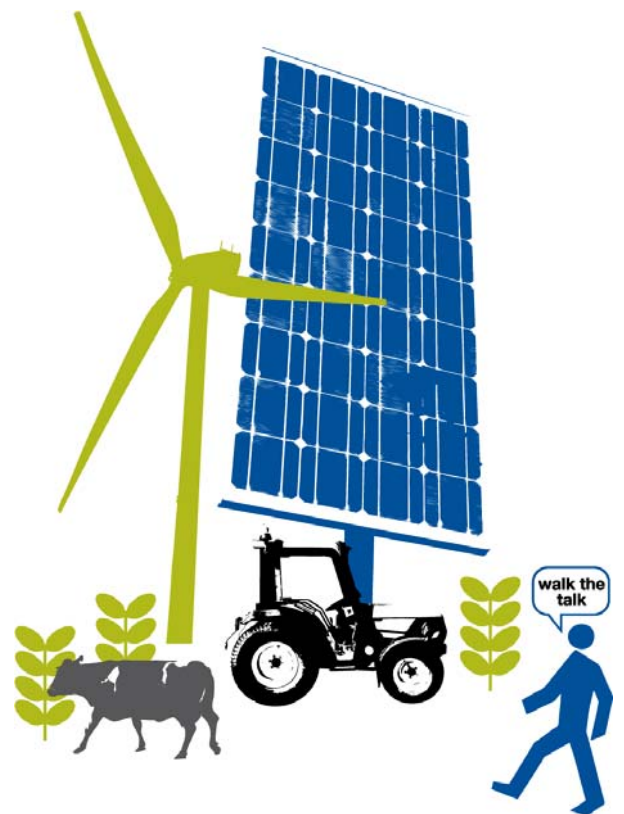




West Midlands
Regional
Observatory

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Challenge or Opportunity? How to plan for Climate Change



A State of the Region Thematic Report

November 2009

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Executive Summary

Executive Summary

This report explains the challenges and opportunities that may face six different policy areas as a result of climate change.

Climate change is one of the most significant agendas facing the West Midlands. However, people and organisations are often unclear about the nature and scale of the challenges and opportunities, or of the responses and choices that they will have to make.

By viewing things from a range of policy perspectives we are aiming to demonstrate that climate change will impact on all areas of life but that these areas can all contribute to minimising the impact, help adapt to the changing climate and take advantage of the opportunities that arise.

We have been assisted by the West Midlands Climate Change Panel, the West Midlands Climate Change Office and the Regional Data and Intelligence Network (RDIN) Environment Topic Group. They have given guidance on the evidence and the themes covered in this report as well as providing invaluable contributions to the policy debate. We are also grateful to the authors of the chapters and those that helped us develop the themes. The chapters reflect the viewpoints of their authors, rather than a holistic combined view of West Midlands Climate Change Panel and Office.

Ultimately this report will help decision makers understand how climate change will impact on them and also to give practical ways of adapting to, and taking advantage of, the opportunities and challenges presented by climate change.

The built environment

The way the built environment is planned and used is important to reducing carbon emissions and managing the negative climatic impacts on places, thus minimising disruption to people and businesses. The significant amount of natural resources used and the waste produced tend to reach far beyond the physical limits of the built up area. In addition, half of the UK's carbon emissions arise from energy use in the built environment, and the majority of existing buildings and places were not designed to be 'low carbon'.

People often have little awareness or reflection on the energy, water and food needs that are essential to support our modern lifestyles.

Planning can drive our transition to a low carbon future but it is only one aspect that will influence this move. Moving to 'low carbon living' needs a combination of direct reduction in energy consumption and improved energy efficiency.

Natural resources - water, land use and food

It is important that we take action now to limit and adapt to the impacts of climate change on our region's natural resources. We need to ensure:

- A continuous improvement of the quality of our rivers and lakes for the benefit of people, the economy and wildlife;
- A safe and secure water supply in order to meet the needs of the public, business and the environment;
- We manage and adapt to the consequences of flood risk and ensure people, property and critical infrastructure are better protected;
- We manage our land in a way that maintains and improves soil quality and biodiversity;
- That the Region's poorest people don't suffer most from the impacts of climate change.

By factoring climate change into our planning and investment decisions, we can minimise the costs of adapting to that change. We have made progress in tackling environmental pollution and degradation in the West Midlands but there are still many pressures on our natural resources. With

a changing climate these challenges are becoming more complex. The increasing stress we are putting on our Region's resources and environmental systems cannot be sustained, especially as the population continues to increase, without improving our efficiency and altering how we manage our natural resources.

Transport

Sustainable transport is supported at local, regional, national, European and international levels and it provides opportunities to reduce carbon emissions and address the climate change agenda.

There is no a single 'magic bullet' action that will reduce the carbon footprint of the transport sector. We need a number of inter-related measures that set the tone for a shift in priorities over the medium term.

Many individuals and organisations understand there is a relationship between transport, climate change and CO₂. However, historically most of us have failed to act on that information. We need a collective change of behaviour. While a holistic approach is needed it is very difficult to change behaviour at zero cost. The cost of carbon needs to be factored into all our decision making processes.

Health

Climate change has two potential areas of impact on the health sector. The first is in reducing the impact that the NHS itself has in terms of the emission that its estate and its work create. The second is the effect that the change in climate could have on the health of the public.

Some strands of activity where the NHS can begin to produce a reduction in emissions in the region include: delivering care with as little unnecessary waste as possible; improving the impact of its infrastructure; reducing journeys and encouraging more sustainable travel; influencing the behaviours of its staff; and using efficiently other natural resources within their service, such as water and food.

The impacts of climate change on health will be direct - from increase in diseases or from natural disasters - and indirect, as a result of the effects from water and food shortages and population growth. The health sector needs to be planning for these impacts now to be ready for them when they happen.

Energy & Waste

The use and generation of energy is one of the areas that will be most affected by climate change over the next fifty years. There will be a need to generate significantly more energy from renewable sources and a need to then use that energy much more efficiently.

The generation of energy will be affected by shortages of natural resources; the drive to produce energy in ways that reduce CO₂ emissions; and also by energy security. Our use of energy will also change. It will have to be smarter and we will need to be much more aware of the impact of our energy use.

The connection between waste and climate change is complex. The amounts of waste we produce and the way we treat it have major roles to play in tackling climate change. We need to regard waste as a resource. But also reduce greenhouse gas emissions from waste management to limit climate change.

Key challenges for the waste sector in the West Midlands include an expected gap in treatment capacity by 2020 and increasing waste management costs. We need to adopt an "equivalent self-sufficiency" approach for each Waste Planning Authority in the region.

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We need to ensure the West Midlands becomes and remains a zero waste growth region. Promoting waste management up the waste hierarchy by maximising, in the following order, the reduction, re-use, recycling, composting, energy recovery and, as a last resort, disposal of waste can help to meet this goal. There are some significant opportunities within the sector to bring waste -more fully into business planning and it is critical that we improve the current perception of the waste industry.

Business, skills and education

The region has a strong environmental technologies sector, but the low carbon economy challenges and opportunities that will arise from climate change are just as relevant to the broader economy.

Business must also prepare for the challenges of our changing climate for example through risk management, continuity planning for staff, suppliers and markets and flood plans. Planned adaptation is more effective and less expensive than last minute, reactive adaptation or damage limitation. We need to plan by understanding the new pressures climate change will bring, rather than using historic information and assumptions that will be inappropriate.

Innovation and energy efficiency will be crucial in moving towards a low carbon economy. The way businesses manage their staff will also provide opportunities to achieve behavioural change in areas such as: the amount and mode of travel and home remote working. Ethical consumers, and their purchasing decisions, can also have an impact on the region's businesses.

