Transformation, adaptation &
competitive advantage.

THE GREATER MANCHESTER CLIMATE STRATEGY 2011-2020

What does Greater Manchester's 2020 future look like?

We will make a rapid transition to a low carbon economy.

Our collective carbon emissions will have been reduced by 48%.

We will be prepared for and actively adapting to a rapidly changing climate.

'Carbon literacy' will have become embedded into the culture of our organisations, lifestyles and behaviours.

Foreword

When we set out our future direction in the Greater Manchester Strategy with its vision of 'prosperity for all', we recognised the importance of developing a low carbon economy as one of the key elements of our plans.

This Climate Change Strategy explores this aspect of our future in more detail. It sets out how we can take up the opportunities to be created in transforming buildings, energy and transport networks, how we can fulfill our responsibility to protect and benefit future generations, and what we need to achieve over the next ten years to bring this transformation about.

We have already made a start. The number of low carbon projects in Greater Manchester is impressive and growing rapidly: and we know that it is important that our plans for Greater Manchester provide better leadership and co-ordination with those actions being undertaken in each District, with the numerous initiatives being delivered by a range of organisations and supporting activities in neighbourhoods and what individual households.

Our vision of 'prosperity for all' incorporates a sustainable quality environment; energy efficient homes, green buildings and transport that are less dependant on fossil fuels; jobs, innovation and enterprise in smart and green technologies; vulnerable communities and businesses that are well protected from the risk of floods and drought; everyone better engaged with the value and productivity of our green spaces and waterways.

This Strategy outlines how we intend to achieve this, so everyone can realise the benefits of Greater Manchester becoming a world leader in the new green economy.

Lord Peter Smith
Chair, AGMA

Introduction

Addressing the challenges and opportunities presented by climate change is the biggest issue of our time. It doesn't recognise boundaries between cities and countries, its changes are complex and taking place over decades – timescales that stretch humankind's ability to understand, to plan and to act.

But plan and act we must – to seize the opportunity to ensure future prosperity and to maintain the quality of the global and local environment upon which all future generations will depend. This Strategy is the first climate change plan for all of Greater Manchester. It creates a common framework to provide direction and co-ordination for plans and programmes already in place at Greater Manchester and district level, linking them to all the priorities in the Greater Manchester Strategy.

And it is a plan for action. It sets out the strategic actions we need to take – on buildings, on energy and transport, on the natural environment and on patterns of consumption - it provides the context for action across all these themes and at every level. Households, neighbourhoods, businesses, Local Authorities and the Greater Manchester Combined Authority – we all have a part to play. We will translate the Strategy's aims into implementation plans and take steps to monitor both our actions and their impact.

Leading and co-ordinating action on climate change is the focus of the work of AGMA's Environment Commission and this Strategy maps out the scale and scope of this work from now until 2020. This will be a decade of transformation and opportunity and we look forward to working with everyone in Greater Manchester in achieving the objectives set out here.

Councillor Dave Goddard
Chair, Environment Commission

PART 1: STRATEGY, PURPOSE & OBJECTIVES

1. The only future that counts

Greater Manchester has been called the 'city of change' and today, it is preparing itself for a markedly different tomorrow. Our reputation, worldwide, was shaped from coal and steam and the utilisation of natural resources, now the world's first industrial city is marking out a more sustainable path for its future. The price of carbon is set to challenge the price of oil as our primary economic barometer. Our resilience in the face of climate change will be critical for our health and prosperity.

We know that the nations and cities that move swiftly to change their culture and develop the technologies required to reduce carbon emissions will be more competitive, less vulnerable and better prepared. They also have a responsibility to deliver a more sustainable, low carbon future.

That future is one in which cities and neighbourhoods work in greater harmony with natural systems, where homes and businesses create as well as consume energy, where electric vehicles and public transport are the transport of choice, buildings and services are highly efficient, where streets and public spaces follow a greener design plan, so our urban nature can be cool and cope better with hotter, more changeable weather.

This is Greater Manchester's next major challenge. Across a little less than a generation, the city has already been transformed and regenerated through an impressive array of public and private sector endeavours, its natural heritage almost fully recovered from the blight of its industrial past. Our economy has diversified away from its original reliance on heavy industries and is flourishing in other sectors such as media, finance, sports and the creative arts. Greater Manchester is the most vibrant and productive contributor to the UK economy outside London and the South East. Now we have to become a global leader in the most important emerging market of all; the low carbon economy – to become a global hub for development, technology and cultural change, proficient in the design, production, and use of the tools required for reducing global emissions.

A clear vision and determined leadership are required to achieve this change. The Association of Greater Manchester Authorities (AGMA), our Local Enterprise Partnership (LEP), the Greater Manchester Combined Authority (GMCA) and our ten district Councils will drive our low carbon future alongside countless partners from all sectors. Their resolve will be based on the firm belief that we can deliver, in the face of the threat of climate change, greater prosperity, resilience and an improved quality of life for all our residents and businesses. This is the future we must secure; the only future that counts.

2. Delivering ‘prosperity for all’

‘By 2020, the Manchester city region will have pioneered a new model for sustainable economic growth based around a more connected, talented and greener city region where the prosperity secured is enjoyed by the many and not the few.’

This is the vision of the Greater Manchester Strategy (GMS), the plan that sets our direction of travel and priority actions to 2020. The vision is of prosperity for all, rooted in our culture of enterprise and the regeneration we have achieved in recent years. Among its key priorities, it emphasises the interdependence between economic growth, future prosperity and the quality of the local and global environment.

Two of the core principles in the GMS state that ‘We will be known for our good quality of life, our low carbon economy and our commitment to sustainable development.’ and ‘We will create a city region where every neighbourhood and every borough can contribute to our shared sustainable future.’ The Strategy also states that ‘A timely shift to a low carbon economy and the challenge of adapting to a rapidly changing climate both offer opportunities to the city region. Conversely, failure to cut emissions and adapt to climate change will fundamentally undermine our economic viability and success.’

The creation of our low carbon economy depends upon understanding and maintaining a sustainable environment. Achievement will involve greening existing businesses and creating new ones, replacing the activities that have generated the wealth in the past with new economic activity. It will entail further growth in the technological, knowledge and cultural economies, and the development of new skills and strong supply networks. The low carbon and environmental goods sector for Greater Manchester, measured in 2008/9, was already worth £4.4billion, supporting 34,000 jobs and projected to grow at more than 4% per year.

The vision we set out in the Greater Manchester Strategy is based on a detailed economic assessment, the Manchester Independent Economic Review (MIER). A subsequent ‘Mini Stern’ report for Greater Manchester clearly revealed the economic benefits of tackling climate change.

Our future plans, such as a new Spatial Strategy, an Energy Plan and our Local Transport Plan will all reflect this opportunity, detail how the future may be realised and ensure that our shared approach to the global challenge of climate change, outlined on these pages, makes sense at this spatial scale, as well as in each District, more locally in each of our neighbourhoods, in every business and in the lives of families and individuals.

The global market value of the low carbon environmental goods and services sector was measured at £3,046 billion in 2007/8. Asia accounts for 38% of this total, Europe 27%, and the Americas 30%. Globally, traditional Environmental activities account for £657 billion (21.6% of the global total),

Renewable Energy for £940 billion (30.9%) and the Emerging Low Carbon activities for £1449 billion, or 47.5%.[1]

3. City leadership on climate change

Home to half the world's population and growing rapidly, cities consume over two-thirds of the world's energy and account for more than 70% of global CO_2[2] emissions. And, in cities, the effects of climate change will be keenly felt: heat-trapping urban landscapes can raise temperatures and lower air quality through the "urban heat island effect'. Cities however, are well equipped to deal with these challenges, by harnessing cultural, political and economic leadership. they can adopt bold steps to reduce greenhouse gas emissions that others may follow.

Manchester is one of 2,600 signatories in Europe that has signed up to the Covenant of Mayors, committing themselves to exceed the EU's 20% target for CO_2 reductions; more than a 1000 US cities have made a similar pledge. All these cities recognise that the climate science is now irrefutable: the Earth's climate is changing because of increases in greenhouse gases in the atmosphere, mostly caused by human activity. Through energy use, waste and deforestation we have changed the delicate carbon balance of the planet.

Our collective future is dependant on a global effort to reduce CO_2 emissions, and on local efforts to adapt to a changing climate: the opportunity to maintain a high quality of life can only be taken by developing a low carbon economy and by learning to live differently – within the capacity of our environment's ability to support us and all of nature. For us in Greater Manchester, this brings us full circle: the world's first industrial city, original and modern, was a leader in the industrial revolution that began the cycle of human technology increasing greenhouse gases. Now we need to be leaders in the carbon revolution.

From the breakthrough 1992 Earth Summit in Rio, through 1997's Kyoto Protocol, to the EU's own Emissions Trading Scheme, international efforts on climate change have met with limited success. In spite of this, the UK has been adopting a leading role, not least through the introduction of our Climate Change Act in 2008, an international first; this sets a target to reduce CO_2 emissions by a minimum of 80% by 2050, sets legally binding carbon budgets and establishes a National Climate Change Risk Assessment process. The Low Carbon Transition Plan, published in 2009 set out how the UK will deliver these emission cuts required through annual carbon 'budgets'. The most recent of these, agreed in 2011, sets a 50% reduction by 2025.

In Greater Manchester, we have recognised that this is a time of change and opportunity: a period of transition which we can shape in line with our vision of improving our city as an effective and powerful economic area, with prosperity

[1] Source: Low Carbon and Environmental Goods and Services: an industry analysis BERR 2009

[2] The background to this strategy utilises data on emissions expressed as CO_2. Where, in the strategy we have used the term carbon, this is used as shorthand for CO_2.

for all and sustainability for future generations. We have established our own Environment Commission with a role in both AGMA and the Combined Authority to guide this agenda.

We have also made a start on delivering programmes of activity – establishing a renewables-powered light rail system in Metrolink, creating new low carbon buildings at the heart of our regeneration, putting in place a sustainable solution to an annual 1.1 m tonnes of municipal waste, valuing our green spaces – but we know we now need to grow our understanding of environmental capacities, possibilities and technologies, further exploit our strengths in innovation and enterprise and translate the challenges of climate change into the development of a low carbon economy that benefits every neighbourhood, business and household.

4. Our shared carbon footprint

Key to our success is to develop and maintain an adequate and up to date understanding of where and how we are generating carbon emissions so that we can chart our progress and prioritise our actions. Our approach will be to use and follow the development of the national carbon inventory which currently focuses primarily on direct emissions from fuel use and power generation.

This enables us to be consistent with national and international carbon budgeting, and more easily compare progress with other cities across the globe. However, we are aware that this does not currently include all carbon emissions, especially those relating to aviation and shipping, and the embodied emissions in the materials we use in our buildings, infrastructure, supply chains and services; neither does it account for changes to our landscape.

Estimates show that exported goods accounts for 25% of global and this is growing rapidly, by 2025 it is predicted that net emissions imports to UK will account for 50% of the UK's consumption emissions. Actions within this strategy recognise the importance of acting upon this wider scope of emissions, and as robust information and methodologies are agreed, these will be progressively included in our carbon reporting.

According to the most up to date measurements from the Department for Energy & Climate Change (DECC) total direct emissions in Greater Manchester during 2005 (the first year this data was available) amounted to 18.2 million tonnes of CO_2. Indicative figures for 2008 suggest that our emissions have fallen to approximately 17.5m tonnes, giving an average, of 7.1 tonnes per person[3]. This is lower than the average national figure of 8.7 tonnes per person. There has been a recent downturn in emissions across Europe by an average of 6%, a short-term impact related to economic conditions, much of which may have been offset by the exporting of production: there are also signs that emissions have begun to rise back to the business as usual level.

[3] Our Strategy focuses on absolute emissions targets rather than per capita targets because the latter are subject to fluctuations in population.

Figure1 below shows how this figure is distributed between Districts across GM.

