutiny Committee
  - Zero Carbon Coordination Group
  - Officers leading on Work and Skills, Estates, Local Area Energy Planning, Planning, City Centre Regeneration, Growth and Development, Neighbourhoods, City Policy, Housing, Highways, Transport, Procurement, and Green and Blue Infrastructure
- Transport for Greater Manchester (TfGM)
- Greater Manchester Combined Authority (GMCA)
- Electricity North West Ltd
- UK Core Cities Low Carbon Group
- City Business Climate Alliance partners – including C40, CDP and the World Business Council for Sustainable Development

Conversation on the 2022 Update

Manchester Climate Change Agency launched a short 'Climate Change Conversation' in August 2022 to raise awareness that the Update to the Framework was coming, share some of its headline messages and capture some new insights on attitudes to climate change, building on those detailed above.

This included a simple animation[325] to explain key messages in the Update and a short survey of nine questions[326] to assess respondents' perception of Manchester's climate ambition, their understanding of the co-benefits of climate action, their commitment to take no/low cost climate action themselves, and whether they knew where to get more support.

Initial findings from over 230 responses show:

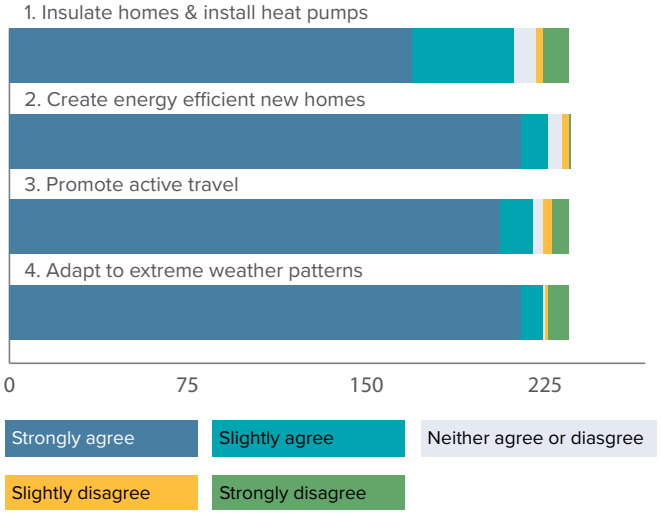
Ambition:

- 61% 'strongly' (29%) or 'slightly' (32%) agree that Manchester's climate change targets are ambitious enough.

Co-benefits:

1. 71% 'strongly agreed' that '**insulating homes** and **installing electric heat pumps** makes houses warmer in winter, cheaper to heat and saves carbon'.
2. 91% 'strongly agreed' that '**ensuring new homes are as energy efficient as possible** makes them cheaper to heat and cool, and it saves carbon'.
3. 87% 'strongly agreed' that '**encouraging people to walk, cycle and use public transport** (also known as active travel) more, especially for short journeys, is good for health and wellbeing, and saves carbon'.
4. 91% 'strongly agreed' that 'climate change is impacting us now, with **extreme temperatures and flooding**, so urgent action is needed'.

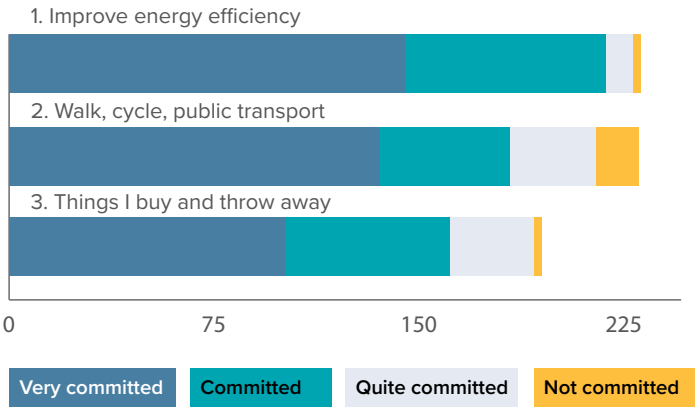
Understanding the co-benefits of climate action:



Personal commitment:

1. 94% were 'very committed or 'committed' to i**mproving energy efficiency** by switching off appliances or equipment when not in use.
2. 79% were 'very committed' or 'committed' to **walk, cycle and use public transport** instead of driving wherever possible.
3. 83% were 'very committed' or 'committed' to think about the **things they buy and the food they eat to help reduce waste**.