For the broader regional economy, identifying the skills needs of a low carbon economy is difficult as it is as yet unclear where the opportunities will come from. The environmental technology cluster businesses identified some of their skills challenges:

- Broad changes in skills required include: the need for flexibility of skills deployment globally, the need to integrate technical engineering skills with commercial acumen, awareness of environmental technology development globally.
- Specialist skills requirements include: operational waste plant specialists, scientific specialists, installation skills specifically in relation to renewable energy systems and appropriate skills and qualifications for energy assessors.

Finally, the education sector has the opportunity to impact on climate change through mitigation and adaptation. It is uniquely placed to have direct impacts through its building, purchasing and operations and also indirect impact through the teaching it provides.

Conclusions

Across all the policy themes we identified the following consistent messages:

- Climate change will bring some very serious challenges but there are already a whole range of opportunities for mitigating against, adapting to and benefiting from climate change.
- We need to use fewer resources and use them more efficiently.
- By factoring climate change into our planning and investment decisions now, we can minimise the costs of adapting to that change in the future.
- On a consumer level, the use of demand management is an important signal towards the more efficient use of resources.
- There are opportunities ahead: a growing market for those businesses that operate in the environmental technologies sector; new drivers for innovation; the opportunity to become self-sufficient in energy supply and reduce costs.

Executive Summary

- The West Midlands tourist industry should benefit from warmer weather and the escalating cost of foreign travel, but this needs to be planned sustainably so we do not damage our environment.
- There are two strands to the infrastructure challenge. One is the need for new infrastructure to facilitate adaptation and mitigation of climate change. The second is the ability of large scale infrastructure procurement to drive low carbon development.

This work demonstrates the reasons why policy makers have to act now on climate change but also why there are great opportunities to be had if they act. The Observatory is already developing more detailed work on the opportunities that are available to the broader economy of the region from a transition to a low carbon economy. The report of that project is due to be published later this year.

Introduction

Introduction

Since 2004, the Observatory has been publishing annual State of the Region reports to inform strategic thinking and policy development in the region. Whilst we will continue to publish the annual reports, we have restructured the State of the Region process so that it will bring the reports closer to the needs of policy makers across the region.

Evidence-based policy can only become a reality if those producing the evidence and those making the policy work together. There needs to be an ongoing dialogue between the two groups not just occasional contact. The new State of the Region process provides exactly that. It consists of a series of thematic dialogues. Each starts with a workshop bringing together the key policy and decision makers with the researchers and analysts who supply evidence. The workshops receive “think-pieces” from experts in the field drawn from across the country to provide a fresh perspective and stimulate debate. Following the workshop, a work programme is produced to develop the regional evidence base and link it to policy developments, involving colleagues from across the region, and beyond it, throughout the process.

One of the outputs of each dialogue is a thematic report, in some cases more than one. These set out the key evidence and how it links to policy. This report is one of these State of the Region Thematic Reports.

Background

This State of the Region thematic report has been produced as the result of a dialogue which follows on from the State of the Region Update Report 2007⁽¹⁾, which explored the challenges and opportunities that the West Midlands faces from Climate Change. As with that report this is not a scientific view of the evidence but takes what we know to be happening and explores what it means at a regional level.

As with all of the State of the Region dialogues this work began with a workshop that was attended by policy makers, those involved in delivery, researchers and academics. The workshop was used to focus the direction of this dialogue.

What came out of the workshop loud and clear was that there is no longer a shortage of evidence about the potential impact of climate change. If anything delegates felt that there was an almost overwhelming amount of evidence on the subject. The key point was that despite all of this evidence it is still difficult to make things happen - to act on the evidence.

The Observatory was asked to look at how the evidence is presented and try to find a way of making the evidence more accessible to "non-environmental" readers. Therefore this report is aimed at decision makers from a non-environmental background. It sets out to explain the challenges faced by different policy areas but also to identify opportunities that come from the climate change agenda.

By viewing climate change from a range of policy perspectives we are aiming to demonstrate that climate change will impact on all areas of life but that these areas can all contribute to minimising the impact, help adapt to the changing climate and take advantage of the opportunities that arise.

We have been fortunate to be assisted by the West Midlands Climate Change Panel, the West Midlands Climate Change Office and the Regional Data and Intelligence Network (RDIN) Environment Group. They have given guidance on the evidence and the themes covered in this report as well as providing invaluable contributions to the policy debate. We are also grateful to the authors of the chapters and those that helped us develop the themes. The policies reflect the views of authors, rather than a holistic view of West Midlands Climate Change Panel and Office.

Ultimately this report will help decision makers understand how climate change will impact on them and also to give practical ways of adapting to, and taking advantage of, the opportunities and challenges presented by climate change.

1 West Midlands Regional Observatory (2007) State of the Region Update Report 2007

The Scale of the Challenge

The Scale of the Challenge

Climate is the average weather experienced over a long period. This includes temperature, wind and rainfall patterns. The Earth's climate is not fixed, and in the past has changed many times in response to a variety of natural causes. In the last 100 years however, the Earth has warmed by 0.74°C and by around 0.4°C since the 1970s.

There is a direct correlation between temperature and the levels of "greenhouse gases" in the atmosphere (mainly carbon dioxide, methane and nitrous oxide) and these have gone up strikingly since the start of the industrial revolution. At present, over 30 billion tonnes of CO₂ are emitted globally each year by burning fossil fuels, and another 7 billion tonnes by changes in land use, mainly deforestation, in addition to those produced by natural processes. These gases are now concentrated in the atmosphere at levels not seen for at least the past 650,000 years and are increasing at an accelerating rate as fast-growing nations invest in carbon intensive infrastructure and as demand for energy and transport increases around the world.

The consequences of these changes are serious. We are already experiencing sea level rise and it is expected that many tens of millions of people will be affected. Climate change threatens the basic elements of life for people around the world - access to water, food production, health, and use of land and the environment and these will accelerate as the world gets warmer. For example, the melting or collapse of ice sheets would eventually threaten land which today is home to 1 in every 20 people. Even if greenhouse gas emissions are controlled today, we will still have to deal with climate change impacts as weather systems take decades to adjust. Furthermore, the impacts of climate change internationally and within the UK are not evenly distributed - the poorest countries and people will suffer earliest and most.

There will be major economic impacts too. In his review on the economics of climate change, Sir Nicholas Stern estimated that if no action is taken the costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever - and possibly as much as 20%. In contrast, he estimates the costs of action to avoid the worst impacts of climate change can be limited to around 1% of global GDP, but only if action is taken now to reduce greenhouse gas emissions.

In May 2009 the UK Government committed to reducing emissions of all greenhouse gases (GHGs) by at least 80% in 2050 in order to tackle climate change and 34% by 2020. If applied globally, it is estimated this would reduce the risk of world temperature increasing by more than 4°C, the point at which temperatures would start to increase exponentially, to 50% i.e. a one in two chance. The UK is clearly demonstrating leadership on this issue, but to be effective it does require us all to play our part.

Business is increasingly recognising the economic implications of a changing climate, in terms of the opportunities it presents but also the economic damage it could cause and the challenges facing us. Much of the discussion in the West Midlands focuses on the many opportunities for exploiting new green technologies, and the West Midlands is well placed to capitalise on these, but the reality is that all business will need to engage with this agenda - to reduce its carbon emissions in response to policy initiatives, to remain competitive in a world where some economies are already responding much more rapidly than ours and to deal with the impacts of changing weather on their business.

There are similar issues for all organisations. They will need to respond to the challenges that climate change presents us with by managing their own operations, their procurement decisions and in delivering services.

Communities and individuals will need to respond too, through their use of energy and as consumers. There will be real challenges for us as a society to adopt the sorts of behaviours that will really make a difference.