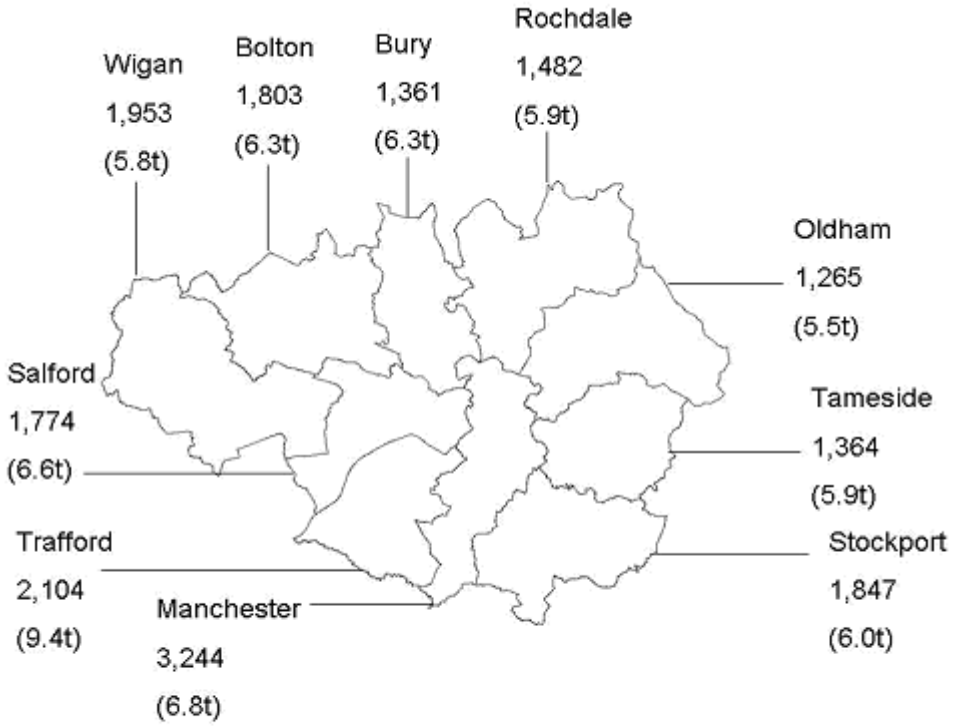

Figure 1 - GM Emissions by LA area, taken from DECC Full Local CO2 emission estimates 2005 expressed in 000s of tonnes (kt) ***Numbers in brackets represent emissions as tonnes per resident***

The consumption of electricity accounts for 36% of our direct carbon emissions, a further 33% comes through the consumption of gas and 25% through use of petrol and diesel road transport fuel. This means that nearly all of our 'direct'[4] carbon emissions arise from buildings, energy and transport, giving us immediate priority areas for action.

[4] Note that this means Scope 1 and Scope 2 emissions

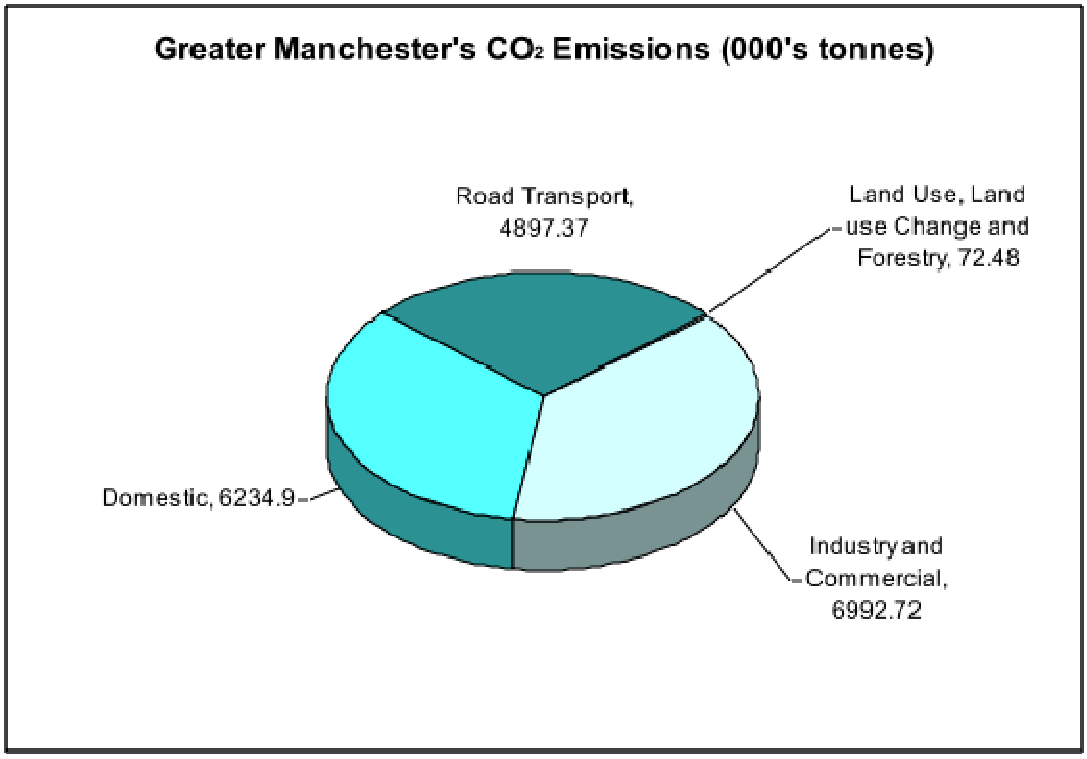

Figure 2 - Greater Manchester's Emissions by Sector (DECC Full Local CO_2 emission estimates 2005)

The move to include a wider scope of 'embodied' emissions has been started through work already undertaken by the North West Sustainable Consumption and Production Plan and in business programmes such as ENWORKS: it will be of increasing importance as the impacts of 'outsourcing' emissions through imported goods and services are better understood.

Indicative estimates show that when we incorporate these embodied emissions, including those related to imported products and materials the total carbon footprint of Greater Manchester may be nearer 15 tonnes per capita rather than the 7.1 through direct emissions. The practical impact of this on our strategy is that our approach to sustainable consumption will be of critical importance and that we need to develop the ability to understand, measure and manage the aggregate value of Greater Manchester's 'carbon balance sheet' including outsourced materials and services and the existing carbon 'sinks' of our peatlands and woodlands.

5. Greater Manchester – the state of play

We have already made a start, with significant local achievements to build on. New low carbon buildings, renewable-powered trams and urban woodlands are well-established parts of our approach to regeneration; micro-generation plants using solar and wind, hydro and waste have begun to appear in our neighbourhoods; alternative fuelled buses are in use, car clubs are established and a programme has been launched to bring an electric vehicle infrastructure to the streets of our city; promotional environmental campaigns such as Manchester is My Planet are part of the culture in neighbourhoods schools and businesses, and we have an unrivalled base of climate change knowledge and research in our Universities.

We have begun to establish new tools for creating and attracting investment, shaping partnerships and budgets to maximise returns and public interest. More than 3,000 of Greater Manchester businesses are already signed up to environmental good practice, our Universities are established world leaders in climate change research and our city is home to thriving third and social housing sectors already engaged with the practice of low carbon lifestyles; events such as Manchester International Festival and FutureEverything highlight and promote the technologies and lifestyles of our greener future.

Our strategy builds upon progress already made in Greater Manchester and on the UK Low Carbon Transition Plan and the Northwest Climate Change Action Plan. It pulls together and strengthens a range of existing plans and policies that contribute to the Greater Manchester Strategy and it creates a co-ordinating framework which enables the climate change action plans and strategies produced by Districts to be aligned to one another through a common scale-able approach. It will provide a framework of objectives and priority actions that constitute our collective action on climate change: the details of delivery will be set out in a suite of thematic plans and local policies.

Low Carbon Economic Area

Greater Manchester was designated as a national Low Carbon Economic Area (LCEA) in 2009 with a focus on the built environment. **AGMA's LCEA Delivery Plan 2009-2014** was drafted to provide a portfolio of workstreams that begin to establish a built environment and infrastructure across the city that is highly energy efficient, and to develop the markets and capacities for low carbon goods and services. These workstreams are based on the Manchester 'Mini Stern' report of 2008, which indicated a potential £20 billion of loss revenues over the years to 2020 if we fail to prepare for climate change. They represent a fast growing mixed investment portfolio that aims to deliver high rates of return as well as carbon savings includes physically retrofitting buildings and decarbonising energy supply, establishing suitably equipped and skilled businesses and workforce, stimulating innovation and helping to inform delivery of a strengthened spatial planning framework. These priorities will help support 68,000 jobs, generate £1.4 billion in economic activity whilst reducing 6.1 million tonnes of CO_2 emissions.

Greater Manchester Energy Plan

Work is under way by the AGMA Energy Group, formed in 2010, to develop a **Greater Manchester Energy Plan**. This will build upon a recent **Decentralised and Zero Carbon Energy report** and a **Sustainable Energy Action Plan (SEAP)** which detailed proposals for developing our energy infrastructure and increasing local generation from renewables. The new plan will set out our commitments to increasing 'smart' grids, smart metering, networks for electric vehicles and map the rapidly changing operating environment for energy producers and consumers.

Local Transport Plan

Headline proposals for reducing emissions from transport are incorporated in our third **Local Transport Plan (LTP3)** agreed in April 2011. This sets out plans and spending priorities over the period to 2025 together with a series of detailed Local Area Implementation Plans which set out collective spending plans for the next four years, up to 2015. Carbon emissions from all transport in Greater Manchester, including rail, accounts for over 30% of total direct emissions, and future growth projections suggest that radical change will be required if we are to achieve our current low carbon targets. LTP3 provides a set of investment priorities and activities for transport that support the maximum potential economic growth while creating a framework for lower carbon travel patterns and a platform for low carbon proposals being put to the Local Sustainable Transport Fund.

GMWDA Climate Change Action Plan

The Greater Manchester Waste Disposal Authority set out its strategic proposals on climate change in 2009. The plan includes a revised approach to waste, targeting zero growth and increasing recycling rates from around 30% to at least 50% by the year 2020, and aiming to substantially increase the level of carbon emissions savings from approximately 80,000 tonnes of CO_2 per annum in 2008/09 to 370,000 tonnes in 2015 and 400,000 tonnes in 2020. These saved emissions represent 5% of Greater Manchester's total target saving to 2020.

Greater Manchester Spatial Framework

The action plans above, and the aims and objectives of this strategy, will be set in a spatial context through a **GM Spatial Framework**. To be put in place during 2011, it will help us plan together for growth. This will recognise the critical connections and interdependencies between different geographical areas and guide and focus investment, growth and infrastructure development to areas where it can have a positive impact beyond the purely local or neighbourhood level. It will provide the framework for cooperation and delivery of the Greater Manchester Strategy, and concentrate on the issues that are important for the conurbation as a whole.

Green Infrastructure Framework

Optimising the assets of the physical environment will be the key objective of a forthcoming AGMA Green Infrastructure Framework and Action Plan. This will provide a policy and evidence base for valuing, maintaining and developing our landscape and green space assets through better targeting of green infrastructure interventions and investments, and integrating the concept of 'ecosystem services' as a key component of a low-carbon society. It will assess the capacity and biodiversity of our environment, summarise the multi-functional value of our land assets and set out how we can protect and enhance the contribution that Greater Manchester's natural systems make to to climate change resilience, to health and wellbeing and economic prosperity; how we invest to optimise the local natural environment and protect it for future generations.

Flood Risk Management

Climate change is forecast to increase the number of extreme weather events, particularly flooding and several plans designed to address these risks are in development. Management of our 'blue infrastructure' is key: **Flood Risk** and **Surface Water Management Plans** involve the Districts, the Environment Agency and other partners working together to identify areas at risk from surface water flooding and developing Flood Risk Assessments and a GM Flood Risk Management Strategy.