Personal commitment to climate action:



Getting support:

- 54% of respondents said they 'strongly' or 'slightly' **knew where to get support** to help them take positive climate action.

Additional comments:

Respondents were given the opportunity to provide additional comments after the survey and 150 were received:

- 37 on integrated transport
- 25 on local action from business and the Council
- 23 on support for home insulation and retrofit
- 21 on support to communities
- 15 on new green spaces and protection of existing ones
- 8 on recycling
- 8 on systemic change
- 7 on the Clean Air Plan
- 6 on plant-based diets and shopping local

An initial review of the specific calls made in these comments identifies that the Recommended Actions in this Update are well aligned to the feedback and provide broad coverage of the individual asks.

Further assessment will be carried out as more responses are received and the survey will remain open as the Update is published and more widely promoted. All findings will be published by Manchester Climate Change Agency on www.manchesterclimate.com

12.
NEXT STEPS

12. Next steps

Manchester Climate Change Partnership (MCCP) and Manchester Climate Change Agency (MCCA) will work together to:

- Promote the 2022 Update of the Framework to raise awareness of the scale and urgency of action needed if Manchester is to meet its climate change goals.
- Champion action that supports delivery of the targets and recommendations contained in this Update.
- Include a wider diversity of voices and perspectives in Manchester's climate conversation and positive action.
- Expand engagement in climate action through convening and supporting new programmes and initiatives.
- Work with partners outside the city to ensure Manchester has access to the latest best practice in climate finance, policy, technology, and practical delivery.
- Position Manchester as a leader on climate action in the UK and internationally.

In addition, MCCP has asked MCCA to:

- Assess the relative impact of the recommendations in the Update, with specific focus on those over which Manchester has direct control. While the targets relating to direct emissions give a clear indication of priority action, it has been identified that additional insights into the level of impact, cost, ease of implementation and timeframe needed would help to catalyse action and prioritise often limited resources.
- Explore options for tracking progress against the targets and recommendations made in the Update. While acknowledging that data is not available for all measures, and that when it is available it is often time-lagged, incomplete and incompatible with other data, a more granular monitoring of progress would help to trigger corrective action as well as amplify success.
- Enhance the city's reporting of climate action, building on the existing Annual Reports[327] and the targets and recommendations in this Update, to more regularly and in more granular detail highlight the progress being made towards the city's goals for climate change mitigation and adaptation.

Members of the Partnership and its independent Advisory Groups will support these actions.

13. ACKNOWLEDGEMENTS

13. Acknowledgements

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- The Zero Carbon Cities project, funded by the EU's URBACT initiative and administered by Manchester City Council.
- Anthesis.
- Members of Manchester's Climate Change Partnership (MCCP) – listed in the Foreword of this report.
- MCCP's Zero Carbon Advisory Group members: the Tyndall Centre for Climate Research and the Sustainable Consumption Institute at the University of Manchester, Manchester Metropolitan University, Anthesis and Friends of the Earth Manchester.
- MCCP's Adaptation and Resilience Advisory Group members: Manchester Metropolitan University, the University of Manchester, Greater Manchester Resilience Unit, Greater Manchester Combined Authority Environment Team, Environment Agency and Groundwork Manchester.
- MCCP's Health and Wellbeing Advisory Group members: Manchester Care and Commissioning Service, Manchester Public Health, Manchester University NHS Foundation Trust, NHS Greater Manchester Integrated Care, Manchester City Council, and Salford University.
- Manchester City Council's Leader, Cllr Bev Craig, and Exec Member for Environment and Climate Change, Cllr Tracey Rawlins.
- Manchester City Council's Zero Carbon Coordination Group, Zero Carbon Team, and Zero Carbon Skills Group.
- Greater Manchester Combined Authority and Transport for Greater Manchester.
- Manchester's Strategic Housing Board and Housing Providers Partnership.
- Manchester's Food Board.
- City Business Climate Alliance partners – CDP, C40 and the WBCSD.
- Creative Concern.

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MANCHESTER CLIMATE CHANGE FRAMEWORK

(2020-25) | 2022 UPDATE

MANCHESTER CLIMATE CHANGE PARTNERSHIP

Produced by

MANCHESTER CLIMATE CHANGE AGENCY