The Scale of the Challenge

But perhaps the area of greatest challenge is how we develop and implement strategies, policies and programmes regionally and sub-regionally that enable the West Midlands to radically transform its infrastructure so that it is possible to develop into a low carbon region, resilient to the impacts of climate change

An Overview of the Evidence

An Overview of the Evidence

The UK is subject to many conflicting greenhouse gas reduction targets. However, it agreed to **reduce greenhouse gas emissions by 80% by 2050, and 26% by 2020**, under the 2008 Climate Change Act.

The Climate Change Committee⁽¹⁾ identified two sets of carbon budgets (interim and intended⁽²⁾) to help the UK meet its ambitious reduction targets. They cover three time periods: 2008-2012, 2013-2017, and 2018-2022.

The **interim budgets say the UK should reduce greenhouse gas emissions by 34% in 2020**, in relation to 1990 levels (21% relative to 2005 levels). This amounts to 110 million tonnes of carbon dioxide equivalent (MtCO₂e).

The **intended budgets say the UK should reduce greenhouse gas emissions by 42% in 2020, and 20% in 2010**, relative to 1990. This amounts to a 175 MtCO₂e reduction, by 2020. The interim and intended carbon budgets targets are summarised in Table 1.

Table 1 - Greenhouse Gas budgets for the UK for 2008-2022

Million tonnes of CO ₂ equivalent	Budget 1 (2008-2012)	Budget 2 (2013-2017)	Budget 3 (2018-2022)
Total interim budget	3,018	2,819	2,570
Total intended budget	3,018	2,679	2,245

Energy

The West Midlands Energy Strategy was published in November 2004⁽³⁾, and showed the region's commitment to addressing this aspect of climate change. It helped partners deal with climate change by encouraging: energy efficiency; renewable energy use; the take up of climate change business opportunities; and joined up working. It set targets and outlined indicators for measuring progress.

The Climate Change Action Plan was published in 2007⁽⁴⁾, and demonstrated the region's commitment to tackling climate change. In 2009, the Observatory drew together a set of indicators to measure progress against the Climate Change Action Plan⁽⁵⁾. The Observatory reviewed the Energy Strategy indicators, and newer indicators (developed by the Department for Business, Enterprise and Regulatory Reform (BERR) and the Department for Environment, Farming and Rural Affairs (DEFRA)), to decide which indicators should be included.

BERR and DEFRA have not backdated the newer indicators so we could only give the West Midlands current position, rather than comparing it to 2004. The key messages from the monitoring work are listed below:

- 1 Building a low-carbon economy by the Climate Change Committee
- 2 The interim budget should be used before the 2050 reduction target for greenhouse gas emissions has been agreed globally, and the intended budgets should be used afterwards.
- 3 Advantage West Midlands, Government Office for the West Midlands and West Midlands Regional Assembly (2004) West Midlands Regional Energy Strategy
- 4 Government Office for the West Midlands (2007) West Midlands Regional Climate Change Action Plan
- 5 West Midlands Regional Observatory (2009) West Midlands Climate Change Action Plan Targets & Monitoring - TM1 Stage 2

An Overview of the Evidence

Overall **energy use**⁽⁶⁾ in the West Midlands fell by 5.5% between 2003 (155,993 GWh) and 2006 (147,505 GWh).

West Midlands **businesses** used more energy (35% share), than households (34% share), or vehicles (32% share), in 2006.

Most energy used in the West Midlands comes from non-renewable sources. 40% of energy used is from **petroleum products**, and 39% is from **natural gas**. However, renewable energy opportunities exist, such as wind power⁽⁷⁾.

The West Midlands consumes the third highest proportion of energy from **renewable sources** (0.4%), in England. However, its regional target is to source **5% of electricity** from renewable sources by 2010 and **10% by 2020**.

Households use **electricity and gas** more than other types of energy. **Natural gas** accounts for 74.2% of **household energy use** in the West Midlands, and **electricity** accounts for 21.1%.

Businesses are becoming more **efficient**, energy intensity decreased to **513 tonnes of CO₂** for every **£million of GVA** in 2006 from 554 tonnes in 2003.

Household recycling in the West Midlands continues to improve, standing at 33% in 2007/08⁽⁸⁾. DEFRA modelling indicates that every **1% increase in recycling saves one million tonnes of carbon dioxide equivalent**.

Household waste sent to landfill continues to decrease, standing at 37% in 2007/08. However, 3.9 million tonnes of household and business waste is landfilled or spread to land annually. In total 9.9 million tonnes of waste is landfilled annually.

Waste is a potential energy source for the West Midlands. Converting all carbon from waste to electricity would satisfy over 40% of household electricity demand in the region. But we must treat waste as a resource, maximising, in the following order the reduction, re-use, recycling, composting and energy recovery and as a last resort disposal of waste.

Air quality in the Midlands deteriorated between 1998 and 2007. Emissions have increased by 11%, resulting in a 9% increase in global warming potential⁽⁹⁾. Further data on carbon dioxide emissions and greenhouse gas emissions is included in the next section. The majority of the region's emissions come from road traffic.

Greenhouse gas emissions

There are two approaches to measuring greenhouse gas emissions, **production** and **consumption based**. Production based approaches allocate emissions based on where they were produced (by industries or transport). Consumption based approaches allocate emissions to the consumer of a product or service, regardless of where the emission was created. Both are important in understanding our contribution to climate change.

Measuring greenhouse gases in carbon dioxide equivalent enables them to be compared in a way which takes into account the global warming potential of each gas, as **some gases are more harmful than others**. Sulphur hexafluoride is the most harmful greenhouse gas but emissions are low, whereas carbon dioxide is the least harmful but emissions are high.

6 Refers to the following fuel types: coal, manufactured fuels, petroleum products, natural gas, electricity, renewables and waste

7 Please refer to Advantage West Midlands wind mapping resources study for further information

8 Department for Environment, Food and Rural Affairs (DEFRA) Municipal Waste Management Survey 2007/08

9 Environment Agency Pollution Inventory

An Overview of the Evidence

Greenhouse gas emissions from production

In 2008, 623.8 million tonnes of greenhouse gas emissions (CO₂e)⁽¹⁰⁾ were produced in the UK, reducing by 19.3% from 1990. **Emissions must reduce by a further 14.7% to meet the lowest (interim) 2020 greenhouse gas reduction target.**

Carbon dioxide remains the most problematic greenhouse gas, accounting for 85% of all emissions. CO₂ emissions have only dropped 10.3% since 1990.

West Midlands industries⁽¹¹⁾ produced 31 million tonnes of greenhouse gas emissions in 2006 (CO₂e), a 13.2% reduction from 1998. The most polluting West Midlands' industries are: **agriculture** (15.1% of total emissions), **electricity production - gas** (8.4% share), and **freight transport by road** (7.4% share).

Greenhouse gas emissions produced from agriculture and electricity production in the West Midlands have reduced year-on-year since 1998. However, **greenhouse gas emissions produced from freight transport by road increased** annually by 1.7%. Many other industries increased their emissions over this period, for example the **production of refined petroleum products, construction, air transport and aluminium.**

Greenhouse gas emissions from consumption

West Midlands' energy use produced 45 million tonnes of CO₂ emissions in 2006⁽¹²⁾. This equates to **8.37 tonnes of CO₂ emissions per capita**, which ranks the West Midlands in fourth place against other English regions.

Businesses use more energy than households or vehicles. They accounted for 41.5% of CO₂ emissions, from consumed energy, in 2006.

Electricity and gas use creates more CO₂ emissions than other energy use. Electricity produced 33.7% of total CO₂ emissions, gas produced 23.3%. Other types of energy use produced less than 7% of total CO₂ emissions.

Greenhouse gas emissions from electricity use continue to rise, in the West Midlands. Electricity produced **15 million tonnes of greenhouse gas emissions (CO₂e) in 2007⁽¹³⁾**, a 4% increase from 2005 levels. The West Midlands dropped from the 4th to the 5th lowest emissions in comparison to other regions.