EcoCities

Greater Manchester's adaptation and resilience challenges and opportunities are being brought together in the action-research programme led by the University of Manchester, supported by property company Bruntwood. The outcome of the current phase of the EcoCities programme, due for completion in December 2011, will be a state of the art adaptation 'blueprint' for Greater Manchester.

Local Authority and District Plans

Across all ten Districts of Greater Manchester there are already climate change plans approved or in development. The challenge for this Greater Manchester Climate Change Strategy is to work with each of these, particularly as they have a diverse set of timescales, baselines and objectives. In time, one objective of this strategy is to align and combine all these plans into a single, Greater Manchester-wide plan.

All Districts also have 'Core Strategies' adopted or in development that set out the policy planning frameworks for the period to, and beyond 2020. These Core Strategies take account of climate change issues and targets and set out how local planning policy and practice can steer the capacity for energy efficiency and climate change resilience in new developments.

Greater Manchester Local Authority and District Climate Change Plans

District	Plan	Status & Timescale	Baseline year	Target year	Calculation method	CO_2 reduction Target
Bolton	Carbon Management Plan Adaptation Strategy 2011	Published 2008, revision due 2011 3 years	2007/8	2013	NI 185 NI188 may be retained	20% reduction by 2013
Bury	Climate Change Strategy Undeveloped	Previous one was 10 years				
Manchester	A Certain Future	Published 11 years	2005	2020	NI186	41% from 2005 7.3t/capita to 4.3t/capita
Oldham	Climate Change Action Plan	Draft 5 years	2005	2014	NI186	15% by 2014 from 2005 (Council corporate plan 2010-2014) Equates to 180,000t of CO_2
Rochdale	Climate Change Strategy To be developed for spring 2011	Draft – initial stages 3 years				
Salford	Climate Change Strategy 2010-2020	Published 10 years	1990 2005	2020 2011	National figures NI186	National 34% by 2020 based on 1990 12.5% by 2011. (4-5% from local actions)
Stockport	Local Strategic Partnership Climate Change Strategy 2010-2020	LSP strategy draft (council strategy published) 10 years	1990	2020	National figures	40% by 2020 Equates to 1,198,916.4t CO_2
Tameside	Low Carbon Tameside 2010 – 2020	Published 10 years	2008 2005	2020 2012	National figures NI186	National Target = 18% emissions reduction by 2020 based on 2008 = 11.92% per capita by 2012 against the 2005 baseline
Trafford	Sustainable Trafford Draft 2010 - 2020	Draft 10 years				
Wigan	Climate Change Strategy and Action Plan	Final draft 10 years	1990 2005	2020/ 2050 2020	National figures NI186	80% by 2050 34% by 2020 NI186 target referred to = 13% by 2020

Organisations in Greater Manchester

Many other organisations in Greater Manchester have begun to develop plans and strategies to address the opportunities of a low carbon economy and the challenges of climate change. Public bodies including NHS Trusts, the Fire and Rescue Service, the Environment Agency and many of GM's housing organisations; academic institutions including most of our universities and colleges and many of our schools; businesses from large corporations to SMEs and the organisations that support them, including the Greater Manchester Chamber; voluntary and community organisations including charities and social enterprises are all involved.

6. Our strategic objectives on climate change

The next decade will set the course for a global future in which Greater Manchester can play a key part. This Strategy is the framework we will use to work together, across our ten Districts and with all our partner organisations to co-ordinate our collective action on climate change. Beginning to realise the benefits of a low carbon economy, working with partners across the UK to ensure that the national goals set by the National Carbon Budgets are met or exceeded, and taking steps to ensure that our neighbourhoods and businesses are resilient to the impacts of a changed climate.

Our approach will be based on collaborative working, harnessing the skills, knowledge and creative energy of all Greater Manchester's people and organisations. The challenge of this agenda does not acknowledge boundaries between places and sectors and it will be part of our strategy to develop the arrangements necessary to enable the public, private, third and academic sectors to maximise the impact of their collective capacity by working as one team.

This Strategy is based around four objectives, a series of priority actions and a set of indicators to measure our progress. Together these will provide a framework for reducing the cumulative impacts of climate change, addressing resource security, and realising the benefits of moving to a low carbon economy. However it is a framework and across Greater Manchester, action at all levels will be critical in delivering success – local action in the daily lives and businesses of our 2.6 million people, collective strategic action by Districts and organisations and co-ordinated action working with Government.

Our four objectives are:-

- We will make a rapid transition to a low carbon economy.
- Our collective carbon emissions will have been reduced by 48% on 1990 levels.
- We will be prepared for and actively adapting to a rapidly changing climate.
- 'Carbon literacy' will have become embedded into the culture of our organisations, lifestyles and behaviours.

Adopting these four goals as our strategic objectives will enable us to apply the principles of sustainable development to the achievement of our vision of prosperity for all. They are common to all our plans, they all entail action across several themes, which need to be undertaken as parts of a whole - different programmes at different scales, operating simultaneously and interdependently.

6.1 Core objective: We will make a rapid transition to a low carbon economy

> *'We have to achieve an increase in productivity and prosperity that does not bring with it an associated increase in our carbon emissions. We need to 'decouple' economic growth from ever higher levels of carbon and then we need to work hard, through energy efficiency, behavioural change and investment in environmental technologies, to drive those emissions down still further.*
>
> *'If we do this right, the steps we take to cut emissions will increase the city region's productivity and lead to new business opportunities that enhance our prosperity. If we get it wrong, or simply react to legislation, our efforts to grow prosperity and improve quality of life will be undermined by changing markets and a changing climate.'*

These are two of our low carbon aspirations in the Greater Manchester Strategy. Achieving this transformation will involve securing investment to support the retrofit of our building stock, the development of new energy infrastructure, support for innovation through green technologies and a progressive 'decarbonisation' of our businesses. We will have to ensure our supply chain is prepared to meet and capture demand; new skills will be needed and we will have to change the shape and nature of our workforce. Our embedded and significant knowledge base will help drive enterprise and commercial opportunity.

Over the next five years the potential investment in low carbon projects in Greater Manchester will be in the region of £8-10 billion. Our approach will be to mobilise this investment by developing programmes that deliver both high rates of return and an ability to save carbon. These programmes will integrate with interventions that support skills development across the work force, growth in the supply chain, an increase in local manufacturing and assembly and stimulation of wider business resource efficiency.

This is a time-limited opportunity: the global economy is changing, pressure on resource availability and the onset of Peak Oil's potentially volatile impact on energy prices are multiplied by the rapid rise of developing economies. Acting early will ensure that Greater Manchester is well positioned to win a share in emerging markets and build competitiveness through adopting more resource efficient practices. Our Low Carbon and Environmental Goods sector, already worth £4.4 billion and employing over 34,000 people across 1,900 companies, is projected to see annual growth rates over the next five years of more than 4%. We need to underpin and accelerate that growth.

New and innovative green technologies have a major role to play in these developments. In the context of the global digital economy new technologies are both part of the problem and part of the solution. The rapid growth of, and reliance on, digital technologies is producing increased emissions and an escalating demand for energy: at the same time digital technologies can

support smarter processes and provide innovative technical solutions to the challenges of working and living more sustainably. For example, the European wide 'Green Digital Charter' network, led by partners in Greater Manchester, "commits cities to work together to deliver on the EU climate objectives using digital technologies that increase energy efficiencies, facilitate emissions reductions and forestall climate change".

The scale of the task of transforming buildings and creating new infrastructure has enormous market potential. It will stimulate demand for retrofitting and other low carbon technologies and services and for developing green innovation. It has the capacity to create substantial demand for low carbon businesses, sustainable social enterprises and significant growth in the construction, knowledge, energy and research sectors. Where public spending is reducing rapidly and there is growing emphasis on more inclusive self-sufficient neighbourhoods, this transition amounts to a substantial opportunity for future prosperity.

The low carbon economy will be far more extensive than the discrete confines of the low carbon sector itself. 'Eco-innovation' in the manufacturing, finance, knowledge and digital sectors; growth and diversity in energy, transport and bio-technology, and creating a high level of resource efficiency in all businesses will all drive demand in local, national and international markets.,

We will track our progress annually on this objective through two indicators:

- *a correlated measure of carbon emissions and economic activity*
- *the growth in low carbon jobs and the economic value of GM's low carbon and environmental technology and services sector*

6.2 Core objective: We will have reduced carbon emissions by 48% (on 1990 levels)

Greater Manchester intends to make its contribution to the targets set in the UK Climate Change Act and the UK Low Carbon Transition Plan and if possible, exceed them. This is the right thing to do as part of the global effort to combat climate change, but it will also increase our prosperity – through creating opportunity and diminishing risk - as we move to take full advantage of the emerging and dynamic low carbon economy.

To tackle the direct carbon emissions that arise from energy use in our buildings, transport and infrastructure we will have to use less energy, more efficiently. We will also have to work to facilitate the generation and deployment of renewable energy to support the decarbonisation of the national energy supply, create and support 'smart' decentralised energy systems for communities and businesses and utilise alternative fuels for power, heat and transport.

Developing and delivering the projects and programmes that create these reductions will be informed by the development of carbon budgets. The UK Low Carbon Transition Plan quantifies target emissions savings by sector. Recognising that emission levels vary both by sector and from District to District, we will work together to apply this framework to build up a picture of quantified targets and budgets specific to sectors and localities across Greater Manchester.

While we are primarily focused on reducing these 'direct' emissions of CO_2, these form part of a more complex picture, including emissions of other, less prevalent, greenhouse gases like methane and the full 'carbon cycle', that includes the carbon 'embodied' in our buildings, our landscapes and the materials, goods and services we produce and consume.

Our strategy recognises that these 'indirect' emissions will need to be taken fully into account in moving to the UK's 2050 target of an 80% reduction in emissions and it begins to pioneer a methodology that enables Greater Manchester to take a lead in understanding a consumption-based approach to the impacts of local and 'outsourced' emissions and the culture change necessary to achieve our long-term goals.

We will track our progress annually on this objective through two indicators:

- *total direct CO_2 emissions & emissions per capita*
- *the amount of energy generated in GM by renewables*

6.3 Core objective: We will be prepared for and actively adapting to a rapidly changing climate

Radical action on carbon emissions is needed in order to pass a viable and safe climate onto future generations, our challenge today however, is also to prepare for the rapid climate change that is already underway due to the greenhouse gases already released into the earth's atmosphere. This preparation is made doubly urgent given that global carbon emissions are continuing to rise, not fall.

Research from the UK's Met Office predicts that global average temperatures could rise 4℃ above pre-industrial levels by the 2070s, if not earlier. This poses risks and opportunities for Greater Manchester, where projections collated by the University of Manchester's EcoCities project, highlight annual average temperature increases of around 2.5℃, by 2050, accompanied by wetter winters, drier summers, more intense rainfall events and winter storms.

Present day extremes of weather and climate, particularly floods and storms, already impact on residents, neighbourhoods and businesses in Greater Manchester. The risks of these 'extreme weather events' are projected to increase and diversify over the next 40 years, creating greater and more frequent threats to infrastructure, disruption to businesses and services and hardship for those in hard to reach groups and vulnerable neighbourhoods. The EcoCities project highlights increases in high temperature and heavy precipitation events that will increase the incidence of floods, droughts and heatwaves for Greater Manchester.

Managing these risks is critical to developing and maintaining future economic resilience, raising the prospect of substantial future costs to the local economy. Much of this can be avoided or mitigated by planned adaptation strategies that anticipate risks, protect infrastructure and enhance resilience. Steps are already being taken to implement programmes that maximise the opportunity cost of early action – protecting the future of our energy and watercourse infrastructures, ensuring habitat connectivity to maximise species adaptation in local biodiversity and through civil contingency planning.

In addition to anticipating and adapting to weather and climate risks specific to Greater Manchester, and we need to respond to risks that arise indirectly from much more severe climate change in other parts of the world. These include challenges associated with population movements, economic instability and threats to food, energy and resource security, as well as increased pressure on global resources.

We will track our progress annually on this objective through two indicators:

- *the extent, quality and productivity of green spaces and tree cover*
- *the number and quality of resilience plans and adaptation strategies*

6.4 Core objective: 'Carbon literacy' will have become embedded in the culture of our organisations, lifestyles and behaviours

Delivering our low carbon future will rely on the everyday actions of people. An understanding of energy efficiency and the interactions between lifestyle and the environment that will become routine for businesses, organisations and households. Smart meters in a smart city will be used by smart citizens; neighbourhoods will be active in social participation, increasingly providing their own goods and services, engaged in innovation, enterprise and creativity as well low carbon living.

The culture shift is critical because up to 20% of the energy we use is down to the way we use our buildings and our chosen modes of transport rather than the technologies we have in place. Creating the space in which residents and businesses can easily make the choice to use buildings and transport in a more energy efficient way, enables them to create a 'triple dividend' – saving resources, tackling climate change and fuelling demand in the local low carbon economy. Similar choices about sustainably-produced local goods and services recycles wealth locally and reduces our 'outsourcing' of carbon emissions to other parts of the world.

Building upon our culture of strong partnerships, both locally and across Greater Manchester, we need to provide training and learning opportunities, change the way we plan and think about services, so that carbon literate practice becomes the norm in how we live, work and play. Building upon a strong track record of environmental work in schools and colleges throughout Greater Manchester, we will need to create more common and consistent communications so that messaging and behaviour at school, at home and in the workplace makes common positive connections between individual choices, future prosperity for all and equity between generations and places.

At the same time, our strategy aims to grow our international reputation as a green city for visitors and investors, to export our knowledge, expertise and products, stimulating a virtuous circle of commitment to sustainability, prosperity and a high quality environment where procuring low carbon choices is easy, and value for the environment is visibly present in the spaces of neighbourhoods, workplaces and the urban centre.

We will track our progress annually on this objective through two indicators:

- *the number of businesses reporting carbon emissions and changes in consumer preference towards low carbon goods and services*
- *the number of people participating in programmes, events and training addressing climate change*

PART 2: ACTIONS TO 2020

The four objectives of our strategy establish the priority outcomes we aim to achieve: a strong low carbon economy, substantially reduced emissions, resilience to the risks and opportunities of a changed climate and a culture in which environmentally smart behaviour is the norm. Applying these objectives to programmes of activity involves recognising interdependencies that vary with different themes of work.

We know that most of our direct emissions arise from our buildings, from energy generation and from transport: these are three themes of work that also provide key building blocks in the low carbon economy. The capacity of our environment to support delivery of our objectives, expressed as 'ecosystem services', is rooted in another theme, our green spaces and waterways (also known as green and blue infrastructure) and our capacity to drive these changes as citizens and consumers is recognised in a fifth theme – sustainable consumption.

By undertaking and co-ordinating programmes of activity across these five key themes – buildings, energy, transport, green spaces and sustainable consumption – and through a series of enabling and cross-cutting activities, we can develop and manage the co-ordination and interdependency necessary to achieve successful outcomes against all four of our objectives.

7. Actions by theme

7.1 Our buildings

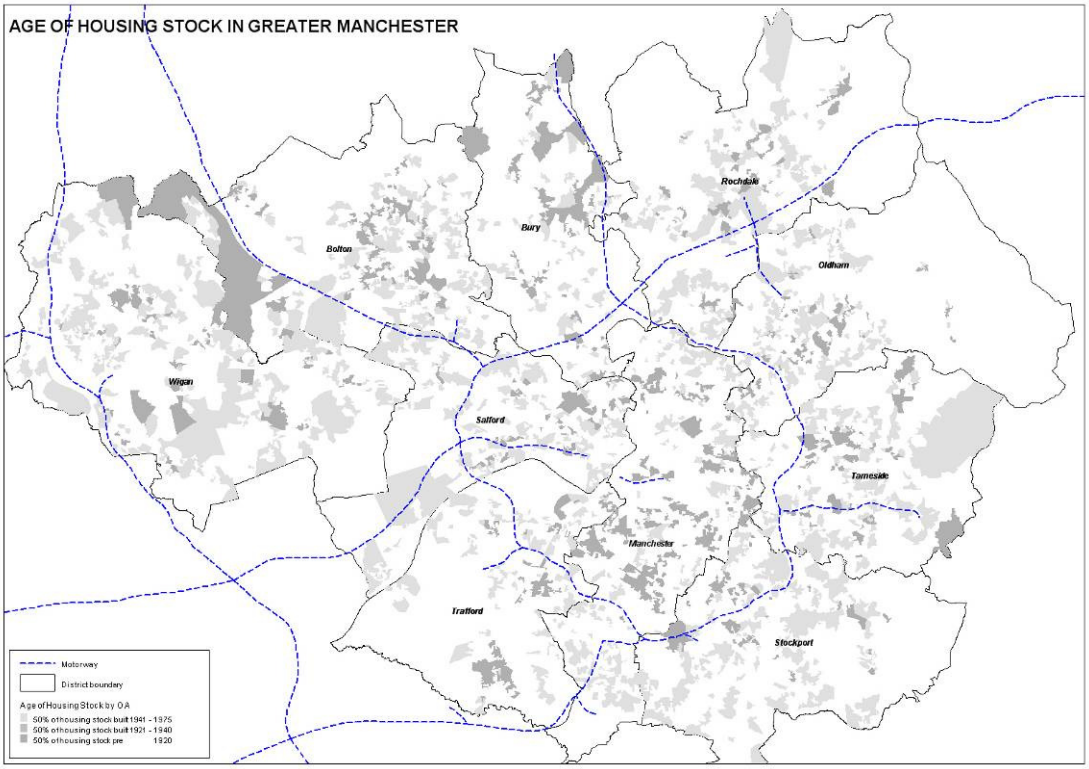

Figure 3 - Age of Housing Stock in Greater Manchester – 80% of our current building stock will still be in use in 2050, underlining the strong need for a retrofit programme.

There are 2.6 million people living and working across the Greater Manchester conurbation. Our homes (over one million of them) generate 36% of our direct carbon emissions and the commercial sector generates a further third, much of it associated with building use. Most of our building stock is pre-1970 and highly energy inefficient: with four out of five buildings likely to still be in use in 2050, retrofitting programmes need to play a very substantial part in meeting our 80% carbon target.

The challenge of retrofitting all our building stock to such very high standards is immense, but, over a 40 year period, the efficiencies are immense too. Taking the economic opportunity to be a leader in this fast-growing field of 'green retrofitting construction' has already begun with the delivery plan for Greater Manchester as a Low Carbon Economic Area for the Built Environment (LCEA). Significant momentum has been achieved through a partnership that is actively developing the opportunities provided by co-ordinating plans and resources through the forthcoming Green Deal. Improving the energy performance of our buildings will have substantial social and economic impact, increasing the effectiveness of businesses and public services and the quality of life for all residents, particularly those on low incomes or in fuel poverty.

Investing in programmes that achieve a step change in the energy efficiency of our existing stock – domestic, commercial and public – lies at the heart of

our strategy: it improves environmental sustainability, improves energy efficiency and security and it can be an engine for jobs and business development. At the same time new build will continue and we need to deliver against nationally-set standards for new buildings: zero carbon standards need to be in place for homes by 2016 and commercial properties by 2019. We also need to change the way we use buildings to maximise their capacity for efficiency and ensure that our retrofitting programmes are 'future-proofed' and adapted to a changing climate.

Our building programmes will include the adoption of micro-generation, smart metering and conservation technologies. They will be developed in parallel with infrastructure projects such as district heating and cooling, digital infrastructure, smart grids and green space – and with cultural schemes that actively engage residents in improving energy efficiency in their homes.

Key outcomes by 2020 will be:-

Carbon emissions from our buildings reduced, standards for new and existing buildings in place; a rolling programme of co-ordinated, proactive and responsive retrofitting projects for domestic, public and commercial properties completed under the Green Deal and Greater Manchester established as a centre of the building retrofitting industry.

- Climate change adaptation measures will be embedded in our retrofitting programmes and a key design feature in all our regeneration programmes for streets, public buildings and open spaces, establishing increased capacity to accommodate the increased need for summer cooling and higher risk of both drought and flooding, as well as a greater sense of place.

- Partnerships will be in place to create scale and demand in low carbon buildings; investment programmes, well-developed local businesses, skills and training programmes will have generated local employment and growth in Greater Manchester's supply chain. The creation of these partnerships will be done in such a way as to ensure that markets and opportunities are opened up rather than confined and restricted.

- Carbon literacy will be commonplace amongst residents, and employees with widespread understanding about how energy in buildings works.

To achieve these outcomes we will:

- Deliver the workstreams in the LCEA Delivery Plan, creating a low carbon investment framework and ensuring that training and supply chain support are integrated into the development of retrofitting initiatives.

- Deliver a Greater Manchester approach to retrofitting strategy and standards that includes energy efficiency, climate change adaptation

and behaviour change and a common approach to maximising energy efficiency benefits from planning and building regulation.

- Create a strong partnership to develop and drive a co-ordinated programme of Greater Manchester Green Deal schemes that provides for both pro-active and responsive approaches, maximises the opportunities to engage all property owners and all types of building stock, and reduces fuel poverty by providing affordable warmth to vulnerable groups.

- Enable the Green Deal Social Housing Trailblazer projects to 2013, utilising the scale of the social sector to building on existing partnerships and investors to test and pioneer retrofitting programmes.

- Establish a communications plan that supports stronger messaging and 'carbon literacy' training on buildings and energy to provide a common and locally-flexible branded approach.

- Influence developers to deliver standards for new build and refurbishment of commercial premises, including accelerating the adoption of zero-carbon standards and tackling poor quality multi-occupancy buildings.

- Support research, technological development, best practice, skills demand and enable business-to-business opportunities to inform the development of Greater Manchester Green Deal schemes.

- Influence Government to maximise the take up of new low carbon business support initiatives to improve the efficiency of our commercial buildings, including access to the Feed-In Tariff, Green Deal, Renewable Heat Incentive, and the Green Investment Bank.

7.2 Energy distribution, generation and use

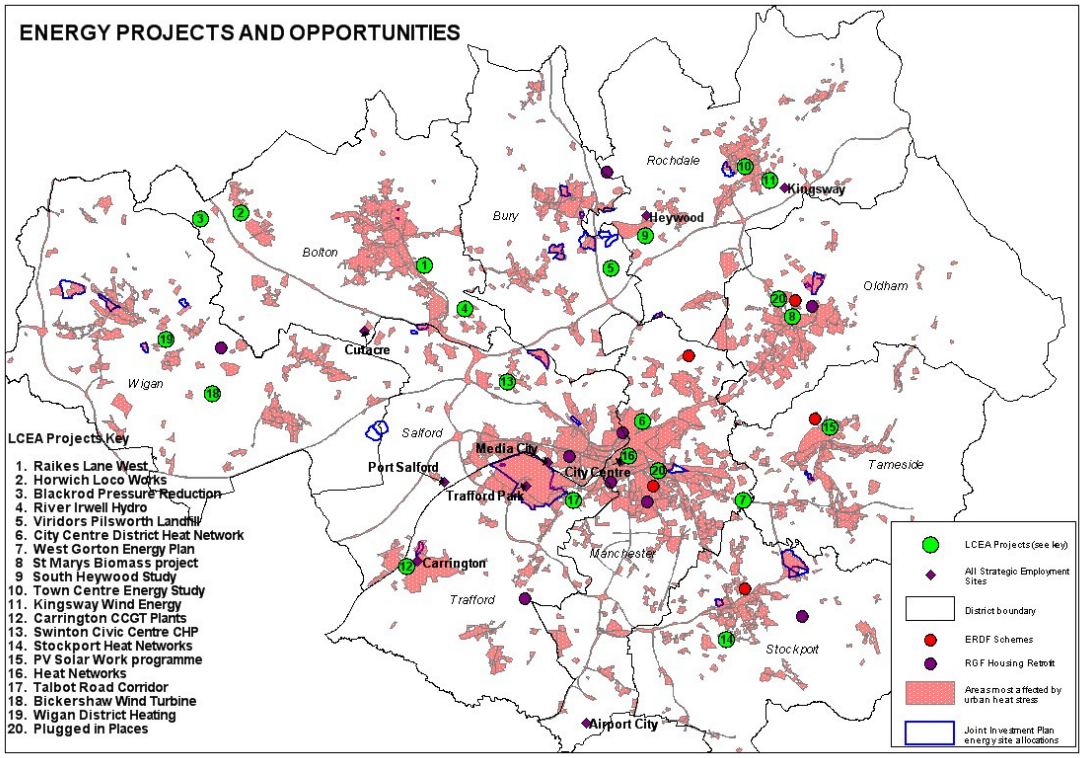

Figure 4 - Energy Projects and Opportunities in Greater Manchester Low Carbon Economic Area

Greater Manchester is powered by a mix of gas, electricity, transport fuels and a small amount of oil, solid fuel and biomass. Only a small percentage of its energy comes from renewable energy sources. Energy security and a low carbon economy mean that we need to significantly reduce our dependency on fossil fuels such as gas, coal and oil, whether used directly for heating and transport, or indirectly to generate electricity.