Greenhouse gas emissions from gas burning have dropped, in the West Midlands. Gas use created nearly **12 million tonnes of greenhouse gas emissions (CO₂e) in 2007**, a 7% drop from 2005. The West Midlands stayed in 5th place.

Future climate

The impacts of climate change will be felt globally over the next few decades. Within the UK we will experience **longer, hotter, drier summers, and warmer, wetter winters.** Extreme weather events leading to flooding, higher wind speeds and stormier weather are likely to become more regular.

10 The Kyoto basket of greenhouse gases includes: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride

11 This analysis is based on employment weighted data from Environmental Accounts and the Annual Business Inquiry - employee analysis. Environmental Accounts provides sector level greenhouse gas emissions data and the Annual Business Inquiry provides employment data.

12 Department for Environment, Food and Rural Affairs (DEFRA) (2006) CO₂ emissions estimates by Local Authority

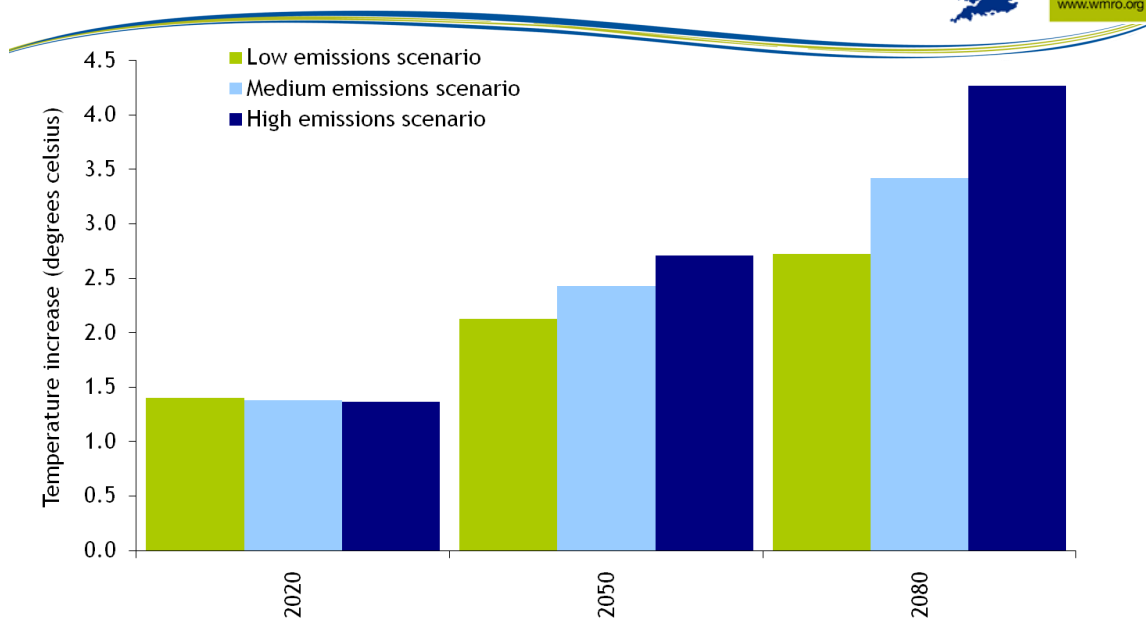
13 BERR energy consumption, DEFRA GHG conversion factors

An Overview of the Evidence

The United Kingdom Climate Impacts Programme (UKCIP) provides climate projections based on three different emissions scenarios: low, medium and high, relative to the baseline period 1961 to 1990. The projections show that **by 2080, we could feel between a 2.7 and 4.3 degrees Celsius increase in temperature**, as outlined in Figure 1. Similarly, summer and winter rain will increase by between 0.7% and 1.7% in 2080⁽¹⁴⁾, please refer to Figure 2 and 3.