Carbon reduction strategies to reduce energy demand in homes and buildings, and reduce emissions from transport are likely to shift the UK's energy mix from gas and transport fuel to electricity. This means that while overall fossil fuel use will decrease, electricity use is likely to increase over the next twenty years. Alongside this, the cost of electricity is also expected to increase due to both fossil fuel prices and the costs of investing in generation, distribution and management infrastructure.

Nearly all of the electricity consumed in Greater Manchester is generated nationally and distributed through national infrastructure in a regulated, partitioned and highly complex market. Decarbonisation of the grid through development of less carbon intensive fossil fuel power stations (carbon capture; gas turbines), large scale renewable energy programmes (e.g. from on and offshore wind farms, water related power, biomass) and nuclear power will significantly reduce emissions generated from our use of electricity.

Opportunities exist for large energy projects such as these to be sited within Greater Manchester, but they are relatively limited, and the policy levers available to local government to shape the energy system are also limited.

This means that opportunities for Greater Manchester centre on creating the right market conditions to deliver on energy opportunities, procuring energy from low carbon sources, and taking steps to reduce and manage our energy demand.

We need to create the right market conditions via influencing, partnerships, economic and planning policies to ensure that the electricity used in Greater Manchester comes from low carbon sources, minimise electricity use in homes and organisations, deliver local low carbon energy generation schemes, manage energy consumption to reduce both grid demand and fossil fuel derived generation, and secure a substantial share of the market opportunities that such a significant transition will bring.

Reducing energy demand, and adapting to a new energy supply environment are both vital to achieving Greater Manchester's energy goals and GM is well positioned to show leadership on this via its work on retrofit, and managing energy demand. As the country adopts a low carbon energy system, there will be a much greater requirement for demand-side response to balance the energy network. This demand side response includes altering our patterns of energy demand and consumption to make best use of times when low carbon energy generation capacity is available, which, when carbon pricing is taken into account, will also be the cheapest times to consume energy. In the longer term, development of local energy storage could enhance the benefits of active energy demand management. This will deliver economic benefits and reduce the carbon impact of energy use.

While we have some influence over large scale generation of electricity in our own area, the majority of large scale schemes will take place outside Greater Manchester – the Committee on Climate Change suggests 30-45% of energy will come from renewable sources by 2030, and this is reflected in the Government's 4th Carbon Budget. While it is a priority to continue to recognise and influence national government's critical contribution to this strategy, local contributions to generation, – heating and cooling networks and smart grids, through how we procure energy, and how we support our energy businesses are essential for Government to meet its targets.

These local contributions to generation and infrastructure form part of a process of decentralisation of energy networks, enabling authorities, organisations and households to participate in local networks and to generate power and heat for themselves or for distribution. If energy generation and heat network opportunities already identified are delivered, they could deliver a reduction of up to 5% in Greater Manchester's annual CO_2 emissions by 2020. While not significant when set against an overall target in excess of 30%, these steps are essential to create the wider supply chain opportunities and market conditions for Greater Manchester to deliver a low carbon economy.

We will put in place a Greater Manchester Energy Plan which promotes a consistent understanding of energy issues, provides a coherent performance framework and establishes a clear pathway to achieving the following:

Key outcomes by 2020 will be:-

- For users to understand that the cost and carbon impact of their energy use is linked to their patterns of consumption, and have access to support systems and schemes to help both reduce demand, and balance capacity, demand, carbon and cost – GM has the opportunity to demonstrate national leadership in this area.

- To have created market conditions which promote low and zero carbon energy generation and distribution opportunities across Greater Manchester, including local renewable power stations, leading and facilitating the development of local heating, cooling and smart grid networks and integrating microgeneration opportunities into our new building development standards and retrofitting programmes.

- To have strengthened our understanding and ensured that existing and planned energy infrastructure is secure, resilient to the impacts of climate change, changes in energy use and the connection of local low carbon supplies, and to have integrated energy security issues into our planning for civil contingencies.

- To have developed an understanding of the need to decarbonise the energy supply at community and household level, ensuring that the benefits of both reducing emissions and ensuring a secure and affordable future energy supply are applied in the planning of energy infrastructure at neighbourhood level.

- Continued support and investment in UK renewable and low carbon energy generation via our energy procurement strategies.

- To have created market opportunities for the £100 million of energy research being undertaken by Greater Manchester's universities, and work to increase the size, economic and jobs contributions of Greater Manchester's energy sector.

- To have integrated the development of new heating and cooling networks and the establishment of locally generated power networks with the development of major retrofitting programmes and role out of smart technologies in order that networks can expand as heat demand from retrofitted property decreases.

- To be early adopters of smartgrids, smart technologies and energy storage, improving the efficiency of our energy system.

To achieve these outcomes we will:

- Deliver a co-ordinated approach to actively supporting the development and delivery of local energy generation and network projects, focussing initially on a discrete number of exemplar schemes across renewables, distribution, smartgrids, pricing, charging and storage that demonstrate technologies and investment models for further development.

- Deliver a low carbon investment framework that provides and recycles access to cost effective capital for low carbon projects

- Deliver a spatial strategy and policy instruments which optimise collaboration between District Core Strategies, the National Planning Framework and local opportunities, and create a robust, transparent and supportive framework which engages communities in balancing the need to encourage large and small scale generation and secure locations for energy infrastructure with local interests and amenity concerns.

- Deliver a co-ordinated communications programme, promoting energy training and 'carbon literacy', making energy use and carbon emissions publicly 'visible', including a rapid and accelerating roll out of smart meter and energy information technologies to encourage informed use of energy.

- Enable the right market conditions to be developed to promote investment and action in Greater Manchester via establishing appropriate governance and partnership arrangements which promote strong working relationships with key energy organisations

- Influence the development of energy programmes to ensure that training and supply chain support are integrated into their development

- Influence existing and new energy generation and distribution companies to ensure they have effective strategies for resilience, adaptation and the upgrading of networks, and the connection of low carbon technologies.

.

7.3 Transport

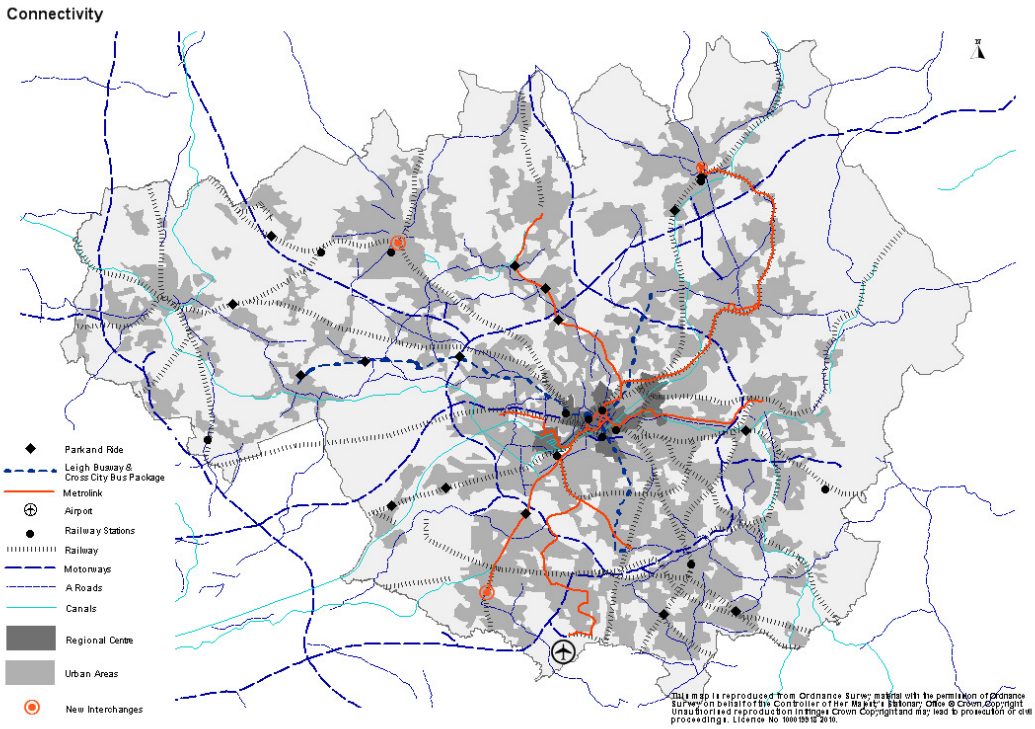

Figure 5 - Interconnectivity of major existing and planned Greater Manchester Transport Networks and Nodes

Greater Manchester is linked through a large, diverse and dynamic series of transport hubs and connections; from the extensive motorway network to the Metrolink system connecting many of the region's towns. Transport accounts for over 30% of our total emissions, four million tonnes of CO_2 and future growth projections indicate that is likely to increase if no action is taken. By pursuing a range of complementary policies on transport, land-use planning and working practices we will be able to reduce emissions and retain a high level of accessibility to, goods and services.

We will manage the development of infrastructure and the supporting technologies accompanied by changes in culture to create more flexible behaviours and travel habits; this will, for example, be supported by improved pedestrian and cycle infrastructure, driver and cycle training, better information on services and options for journeys and support for the uptake of low carbon vehicles and fuels. These 'Smarter Choices', will be delivered alongside ongoing expansion of the Metrolink tram network, removing five million car journeys per year and increasing the number of daily passenger trips from 55,000 to 90,000. Furthermore, new smart ticketing and intelligent traffic management will improve the usability and efficiency of the highways network.

Tackling carbon emissions from transport will be delivered in parallel with measures that achieve and sustain other environmental, economic and social benefits.

The 3rd Greater Manchester Local Transport Plan (LTP3) was published in March 2011, setting out the spending review period (2011-2015) and longer term for transport strategy (15-20 years).The key actions are:-

- Setting targets for the reduction of carbon emissions from transport, establishing an attainable 2020 milestone and developing detailed emission reduction outcomes from modal shift, fuel efficiencies and infrastructure development.

- Developing the implementation plans for LTP3 and the application of Government support (e.g. from Local Sustainable Transport Funds) so that climate change outcomes are delivered as part of the economic objectives and the transport infrastructure develops resilience to prepare for an increase in extreme weather events.

- Ensuring that the design and maintenance of the transport network and provision of services stimulates active travel and modal shift, supports sustainable neighbourhoods and public space and provides equality of transport opportunities, developing low carbon transport that supports our economy and improves the quality of life and the success of business.

- Taking steps to reduce the need for travel, by encouraging online services and flexible working practices and reducing the carbon intensity of journeys through promoting electric vehicles, car-sharing, car clubs and cycling.

- Improving air quality across Greater Manchester by actively monitoring air quality and using the interventions above to reduce greenhouse gas emissions.

To achieve these aims we will:

Network Management

- Improve the efficiency of the network by delivering reliable and fast journey times;
- Reduce congestion; particularly based on evidence of on air quality hot spots;
- Effectively and efficiently manage freight, including the introduction of consolidation centres;
- Continue to invest in bus, rail and Metrolink services to encourage modal shift and manage the impact of transport emissions from new developments.

Smarter Choices

- Develop co-ordinated GM wide communications on modal shift, develop image and customer service, alongside information provision, ticketing and pricing improvements to encourage large scale

behavioural change, providing a common branded approach across Greater Manchester;
- Improve journey planning by providing improved passenger information to inform smarter choices, using all available channels such as mobile communications and the Internet;
- Work with local employers to develop increased flexible and home working policies across GM; reducing the need for travel and peak time congestion;
- Support community based initiatives that encourage behavioural change e.g. cycling training schemes, cycle loan agreements and improve cycle infrastructure including cycle parking, storage, lanes, priority, and superhighways;
- Establish GM as a centre for car clubs and car sharing and develop promotions that reduce congestion;
- Market and promote cycling through a range of media, including personal travel planning.

Partnerships

- Work with community groups and projects that are achieving carbon savings in transport;
- Partnership contracts with bus operators to improve performance, reliability, safety, affordability and accessibility on the bus network;
- Work with boroughs neighbouring GM to develop actions to address commuting emissions from outside GM into the GM economic area;
- Promote fuel-efficient driving practices in private hire vehicles, business and public sector fleet and the general public.

Demand management

- Ensure an integrated spatial and transport planning system to reduce the need to travel;
- Manage the capacity and operation of transport networks in order to achieve and sustain environmental, economic and social benefits.

Integrated Transports Systems/Cleantech

- Develop new approaches and strategies to reduce emissions relating to freight, looking in particular at logistics, technology, driving styles and fuels;
- Support the uptake of low carbon vehicles and fuels;
- Utilise intelligent traffic management systems to relieve congestion, increase average speeds and reduce emission;
- Investigating the potential for road surface changes to reduce emissions;
- Introduce a smart ticketing system throughout GM to increase awareness and patronage of public transport.

7.4 Green and Blue Infrastructure

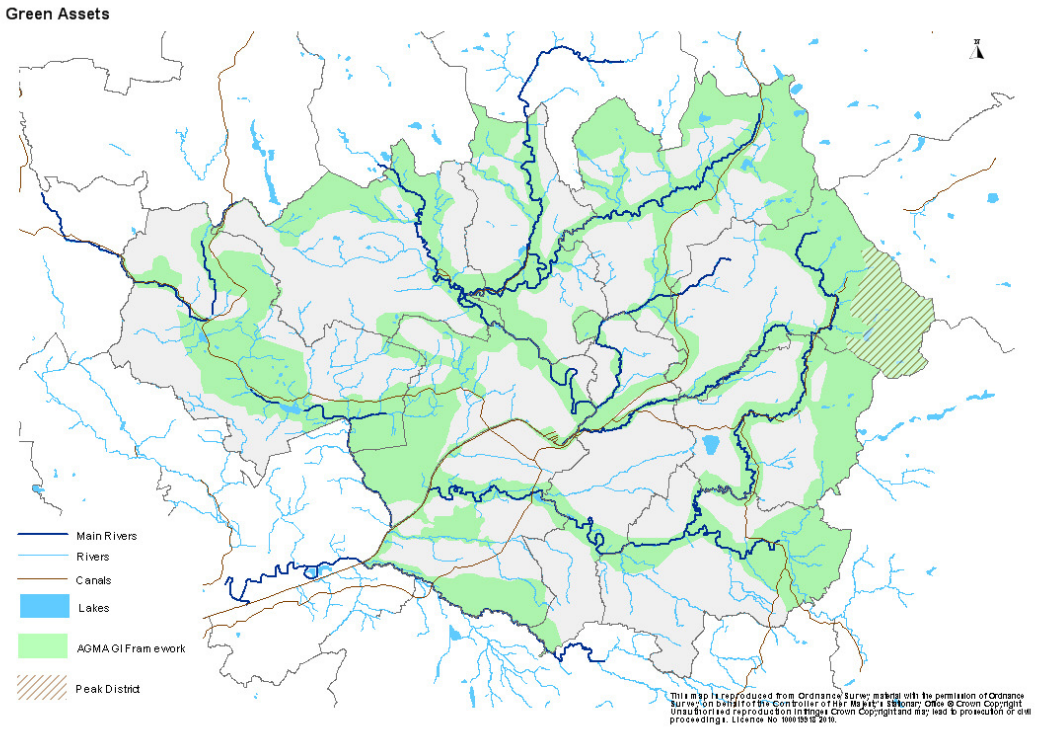

Figure 6 - Major components of Green and Blue Infrastructure of Greater Manchester

The natural assets of our green spaces, trees and waterways run through Greater Manchester forming a complex network of public spaces, habitats, landscapes, rivers and greenways. This green and blue infrastructure provides a critical role in contributing to health and wellbeing, helping us to achieve our carbon reduction targets and protecting our urban environment from the impacts of a rapidly changing climate.

Our commitment to growth and our vision of a vibrant, modern economy, with communities enjoying a high quality of life depends upon a healthy, accessible natural environment. The social and economic benefits that high environmental quality brings are well-documented; in a low carbon economy, benefits grow as the multi-functional benefits of these assets increase their value. Realising our aims of sustainable growth and prosperity for all demands a place for green and blue infrastructure in our strategy.

Maintaining as well as creating and improving our landscape and waterways assets is vital to the continued economic success of Greater Manchester but presents a significant challenge in the context of development pressure to accommodate an increasing population and the associated higher capacity requirements on existing infrastructure. Green and blue infrastructure needs to be considered as an integral part of cross-boundary infrastructure and spatial planning frameworks, not least through a proposed AGMA Green Infrastructure Framework and the University of Manchester's EcoCities programme.

Key outcomes by 2020 will be:-

- Carbon sinks will be protected, managed and enhanced as part of our carbon management strategy; carbon sinks include the extensive peat and mossland areas of GM which are also important biodiversity assets.

- A well co-ordinated green and blue infrastructure network that delivers cooling, shelter, resilience and flood management, increasing urban tree cover, local biomass production and food production within strategies that protect biodiversity and provide for local habitat adaptation.

- Integration of green infrastructure into the strategies and work programmes of all organisations working in the growth, sustainability and wellbeing sectors including dissemination of research into costs, levies, standards and benefits.

- Cultural value attached to our green and blue infrastructure will be increased and the benefits (including health and well being for communities), and use of such infrastructure will be maximised through promoting environmental understanding appreciation of our natural landscape heritage.

- To have developed the business case around the positive benefits of risk management and mitigation (including sustainable urban drainage (SUDS), building resilience and urban greening), including the promotion of economic returns and added values of investment in adaptation and mitigation within our urban environment.

To achieve these outcomes we will:

- Deliver better management of our green infrastructure in recognition of the value and vulnerability of species in adapting to a changing climate.

- Deliver improved management arrangements to develop and extend the scope, capacity and use of our green infrastructure to maximise a full range of 'ecosystem services' – food, fuel, shelter, recreation, resilience – across Greater Manchester and with neighbours across the North West and beyond.

- Deliver work to identify, protect and enhance green and blue infrastructure to increase the carbon sink, reduce emissions and generate energy.

- Enable supply and demand for energy to be matched more effectively including biomass and hydroelectricity; the GM Energy Plan will provide a basis for further work on energy potential from green infrastructure and hydro related energies.

- Support an improved sub-regional approach to flood risk management and mitigation through coordinated management strategies (including River Basin Management Plans) and development of the GM evidence base (including PFRAs and the GM SWMP).

- Influence, promote and identify sub-regional investment opportunities in green infrastructure, to better shape the natural environment to enhance its ecosystems and fulfil growth support functions and multi-functional use of land.

- Influence and maintain partnerships with the Environment Agency, United Utilities and other key stakeholders to manage flood risk as part of the new role for local authorities as Lead Local Flood Authorities.

7.5 Sustainable Consumption

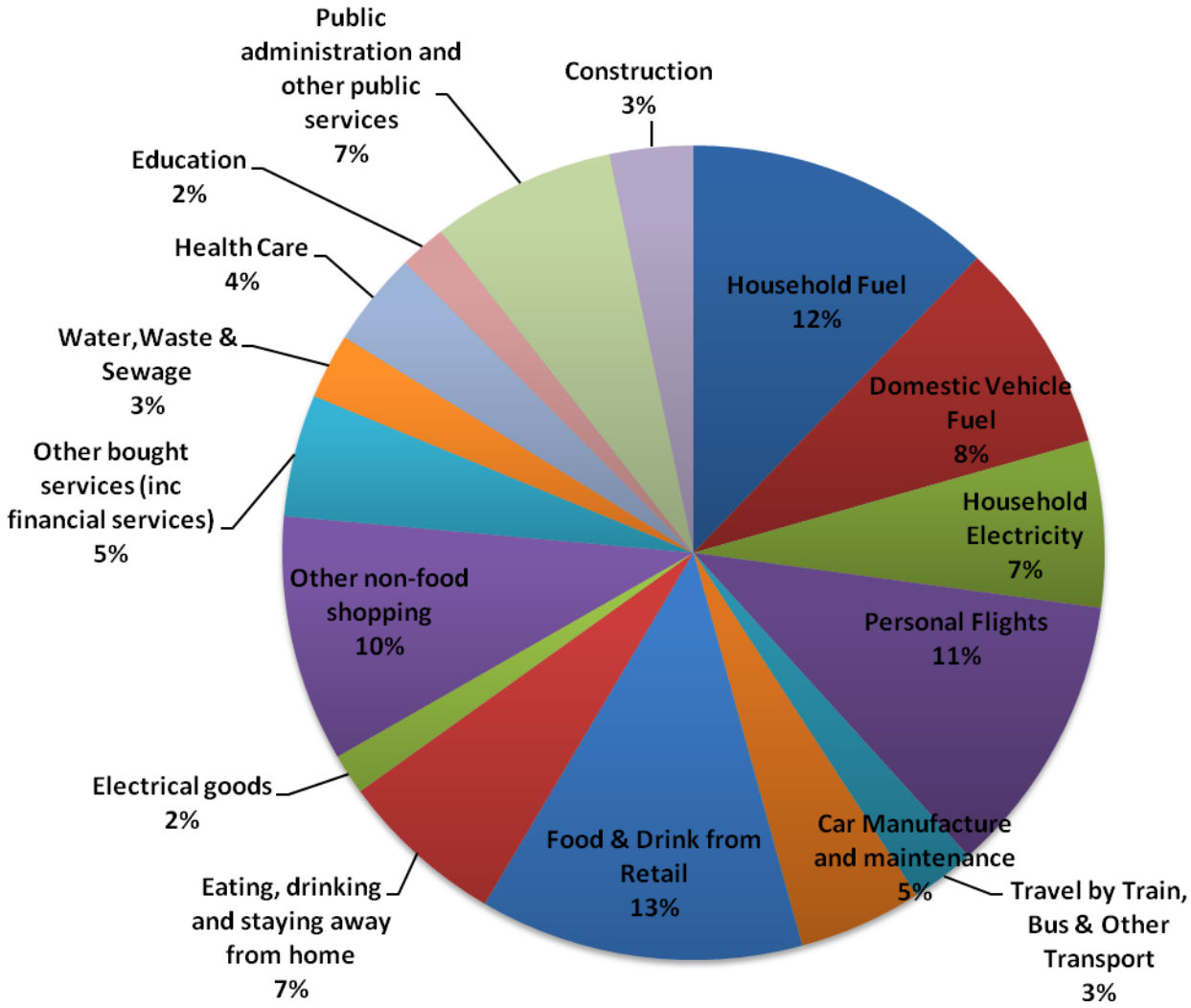

Figure 7 : A consumption-based 'total carbon footprint' for Greater Manchester. *The greenhouse gas footprint of Greater Manchester residents broken down by consumption category (A total including 'embedded' emissions of 41.2 million tonnes CO_2e compared to 18.0 million tonnes of 'direct' emissions).*

Everything that we consume through our daily lives has a carbon impact; the goods and services we purchase, the food we eat, the way we use buildings and the way we choose to travel. All result in emissions in their production, transportation, use or disposal: 'embedded' emissions that represent the total amount of energy use in the supply chain, whether that occurs locally, elsewhere in the UK or abroad in the case of imported goods. In the future it is highly likely we will need to take 'embedded' as well as direct carbon emissions into account, and there are already increasing demands for a 'consumption-based' approach to emissions reduction.