Figure 1

Projected changes in average annual air temperature by CO2 emissions scenario



Source: UK Climate Impact Programme 2009 model

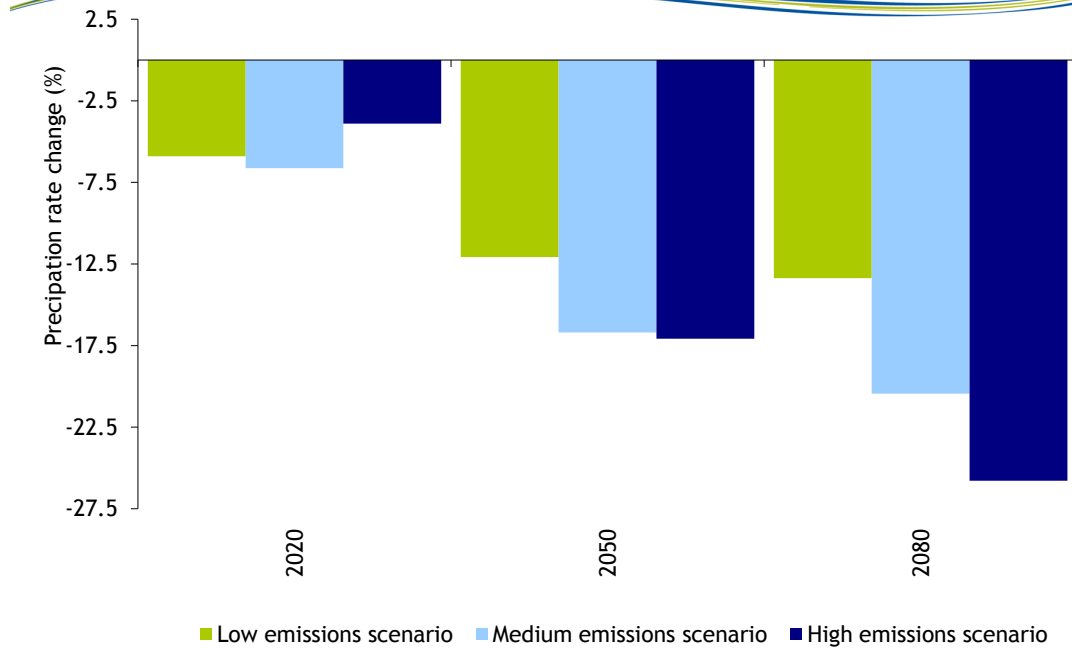
West Midlands Regional Observatory 2009

14 Figures are based on central estimates and range between the low and high emissions scenarios.

An Overview of the Evidence

Figure 2

Projected changes in summer precipitation rate by CO2 emissions scenario

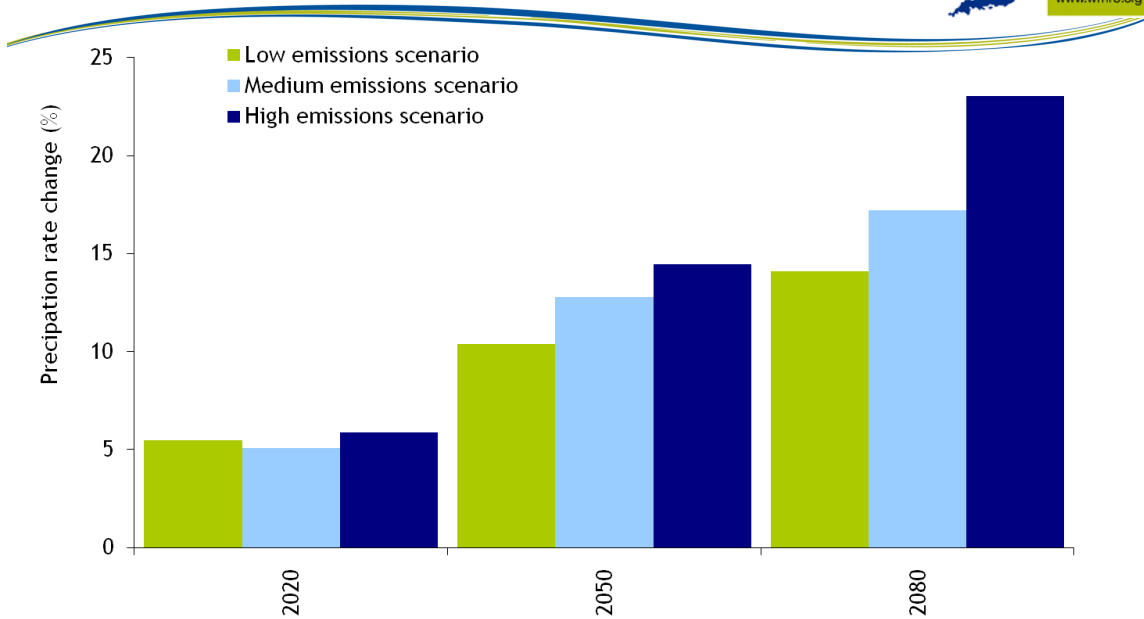


Source: UK Climate Impact Programme 2009 model

West Midlands Regional Observatory 2009

Figure 3

Projected changes in winter precipitation rate by CO2 emissions scenario



Source: UK Climate Impact Programme 2009 model

West Midlands Regional Observatory 2009

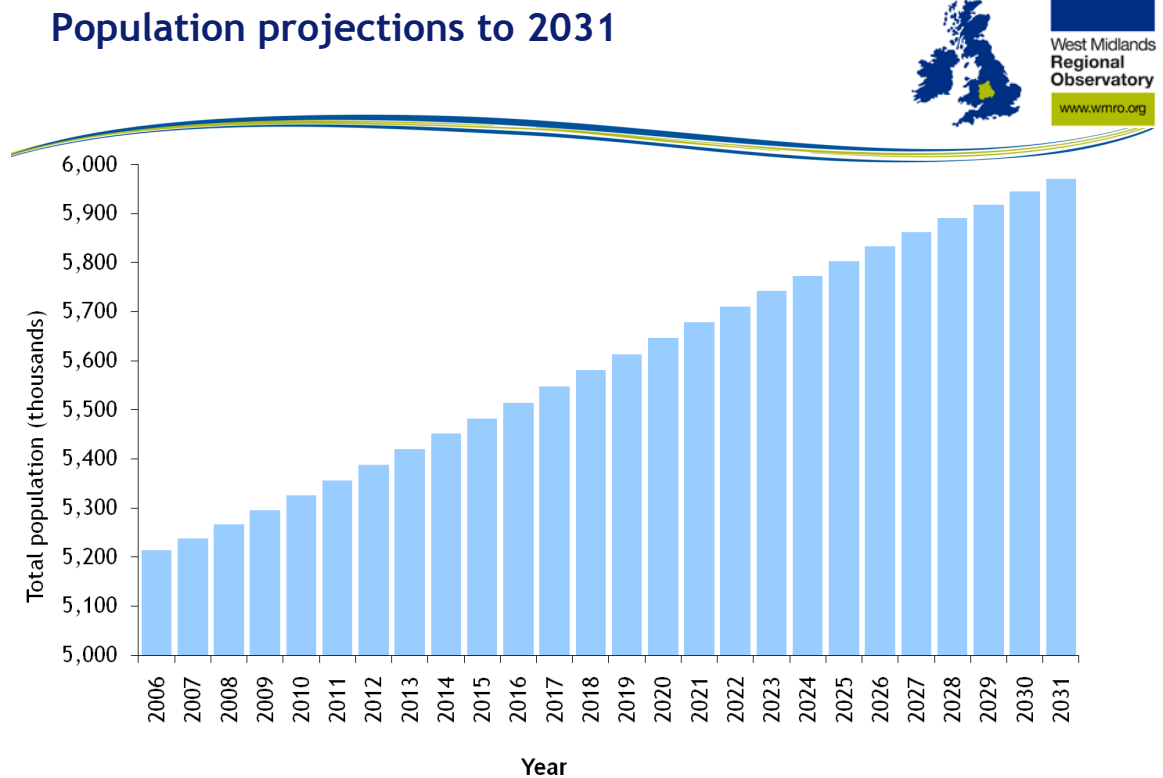
Population and housing

The population of the West Midlands is 5.4 million, but projections⁽¹⁵⁾ show **this will climb to six million** by 2031 (Figure 4). The impacts of increased levels of environmental migration are as yet unknown. As the population grows, more housing will be needed as the current stock will not be sufficient. There is also strong evidence that there is a move to greater numbers of single occupier households which in turn will add to the number of houses required.

15 Office of National Statistics (ONS) 2006-based population projections

An Overview of the Evidence

Figure 4



Source: ONS 2006-based sub-national population projections

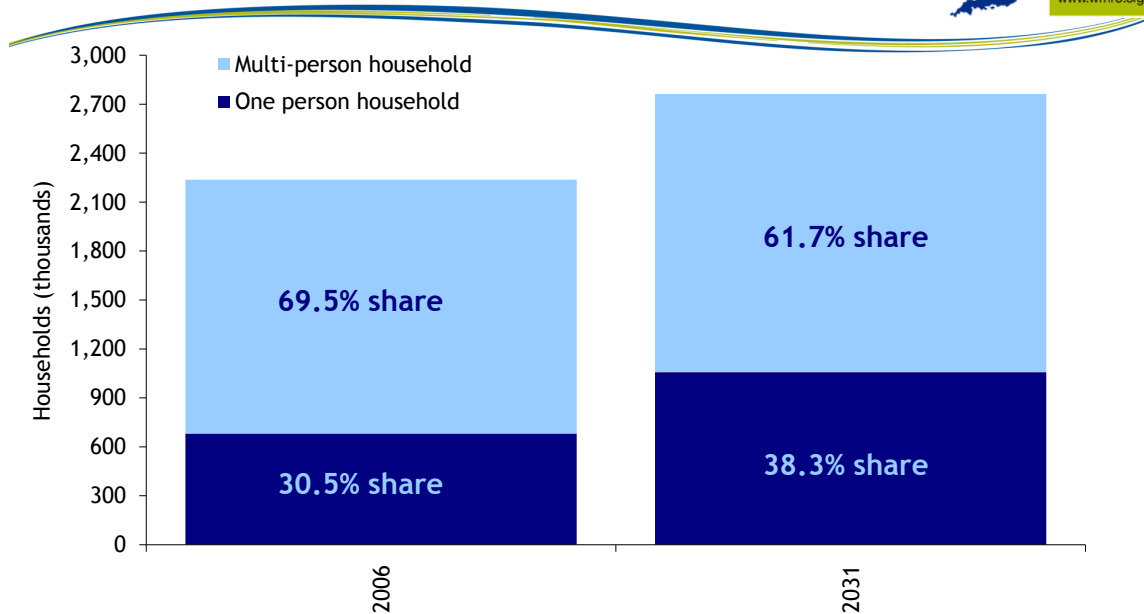
West Midlands Regional Observatory 2009

Estimates show there were 2.2 million households in the West Midlands in 2006, which were mostly multi-person households (69.5%). By 2031, the number of households will increase by nearly a quarter to 2.8 million. During this time **the number of single person households will nearly double⁽¹⁶⁾**, as shown in Figure 5.

16 Department of Communities and Local Government (DCLG) 2006-based housing estimates and projections

Figure 5

Change in West Midlands household composition between 2006 and 2031



Source: Department for Communities and Local Government household projections

West Midlands Regional Observatory 2009

As households become smaller and the number of households rises overall, energy use will increase. **One person households are less energy efficient than multi-person households.** On average, they spend 5% more of their income on housing, fuel and electricity than other household types⁽¹⁷⁾.

Although carbon dioxide emissions decreased in the UK between 1990 and 2007⁽¹⁸⁾, **CO₂ emissions from household energy use⁽¹⁹⁾ continued to rise.** Household energy use accounts for nearly a third of all energy use in the West Midlands.

New houses must be built in an energy efficient way. However, **80% of housing which will be here in 2050 has already been built.** To encourage people to lead 'greener' lifestyles, existing housing **must** be retrofitted with energy efficiency measures. Over 2007 and 2008, only 9.5% of households had been retrofitted with energy efficient measures - a further 2.1 million households in the West Midlands could benefit from these measures. The carbon budgets highlight that reducing household energy use is essential to meeting the greenhouse gas reduction targets.

Water use is also an issue; large quantities of greenhouse gases are emitted for every litre of water consumed (one litre of mains water emits about 0.75g of CO₂ according to ⁽²⁰⁾); **35% of people living in the Midlands get their water from an over-used source**, which is unsustainable. Severn Trent Water says that fitting water metres lowers water use, but they are concerned that only 30% of Midlands homes have them.

17 Joseph Rowntree Foundation (2006) Single person households and social policy: looking forwards
 18 Department of Energy and Climate Change (DECC) UK Greenhouse Gas Emissions published as National Statistics
 19 Department for Environment, Food and Rural Affairs (DEFRA) CO₂ emissions based on Local Authority consumption
 20 Waterwise Waterwise is a UK NGO focused on decreasing water consumption in the UK; <http://www.waterwise.org.uk/>

An Overview of the Evidence

Many **energy efficiency measures**⁽²¹⁾ could reduce household emissions, without compromising quality of life. For example, low energy light bulbs only cost £3.00 and offset 0.43 kg of carbon over their life time. However, if we are to stand any chance of meeting the Government's carbon reduction targets full house retrofitting will need to be considered for the majority of existing housing stock.

Transport

In 2007, 24.2% of West Midlands' workers travelled to work sustainably (by: public transport, bike, walking or home working). However, **most workerstravelled by car (74%**⁽²²⁾). Only 23% of West Midlands' households didn't own a car in 2006⁽²³⁾.

Congestion is an issue for the West Midlands, traffic flows increased by 23.6% between 1993 and 2008. More cars will be on the road in 2025, projections show a **30% increase in the distance travelled by car drivers** from 2003 levels in England.⁽²⁴⁾

Sustrans' reported 4.7% more trips were made on their cycle network during 2007 than 2006. These **journeys potentially saved over 450,000 tonnes of CO₂**. In 2006/07, 33% of adults owned a bicycle⁽²⁵⁾; encouraging more people to use them could cut CO₂ emissions even more.

Bus accessibility continues to improve; 89% of West Midlands households lived close to a bus stop with a regular service in 2006/07⁽²⁶⁾. However, **bus usage in the West Midlands dropped** by 51 million journeys between 1998/98 and 2007/08.

Rail usage continues to rise in the West Midlands and has nearly doubled between 1995/06 to 2007/08⁽²⁷⁾.

Research undertaken by the Department for Transport indicates that **apathy and scepticism towards climate change is a major issue**. Nearly a quarter of West Midlands residents said that they were 'not very' or 'not at all' concerned about climate change, and only 21% were 'very concerned'⁽²⁸⁾.

The **carbon efficiency of cars could be improved by 30% to 40%**. New transport technologies, such as: electric vehicles, hydrogen and biofuel powered transport, could allow this to happen.

The policy perspective

The Observatory worked with the West Midlands Climate Change Panel and Office to draw up a list of policy themes. These were considered to be important themes that would be affected by, and in a position to impact on, climate change. The aim of the report is to try to get a perspective of climate change from each of these themes and identify where there is common ground.

In order to get a clear perspective on the chosen themes we worked with people from those areas who either wrote, or helped the Observatory write, an analysis of the impacts of climate change. Within each chapter there is explanation of:

- What behavioural change authors would wish to see within their policy area to achieve policy objectives? This could be both in terms of the sector and the users of the services provided.

21 These are identified in the following reference: Advantage West Midlands and West Midlands Regional Assembly (2009) Low carbon housing: developing a baseline for refurbishment in the West Midlands. The document also reviews their cost and impact.

22 Labour Force Survey, October to December 2007

23 Department for Transport (2008) Transport Statistics Great Britain

24 Department for Transport; National Transport Model

25 Department for Transport (2008) National Travel Survey

26 Ibid

27 Office of Rail Regulation National Rail Trends

28 Department for Transport (2008) Omnibus Survey February and August

An Overview of the Evidence

- What impact they see the challenges and opportunities their policy area faces having on the region's economy?
- What infrastructure they envisage being developed or required due to the impact of climate change? E.g. transport, buildings, communications, use of resources.
- How the challenges and opportunities faced in their policy area vary between the urban and rural parts of the region, if at all?
- What implications they consider that climate change will have on poverty, community cohesion and building resilience?

The Built Environment

The Built Environment

With thanks to Chris Blakeley, Strategic Advisor - Regional Planning, West Midlands Leaders Board.

This chapter explores how climate change affects the built environment, how we may need to organise our lives if we are to reduce greenhouse gas emissions and how the spatial planning system will need to respond to help us achieve this. But, is this enough? How do we know? Do we need to do more?

Not all aspects of the planning system are covered; for example, it doesn't explore the planning relationships with health, procurement, making all buildings more energy efficient, and so on. And although it touches on the system changes, such as new settlement forms, we may need to think more fundamentally about how we organise our infrastructure to reduce carbon emissions and prepare us for the impacts of climate change. But what this chapter does do is demonstrate that through spatial planning, climate change will impact on each and every sector.

Inevitably this will present us with choices about how we reduce carbon emissions most effectively at each spatial level, to prepare for the risks and opportunities that a changing climate will bring and to make the most of the opportunities for business supply chains that these drivers for change will present.

The Built Environment

Spatial planning has a key role in shaping the built environment. It can encourage new urban and rural settlement forms and functions that facilitate sustainable communities. It can encourage new settlements that reduce carbon emissions and are well adapted to changing climate conditions.

The built environment includes all buildings, places and settlements that are created or modified by people. The built environment is partly defined by its physical make up and partly by the ways in which it is used by people.

Spatial planning influences both of these areas to some extent. It is particularly relevant to the evolution of places, through a mix of new build, reuse and redevelopment. In the West Midlands, the pressure for growth is increasing which presents an opportunity to accelerate the transition to low carbon places: through changes to energy systems; the regeneration and renewal of the building stock; improved energy efficiency and environmental improvements.

The way the built environment is planned and used is important in reducing carbon emissions. Development uses significant quantities of natural resources (energy, water, minerals and land). It produces wastes and demands that reach far beyond the physical limits of the built up area. Change in the built environment has a significant contribution to make because about half of UK carbon emissions arise from energy use within it, and the majority of buildings and places are not designed or constructed to be low carbon or adapted to the future climate.

The increasing sophisticated systems on which people's lifestyle depend, allow most people to live in the built environment with little awareness or reflection on the energy, water and food needs that are essential to support them. Consumption of energy is increasing and growth in population and households in the Region will add to the pressure to increase energy supply in low carbon ways.

The planning and design of places has a key role in meeting this challenge, through overall settlement design, use of mixed uses and density to complement new forms of decentralised energy supply. By locating growth to efficiently use existing infrastructure we can allow opportunities for walking, cycling and encourage public transport use. Planning also needs to consider the role of both water and green infrastructure to assist in:

- adaptation to high temperatures and more frequent storms ;
- influencing the uptake of renewable and decentralised energy systems through the use of planning briefs.

Planning can also contribute to the renewal and regeneration of existing places and building reuse. This would help to reduce the use of primary resources, increase energy efficiency through retrofitting and support the introduction of decentralised energy systems.

Behavioural change and planning for climate change

People, rather than buildings, use energy and make the choices about how to travel and where and how to live. However energy and water supply influence not just individual people's choices, but communities' choices and behaviour. The transition to low carbon living needs both a reduction in consumption, and an improvement in energy efficiency.