This approach transforms the traditional view of carbon emissions as they are reallocated to the point of consumption rather than the point of manufacture, and citizens – or companies or other organisations–learn to take responsibility for direct and embedded emissions through the purchasing choices they make. This, in turn, creates the opportunity to change patterns of consumption in Greater Manchester so that the total consumption of our city can be measured in proportion to the ability of natural resources to support it, creating a true 'whole city' total carbon footprint.

While much needs to be done at national and international level, we can take action at a city level in some areas of consumption and at particular points in the lifecycle of goods and services. We can advance the development of our local low carbon economy by promoting low carbon choices for consumers, supporting the mapping of resource flows and improving systems for procurement, processing and disposal of products. Given that food consumption accounts for a greater proportion of our carbon footprint than flying, and is estimated to be between 20 and 30% of GM's total carbon footprint, the food supply chain and waste reduction and recycling programmes are two priority areas where action by residents and businesses can accelerate progress towards a more resource efficient, low carbon society.

Whilst measuring and reporting on consumption emissions is not currently a requirement, it provides vital additional perspectives on the sources of emissions and opens up many more opportunities for developing policy responses than looking at direct emissions alone.

Key outcomes by 2020 will be:-

- To have developed our understanding of embedded carbon and incorporate a total carbon footprint option into our metrics methodology so that the leadership of pioneering businesses and organisations can be shared and replicated.

- To further develop our understanding of resource efficiency in business and consumption and the ways in which sustainable procurement can drive the development of the low carbon economy.

To achieve these outcomes we will:

- Deliver a programme of stakeholder engagement with key audiences, promoting shared understanding of the scale and source of direct and embedded carbon emissions, the concept of the total carbon footprint of Greater Manchester, and discussion of scenarios for its reduction.

- Continue to deliver and extend our Business Pledge and ENWORKS programmes to identify, engage and nurture the next generation of 'low carbon' business leaders and social entrepreneurs as champions of a 'consumption-led' programme in every business sector.

- Continue the delivery of a holistic approach to long-term waste and resource management by increasing recycling rates, reducing waste going to landfill and working with manufacturers, suppliers, retailers, recyclers and waste management companies to refine the efficiencies in the flows of resources and waste.

- Work with the creative industries across Greater Manchester to develop innovative approaches to increase the local manufacture, assembly and repair of low carbon products and services, and promote these services and lifestyle choices to generate large scale cultural and behavioural change.

- Enable development of capacity of our partnerships between businesses, organisations and social enterprises to develop and mainstream sustainable procurement, supporting suppliers in developing low carbon systems and practices, and increasing the market for 'low carbon' goods and services.

- Through developing our understanding of the carbon impacts of food production and processing, we will enable and promote the basis for a sustainable framework of local food production that connects local producers and consumers, both within GM and across the North West and support low carbon low waste innovation that increases local supply and employment.

8. Enabling and Cross-Cutting Actions

8.1 Creating green jobs

The low carbon sector is showing strong signs of existing and future growth and it is critical that Greater Manchester invests in the skills and technologies needed to be a key player in this area.

In 2008/9 the global market for low carbon goods and services was worth around £3 trillion and this is forecast to grow by 45% by 2014/15, primarily due to the large growth expected in the emerging economies, in particular China. The US has the biggest market share in this sector while the UK's position has slipped, from 6th in 2008/9 to 13th in 2010/11.

There is strong evidence to suggest that the UK does not have the necessary skills to make the transition to a low carbon economy at the pace required, nor are the training structures currently in place to fill that gap. Urgent action is needed to ensure we do not miss the opportunity to be part of what many are calling the 'next industrial revolution'.

Our plans in this area include support for educational programmes that offer basic and technical skills needed for 'green collar jobs'; we want to develop a programme of 'green apprenticeships' with businesses, schools and colleges; and we will promote business-to-business opportunities in this sector to ensure that those looking for low carbon products turn to Greater Manchester businesses, first. In this area we will be working closely with our Further Education sector, which is currently developing a consolidated offer for the entire area to ensure we have the capacity and breadth of provision needed for the future.

Large businesses, organisations and networks across Greater Manchester can also play their part by being part of a wave of 'sustainable procurement' to favour those businesses that are committed to low carbon practice and sustainable development; in tandem with this we will develop the low carbon supply chain as part of the Green Deal and help to establish new businesses and social enterprises to take full advantage of this rapidly developing marketplace.

Alongside better skills and more sustainable procurement practices, we need to support the so-called 'sixth wave' of innovation in areas such as radical resource productivity, whole system design, green nanotechnology, new forms of renewable energy, urban agriculture and biomimicry, where natural ecological systems provide cues to future industrial innovation. Here we need to draw fully on our strengths in Greater Manchester's universities, from the building and construction strengths at the University of Salford to the £100 million worth of energy research currently being carried out at the University of Manchester.

Key outcomes by 2020 will be:-

- A marked shift in basic level 'green collar' skills across the entire Greater Manchester workforce, measured against a baseline to be set in 2012 through a mapping of our current skills and the future marketplace. To have also mainstreamed low carbon opportunities and thinking into all other skills and employment programmes.

- A renaissance of STEM (science, technology, engineering and maths) subjects being taken across our educational sector which will ensure that the next generation workforce is well equipped for the future low carbon economy.

- A standard-setting Green Deal programme for Greater Manchester that fuses together our ambition to be a leading low carbon city with the urgent need to address worklessness and disadvantage across poorer communities.

- A sustainable procurement framework for the public sector, and for large private sector businesses, that directly benefits local, low carbon goods and services.

- A well-networked and enterpise-facing partnership between Greater Manchester's universities, the public and private sector to ensure that game-changing technological breakthroughs (such as graphene) are fully leveraged to benefit Greater Manchester's businesses and unlock global market opportunities.

- The establishment of a new generation of low carbon businesses and social enterprises trading in energy generation and efficiency, retrofitting, transport services, digital technology, urban food production, material re-use & resource efficiency and ecosystem services.

To achieve these outcomes we will:

- Carry out a detailed forecasting of future skills needs and trends cast against a baseline of our current skills and leading to a prospectus for skills, education, business partnerships and industrial innovation.

- Support programmes of research and innovation and develop the partnerships that translate this work into local enterprise applications for existing and new businesses and improve the market share of our businesses in low carbon supply chains.

- Extend our carbon literacy programmes to ensure young people and existing employees are aware of low carbon career opportunities and have clear pathways available to them to pursue those careers.

- Review current training and development programmes across Greater Manchester to ensure that they are adequately resourced and financed

and that there is appropriate capacity in place within the local training infrastructure, including the development of new capital facilities as appropriate.

- Put in place an assessment framework for all major developments or investments across Greater Manchester to ensure that they incorporate a full sustainability appraisal which leads to reduced carbon emissions but also significant employment and businesses opportunities for our local low carbon sector. This framework will be set alongside a wider green procurement programme designed to build our low carbon sector.

- Revisit and reinvigorate existing or under-utilised low carbon innovation programmes already planned for Greater Manchester (for example through our Science City Strategy or Innovation Manchester) to develop a permanent culture of low carbon innovation across the city, closely connected to Greater Manchester businesses and business support providers.

- Develop a social enterprise programme for local, neighbourhood-level action on a broad range of areas including sustainable travel, energy efficiency and domestic retrofit, following the successful 'carbon Co-op' model.

8.2 Working across different spatial levels

The environment we share does not recognise political and administrative boundaries at any scale – both within Greater Manchester and beyond. The success of our strategy depends upon collaboration at every spatial scale and is rooted in linking together the mutual benefits for individuals, organisations, communities, cities and nations. The more efficient home, the low carbon business, the sustainable neighbourhood, the 'decarbonised' energy infrastructure are all ends in themselves; yet they all contribute to one another and multiply the opportunities for a more prosperous future.

Key outcomes by 2020 will be:-

- To have developed a high level of co-ordination of climate change policy and activity between the different spatial levels in Greater Manchester, so that Districts, business and voluntary organisations, neighbourhoods and households are all able to value how their collective role and actions contribute to and benefit from activity undertaken or led at a Greater Manchester spatial level.

- To have aligned our strategy with national and international climate change targets and will work with national government to encourage them to continue to develop their actions in line with our strategy.

To achieve these outcomes we will:

- Enable opportunities for residents and households to participate in the low carbon economy, planning, and contribute to this strategy.

- Influence all key organisations and the Districts to align our climate change strategies.

- Deliver mechanisms that enable alignment with the climate change plans of businesses and third sector organisations.

- Influence government to maintain its commitments to decarbonising the grid and stimulating the low carbon resilient economy, fulfilling the key national contribution to our strategy.

8.3 Developing a common measurement methodology

Many organisations across Greater Manchester, including our Districts, are actively involved in measuring emissions, using a variety of tools and methodologies. To improve coordination and provide transparency and efficiency, we will seek to develop a robust common approach to carbon accounting and reporting, with standard baselines and timescales.

We will retain the common approach for the Districts developed by National Indicators 185 and 186, and incorporate a continuing close liaison with Government on methodology compatibility and access to nationally compiled data. We will also optimise compatibility with mechanisms such as the Carbon Reduction Commitment and Carbon Disclosure Project and create opportunities for businesses, communities and individuals to contribute.

This converged approach to carbon accounting will be one of the key outputs of our carbon metrics project. In developing an overall target for Greater Manchester and a common approach, it will recognise that targets within GM will vary from district to district: each GM district has different opportunities for carbon reduction, as a direct result of differing economic and built landscapes.

This common approach will enable us to track our progress and develop a Greater Manchester pathway to delivering our share of emissions reduction through to 2050 based upon our priorities for economic growth and decarbonisation. This will shape the contribution that each sector needs to make, whether housing, transport, or businesses and inform the development of projects and programmes through carbon accounting and appraisal.

Key outcomes by 2020 will be:-

- To have adopted a common methodology for measuring and reporting on carbon emissions to achieve a consistent and convergent approach to performance monitoring across Greater Manchester.

- To have developed prominent reporting on emissions and progress so that businesses, residents and visitors can have easy access to information about our action on climate change.

- To have devised our preferred pathway to emission reduction by 2020 and 2050 that reflects our development priorities, and put in place voluntary carbon budgets and targets.

- To have developed and promoted an understanding of consumption based carbon accounting so that we can measure embedded as well as direct emissions when appropriate.

To achieve these outcomes we will:

- Deliver a process of carbon accounting and appraisal to assess the carbon impact of policies and programmes to inform investment decisions, procurement and commissioning by both the public and private sector.

- Deliver annual carbon data reports and disseminate publicly to stakeholders to influence policy and culture.

- Enable agreement and adoption of a common framework of climate change methodologies and tools and a short timescale for convergence.

- Anticipate future developments in carbon reporting, including consideration of consumption-based emissions, outsourced and embedded carbon, deferred carbon costs, and lifecycle analysis, and seek to build this into our monitoring approach at the earliest opportunity.