Spatial planning of the built environment has a catalyst role in bringing together new forms of decentralised and renewable energy provision with new forms of settlement design. This could be provided locally rather than always by remote centralised energy networks. This approach requires public and political support which will allow people to change the way we use energy in our homes and access services and travel.

The scale of behavioural change required is difficult at the individual level because of the current dominance of centralised UK energy systems. The way the built environment is planned can have only a limited effect on the scale of transition. It will also require change in institutions and regulations that currently reinforce the dominant position.

The shift from high carbon use, poorly adapted places to low carbon well adapted towns and cities will be a major change. It will need to bring low carbon approaches closer to the consumer both spatially and fiscally. This will need the implementation of stronger spatial planning energy policy. It will also require the opening up of energy systems and resources to make energy supply a primary consideration in the development of sustainable communities.

The relatively slow rates of change in physical structures means there is a high degree of carbon "lock in" in the existing built environment and energy systems. This means that it is difficult for people to change without a stronger strategic support. With that support communities can take greater responsibility for management of their energy needs or transfer responsibility for management of energy to non-centralised energy providers.

This may require greater levels of acceptance for medium density living and mixed uses than is traditional in the UK. It may need a greater preference for urban living, and a greater acceptance of energy infrastructure, such as wind energy turbines.

This transition will not happen overnight but requires a change in the relationship of people with the built environment and the use of low carbon and energy services. Where energy generation in the built environment is now rare, planning will need to be at the forefront of integrating electricity and heat within the development of sustainable communities. A bold reconnection of people to the built environment is required. The incentive could be to link change to fiscal benefits such as sharing the benefits and profits from a communal heat and power facility or the provision of pooled low carbon cars.

This will also require greater change by professionals to use spatial planning to achieve a low carbon built environment. This could mean a range of design solutions from integrated low carbon passive design, to the development of large sustainable communities designed around low carbon approaches. There may be opportunities for changes to construction methods, including modular off site building approaches to fulfil low waste and zero carbon standards building design.

The Built Environment

Increasingly we will need to consider the whole life cycle of the building. This will include designing in deconstruction and building in the costs of use of primary minerals and reuse of waste. These whole life cycle approaches will mean greater acknowledgment of the low carbon role of the historic environment. This has the benefit of revealing the true carbon costs of redevelopment including: the material wastage; embodied carbon involved in demolition and new construction; pollution from particulates; carbon loss of transport for materials and wastes; and use of primary aggregates.

There will also need to be new design of places requiring innovation and changed attitudes to adapt the built environment to the climate. This may see the greater use of green roofs, vertical green buildings for shade, sustainable drainage systems, water space and the use of white reflective surfaces.

Challenges and opportunities for the region's economy

These new built environments will also support greater levels of innovation. They provide a home and a market for low carbon growth sectors. They aid provision of energy efficiency products, renewable energy infrastructure, traditional energy infrastructure and provision of environmental goods and services.

This could include the opportunity for the expansion of:

- Energy, carbon and broader environmental consultancy;
- Air pollution control;
- Environmental monitoring;
- Waste management processes;
- Service industries that support environmental management.

Greater planning and design expertise will be required to integrate reduced energy consumption and integration of decentralised energy systems into new and existing development.

The renewable energy sector offers the opportunity of acceleration and expansion of advanced green engineering to provide for on shore wind power and offshore wind, wave and tidal power infrastructure. Further opportunities could include the provision of biomass, hydro and photovoltaic technologies services.

There is also a growing low carbon sector including: the re-emergence of civil nuclear technologies; alternative fuel for cars; technologies for carbon capture and storage; new building technologies including logistics and road rail interchange; and energy management and corporate finance.

The planning of the region will need to take account of its increasing vulnerability to climate change, avoiding new development in those areas such as flood risk. This will increase the level of resilience of infrastructure and build on the benign, central geography of the region that will be unaffected directly by longer term threats of coastal erosion and tidal uplift.

Challenges remain to provide land for renewable energy infrastructure in the regional and national interest. Local opposition to development is often strong from people directly affected by proposals, despite stronger planning policy and national targets. Planning has a major role in bringing forward proposals that are the subject of sustainability appraisal and which balance the protection and improvement of the environment with the transition of the local economy to low carbon.

Infrastructure and planning for climate change

A low carbon built environment will require the development of new, and adaptation of existing, infrastructure. This includes the refurbishment of the UK's energy infrastructure to handle renewable technologies and new distribution networks, including micro generation and back up infrastructure for intermittent renewables.

The demands for growth in the region will require the planning and design of sustainable communities of sufficient size so as to achieve a critical mass of services, homes and jobs. The way this is done will affect the level of energy, water, waste and transport infrastructure required. Waste, sewage, wind, sun and woodland can all be considered as sources of energy that will require different infrastructure. The retention of water through sustainable drainage and achievement of water neutrality could be considered as part of the necessary infrastructure. This offsets the need for traditional flood risk protection and piped water infrastructure.

The integration of high speed broadband infrastructure will give greater choice for access to information and networking. This can reduce the need for journeys until ultra low carbon vehicles are the norm.

New settlement and building forms, including flexible space architecture that can be adapted easily for multiple land uses and can cater for different uses during its lifetime, may become the norm. Buildings will need to be designed for eventual deconstruction and reuse to offset carbon and use of primary aggregates. A shift to more flexible space will also require land for the segregation of reused construction wastes and new types of energy infrastructure. This could be combined with high levels of passive energy design in layouts to, for example, maximise winter solar gain and minimise summer heating. The provision of new renewable energy infrastructure and distribution networks would need to be balanced by gains from embodied design. Multiple use of waste for energy sources could also be part of the balanced approach. Energy from waste infrastructure will need to be integrated within the built environment.

The development of shared flexible space infrastructure “Tele hubs” at transport nodes could replace office based work for people. This would reduce the need for travel and reduce journey times and congestion.

The development of ultra low carbon vehicles will require hybrid and electric vehicle charging infrastructure to be retrofitted within existing towns and cities and within new developments.

The development of new high speed rail interchanges could form clusters of high connectivity within the UK and in Europe replacing short haul air journeys and freeing up existing airport infrastructure.

The implementation of low carbon energy will require the transformation of the existing energy infrastructure to handle intermittent renewable technologies and for micro generation feed in tariffs from dispersed locations. Decentralised energy networks will become widespread and this infrastructure will need to be planned into town centres and new developments. Logistical markets for bio fuels and biomass will also need to be strengthened especially in rural areas. Areas close into towns will be required for infrastructure for waste transfer, solar farms and other renewable energy systems

Retrofitting the existing stock of buildings along with changing people’s behaviour can make a large contribution to reducing carbon emissions. A key challenge is to design proposals that also allow sufficient cooling in summer hot weather. Planning can have a role in linking new infill development and adjacent developments into energy and low carbon infrastructure to achieve balance in the systems.

Where larger sustainable communities are planned there will be opportunities to integrate higher levels of green infrastructure and water space to mitigate microclimatic conditions across whole areas. This, combined with woodland belts for shade and to act a wind breaks, will provide multiple benefits for recreation, biodiversity and a resources for biomass energy generation.

The Built Environment

Challenges and opportunities of planning for climate change in urban and rural areas

The impact of climate change on urban and rural areas varies. Urban areas will become prone to increased summer temperatures. These will be much higher than the surrounding countryside owing to the level of hard buildings and surfaces absorbing and retaining heat. This will increase the need for cooling and development of water space and higher levels of green infrastructure to improve microclimatic conditions. The scale of tree planting, green roofs and vertical green planning on buildings will increase shade together with low energy natural air conditioning building design.

In rural areas there will be to changes in type and scale of food production and viable crops with more diversified farms. There will be more locally distributed food networks. More land will be used for wetlands and water for irrigation and to cope with increased flood risk management. More frequent warmer summers could drive tourism both in terms of UK and local based travel and increased overseas tourism.