8.4 Co-ordinating business and organisation networks

Several 'business environment' networks have developed in Greater Manchester over the last ten years, often part of national or regional initiatives, often meeting the needs of particular business sectors providing support on resource efficiency linked to risk, reward and reputation. More than 3,000 organisations participate in these networks, making significant contributions to the economy, to a collective increase in knowledge and practice of resource efficiency and environmental responsibility and to an increase in local demand for low carbon goods and services.

There is now an opportunity to build from this platform to further embed resource efficiency into Greater Manchester businesses, support those companies who have, or could develop new, low carbon environmental goods and services and broaden the base of local supply chains in the low carbon economy. These local supply chains are critical to investor confidence and to optimising the benefits of low carbon jobs in the Greater Manchester employment market. This will enable businesses to benefit from early adopter advantage and drive future prosperity. Early action at a Greater Manchester level will also help bridge any gaps that arise in support and advice as national programmes such as Waste and Resources Action Programme (WRAP) or the Carbon Trust see their funding being cut.

Key outcomes by 2020 will be:-

- To have developed a co-ordinated approach to business support networks that help businesses to realise their full potential in contributing to and benefiting from a low carbon economy. Providing companies with access to knowledge, expertise and practical skills that help them innovate, adapt, reduce their exposure to climate change risks and increase their resource efficiency.

- These networks will, actively stimulate and suppor companies to develop low carbon environmental goods and services, having created an effective local supply chain capacity necessary to make retrofitting and energy programmes an attractive investment proposition, thereby creating local jobs and supporting social, economic and environmental development in a carbon constrained world.

To achieve these outcomes we will:

- Develop extended and aligned networks of green business support and development to meet the needs of all types of business organisations.

- Align these networks to stimulate the market for low carbon environmental goods and services.

- Support companies to better understand the carbon levels in their supply chains and take action to manage and mitigate this.

- Actively promote green 'business-to-business' activity to accelerate demand.

- Maximise the opportunity for business engagement in carbon measurement, reporting and promotion across GM.

- Influence and support new low carbon / low resource social enterprise

- Identify and support green collar enterprise as well as collaborative sustainable consumption and production opportunities across Greater Manchester.

8.5 Recognising inequality, health and wellbeing

The impacts of climate change will impact upon everyone in Greater Manchester, but they will be most keenly felt by the most vulnerable members of society who have least choice and are least well equipped to adapt. Our more deprived neighbourhoods typically experience low quality environment goods and services and some consequences of climate change such as reduced mobility and higher urban temperatures may increase inequalities.

We will address the risk that people and places facing poverty and disadvantage are likely to be disproportionately affected by climate change, and our plans need to ensure that we maximise their access to low carbon

solutions. We will embed our understanding of the potential impacts of climate change on human health into Greater Manchester's wellbeing strategies, facilitate access to low carbon goods and services by the most deprived, tackle fuel poverty in our Green Deal programmes, prioritise flood risk abatement in deprived communities, adapt our service provision, and create an accessible quality environment for all. We will also maximise the opportunities for those from poorer neigh2.bourhoods to take up low carbon jobs and participate in 'green' enterprise.

Key outcomes by 2020 will be:-

- To have minimised the risks and impacts of climate change on health and well-being and prioritise the needs of those in the most deprived neighbourhoods.

- The integration of low carbon projects into neighbourhood plans, promoting carbon literacy, stimulating engagement and providing support for local action that increases active participation and sustainable social enterprise.

- To have targeted flood risk management programmes in deprived neighbourhoods and taken steps to eliminate fuel poverty.

To achieve these outcomes we will:

- Deliver retrofit programmes that target vulnerable neighbourhoods and recognise that with fuel poverty, the first priority may be health, not carbon.

- Enable shared knowledge of potential impacts by mapping the spatial perspective of vulnerability, environmental quality and access to environmental goods and services.

- Prioritise deprived neighbourhoods with high flood risk in our flood risk management strategies.

- Enable the resilience of Health/Fire/Police and Civil Contingency services and develop extreme event scenarios.

- Influence low carbon economic activity, interaction and interdependency at neighbourhood level, giving priority to the most deprived communities.

- Promote the development of local food production, both commercially and through community and household schemes, supporting opportunities for small scale urban agriculture and access to local produce through farmer's and country markets.

- Promote and facilitate the environmental and health benefits of active and sustainable travel and actively support mobility in deprived neighbourhoods.

8.6 Embedding action on climate change within the spatial strategy

The development of our Spatial Framework will reorganise the connections and interdependencies between different geographical areas and environmental and economic capacities for change, including our interactions with the climate. The framework will prioritise flows of people, energy, water and resources to reduce our future 'footprint' and maximise future security, recognising the interdependencies of economic centres and neighbourhoods and the infrastructures that connect them to each other and the wider environment. It will 'add value' to Local Plans produced by individual Districts and help to plan and manage our shared opportunities, risks and consequences.

Our framework will approach Greater Manchester as a single functional economic market area, managing the interactions between local distinctiveness and the broader functioning of the city, looking beyond the lifetime of a plan, and incorporating understanding of the relevant long term climate risks and consequences facing both the districts and Greater Manchester as a whole.

Key outcomes by 2020 will be:-

- To have developed the cross boundary frameworks for spatial and infrastructure planning both within Greater Manchester and with our neighbours, in order to accommodate all the opportunities and challenges presented by climate change into future development proprities.

- To have developed these frameworks to identify the synergies and opportunities, resolutions and solutions between the challenges of climate change and our pursuit of economic growth, investment in strategic infrastructure and our traditions of culture and place.

- To have shaped Greater Manchester as a place that secures radical cuts in emissions, secures growth whilst minimising vulnerability and increasing resilience.

To achieve these outcomes we will:

- Deliver work to Identify, protect and provide areas of high biodiversity and 'carbon sinks', maximising opportunities to enhance and protect the natural environment in the long term.

- Support the key development requirements of delivering low carbon energy, transport, buildings, green and blue infrastructure and sustainable consumption at the sub regional, district and neighbourhood level.

- Give priority to the development of effective energy planning.

- Strengthen adaptation functions that operate on a sub-regional/regional scale e.g. water supply, flood risk management, transport and green infrastructure.

- Ensure better co-ordination of climate change and sustainability requirements in Core Strategies and Development Plan Documents across GM to create and maintain a GM standard.

9. Governance and Delivery

Our strategy sets a single framework of priorities for action across Greater Manchester, and our approach will be to further develop joint-working arrangements so we address these opportunities as a co-ordinated team.

We will build upon our extensive track record of partnership working. Groups of organisations are already working together in several areas including Green Deal development and joint plans for energy, green infrastructure, spatial frameworks, electric vehicles and flood risk management. AGMA's Environment Commission is in place to oversee this agenda, and action on some themes – transport and waste – are already managed collectively through Transport for Greater Manchester and Greater Manchester Waste Disposal Authority and GM is served and supported in other areas by the Manchester family of organisations.

While the governance overview of the whole strategy will be undertaken by the Environment Commission**,** we will extend management and implementation functions at a Greater Manchester scale, creating a strong single mechanism for Districts and partners from all sectors to work as a co-ordinated team. This team will be developed to work alongside all the other units of AGMA, GMCA, the LEP Board and the Manchester Family to provide one source of co-ordinated climate change advice, information, policy and communications.

By converging systems and resources, we will make the most of efficiencies, reduce duplication and focus capacity on shared priorities. With one co-ordinated set of climate change plans and metrics, co-ordinated environmental communications and common programmes for investment and appraisal, we will ensure that the objectives of our strategy are translated across all of Greater Manchester's strategic priorities. These will be reflected in a rolling programme of action plans initiated by this strategy: a first phase Implementation Plan that sets out a delivery programme of projects and targets to be achieved by 2014 will be put in place by 2012.

The co-ordinating role of the **Environment Commission** will involve closer joint working with AGMA's other Commissions, GMCA and the LEP. It will also entail a headline monitoring progress through the performance indicators, providing reports on the collective impact of our plans and programmes and overseeing the collection and collation of indicative carbon data across Greater Manchester.

Implementation will depend upon the development of investment programmes and the progressive adoption of these priorities by a large number of organisations operating at different scales and often working collaboratively. Each District, organisation, and neighbourhood will continue to make, develop and deliver its own plans and programmes, but they will form parts of a co-ordinated whole, supported, guided and informed by a team that ensures we share knowledge and good practice effectively and convert ideas into scaleable projects that can benefit all parts of our city.

Some key aspects of our strategy depend substantially upon action being taken nationally and internationally, particularly in decarbonising the national electricity supply and establishing policy, regulation and programmes that incentivise change. We will work closely with national, north-western and core-cities partners to influence and contribute to actions taken by Government and national organisations, and collaborate with them to maximise the benefits of aligned policies and investments.

The Environment Commission's **LCEA Programme Board** will maintain an overview of low carbon projects in the LCEA workstreams and we will create the capacity to support a common carbon metrics reporting function. We will work with the **Greater Manchester LEP**, business leaders and the **GM Chamber of Commerce** to support and monitor enterprise activity in the private sector and promote low carbon efficiencies in business development. Stimulating investment in low carbon projects and optimising sustainability in economic development will be overseen by our **GM Investment Centre of Excellence**.

Responsibility for progressing key themes of work will include the following:-

- Buildings: the Environment and Planning & Housing Commissions will maintain an overview of retrofitting programmes that will be implemented by partnerships including business partners, Districts, housing and property organisations working together through the Green Deal. Workstreams in the LCEA Delivery Plan will be overseen by the LCEA Programme Board and Districts will oversee the progress of new low carbon construction.

- Energy: The Greater Manchester Energy Group will oversee the implementation of a GM Energy Plan and work with energy companies, Districts and other agencies to deliver changes in generation, distribution and supply. An energy workstream in the LCEA Delivery Plan will be overseen by the LCEA Programme Board.

- Transport: Transport for Greater Manchester will lead the work on sustainable travel, co-ordinating work with Districts and partners through LTP3, the Sustainable Transport and its Local Implementation Plans.

- Green & Blue Infrastructure: the Planning & Housing Commission will maintain an overview of our Green Infrastructure Plan, working closely with the Environment Agency, Districts and partners on plans and programmes that manage flood risk and maximise the capacity of our waterways and greenspaces to improve environmental quality.

- Sustainable Consumption: the Environment Commission will progress a policy overview, working with the Improvement & Efficiency Group on co-ordinated sustainable procurement and working with relevant agencies including the Greater Manchester Waste Disposal Authority seeking to influence more sustainable production, in a way that provides a platform to create more green jobs.

Conclusion

This strategy is not intended as a prospectus or a menu of strategic options; a smorgasbord of 'nice to haves'. The direction set out here is now essential and in some respects only the beginning of a much greater process of transformation in the way we live, work and play.

Climate change is happening now and if we do not craft a new industrial and civic strategy to respond to it with all of the energy and innovation that Greater Manchester is rightly famous for, we will be seriously disadvantaged in the years ahead.

At the same time, if we fail to fully adapt to the consequences of climate change that are now inevitable, we risk exposure to extreme climate impacts which will damage our businesses, disrupt our services and infrastructure and create hardship for those in our most disadvantaged communities. It is our collective duty to prepare for a very changed future.

Across the world, great cities and city regions are blazing a trail on climate change often leaving their home nations standing in their wake. We should be fully aware to the fact that there is a global league of 'climate-friendly' cities who we should see as our benchmark for success, our competition in pursuing the economic benefits of the low carbon future.

More detail will follow on the heels of this strategy and it will of course need revising. When we better know the details of our proposed delivery mechanisms, when carbon financing and accounting becomes clearer, when a national Green Deal comes into play, there will be a need to return to this strategy and refresh it, to steer successive action plans with policy that keeps pace with progress.

Action on climate change is a fast-moving landscape in policy terms; our collective challenge is to start to match that pace with reductions, not increases, in our global CO_2 emissions, with steps to embrace a revolution in energy and retrofitting technologies and with preparations to mitigate the risks of extreme weather events. We need to match our words with measurable progress, and do so very quickly.