Poverty, Community Cohesion and Building Resilience and planning for climate change

The impacts of climate change on building resilience are extensive. Increases in the frequency of storms will lead to more damage therefore buildings will require more maintenance work. Better design and specification can reduce this impact, by for example reducing exposed metalwork to corrosion.

Drying of soils could increase ground movements leading to expansive underpinning of buildings. The use of wood in buildings could degrade quicker because of increased pest attack. Flood risk and localised flooding will increase with affected buildings requiring extensive repair.

The issue of fuel poverty increases if fuel prices rise. The change to low carbon sources of energy and decarbonised electricity could increase the level of fuel poverty because of increased management and other costs without additional safeguards for some users. But where local heat and power distribution is developed it could have beneficial effects on the communities' understanding of energy and low carbon approaches and provide a constant supply of community level funding, helping to offset fuel poverty.

In terms of community cohesion, the drive for low carbon places could increase the amount and quality of green space available, providing greater opportunities for interaction and shared activities. More emphasis on public transport can also provide shared spaces for people to interact.

Efforts to bring about the transition required should involve solutions for developing sustainable communities that include people in the design of places, including new energy systems and increased levels of community ownership. For example, objections to wind energy could lessen if part of the benefits were directly shared with people affected.

Communities can be encouraged to work together to increase energy efficiency, bringing people together around common actions on reduction of carbon. The development of sustainable communities includes places where there is a mix of houses, tenures and types to foster integration. On a broader level, failure to act on carbon reduction could see large scale environmental migration effects from areas affected by drought and excessive summer heat having significant adverse effects on levels of community cohesion.

Natural Resources (water, land use and food)

With thanks to Midlands Regional Strategy Unit in the Environment Agency

This chapter on natural resources sets out very clearly some of the decisions that we need to be taking in the West Midlands if we are to maintain our life support systems, deal effectively with risks such as flooding and radically reduce our carbon emissions. It shows that we need to invest in our environmental infrastructure just to maintain our quality of life and that a failure to do so will bring serious consequences. It is also clear that the choices that we make now about flooding and water use will have long term impacts and that there is an opportunity to gain the benefits of early decisions long in to the future.

The focus of the chapter is on the direct climate change impacts on this region. We can also expect impacts elsewhere in the world to affect, for example, global food price fluctuations. How will agriculture in the West Midlands, and the related supply chains, respond to increased risks and what will be the impacts on the environment, carbon emissions, local economies and rural communities?

There are some areas where the West Midlands is being particularly proactive. For example, the West Midlands Biodiversity Partnership⁽¹⁾ is developing new targets that take adapting to the impacts of climate change into account and opportunity maps that set out where these targets can be delivered. There are huge opportunities for linking these targets with other sectoral agendas to deliver real synergies for health, business opportunities, renewable energy and community wellbeing.

Natural resources

Natural resources are vital to our existence and our prosperity. Our economy, health and well-being are all closely linked to the quality of our air, water, soils and biological resources. We are now locked-in to some degree of climate change and this will impact on our natural resources. These impacts will include:

- The quality in our lakes and rivers will be threatened as lower flows make discharges from sewage treatment plants, diffuse and urban sources more detrimental.
- As rainfall becomes less predictable, groundwater and river flow regimes will change, threatening the future availability of our water.
- Changes in temperature will affect animal and plant species as well as ecologically and economically valuable habitats such as woodlands, forests, grasslands, heath and marches.
- Increasing risks to harvests will bring far more volatility in food supplies and prices. There are also potential implications for animal disease and food safety.
- Winters will get significantly wetter increasing the likelihood of flooding, threatening people, land and property.
- We need to take action now to limit and adapt to the impacts of climate change on our region's natural resources. We need to ensure:
- The quality of our rivers and lakes needs to continue to improve for the benefit of people, the economy and wildlife;
- Safe, secure water supplies are available to meet the needs of the public, business and the environment;
- We manage and adapt to the consequences of flood risk and ensure people, property and critical infrastructure are better protected;
- We manage our land in a way that maintains and improves soil quality and biodiversity.

1 www.wmbp.org

Natural Resources (water, land use and food)

Behavioural change

The water environment is particularly vulnerable to the effects of climate change. The Water Framework Directive through River Basin Management Plans seeks to improve the ecological quality of our rivers, lakes and groundwater. River Basin Management allows for a more holistic and sustainable approach to the water environment including a more systematic and consistent approach to considering climate change.

We must slow the growth in water demand due to a growing population and increased development so that in future we can supply enough water without having a detrimental impact on the environment. We need to further integrate sustainable planning and water resources management to meet the needs of people, agriculture and industry while still protecting the environment. Home owners, industry and agriculture will have to plan for using less water. It is important that water companies deliver their water efficiency plans and are ambitious with their metering targets.

Water cycle studies need to be completed in the early planning stages for new developments to ensure that the appropriate water supply infrastructure is in place before planning permission is granted. Water neutrality should be considered as a way to manage demand in the face of climate change and population growth. That is, the total demand for water in a pre-defined area does not increase after a new development is built. This is achieved by offsetting the demand from the new development by making existing homes and buildings in the wider area more water efficient.

Eighty-nine per cent of the greenhouse gas emissions associated with water (treatment, transport, use, abstraction and disposal) is from use in the home. Therefore the highest possible standard of water efficiency should be included in new developments. On a consumer level, demand management through increased water metering and water efficiency options in homes, schools and businesses will also be necessary.

Drier summers are likely to result in different crops being grown and increased demand for irrigation. This will alter the water supply-demand balance and necessitate more frequent restrictions on abstractions for irrigation. Farmers will need to use water that has lower impact on the environment, such as the use of high flow storage reservoirs; taking water when it is plentiful. In some agricultural sectors there are environmental benefits to utilising rainwater from farm buildings, such as reducing runoff across fouled yards and soil erosion from polytunnels. However, rainwater harvesting may become increasingly unreliable with climate change and therefore farmers will need to supplement their supply from alternative sources.

If investment in flood risk management is kept at current levels, by 2035 there could be an additional 350,000 properties at significant risk of flooding from rivers and the sea in England. The Environment Agency has produced Catchment Flood Management Plans which highlight many of the challenges faced by the Region from flooding in the next 50 to 100 years. Land at risk of flooding should be left undeveloped. However local authorities and developers continue to underestimate the risks of flooding. In 2007/08, the Environment Agency objected to over 6,000 planning applications because of flood risk concerns. In over 95 per cent of these cases, the outcomes were in line with the Environment Agency's advice. However, 15 major developments went ahead against the Agency's advice, including six in areas at the highest risk of flooding. We want those involved in planning decisions to consult with the Environment Agency at an early stage and to act on their advice.

Opportunities to provide Green Infrastructure should be supported. For example, a floodplain being used for 'storing' flood water to reduce the risk of flooding to development and infrastructure, while also providing an extensive recreational space for local people and a valuable habitat which can also be managed as a nature reserve. Green spaces can also be agriculturally productive, with a grazing or cropping regime that maintains the capacity of the site to perform its other functions effectively.

Natural Resources (water, land use and food)

Agriculture is currently responsible for 7% of the UK's greenhouse gas emissions and the food supply chain as a whole is responsible for 18% of emissions. We need to ensure our production, distribution, storage, and retail activity in food supply chains all rely less on fossil fuels. Future sustainability of the Region's food supply will depend on maintaining the natural resources, including soil, on which production depends. Defra's recently published Soil Strategy for England⁽²⁾ addresses these issues, outlining practices that should be incorporated within Regional Strategies, promoted among land managers and seen as the basis of policy on soils. Our region's soils are often overlooked as a natural resource but are of great significance in mitigating climate change. UK soils store over 10 billion tonnes of carbon in organic matter. A 1% loss of soil carbon is equivalent to the UK's total annual fossil fuel emissions.

Challenges and opportunities for the region's economy

By becoming more resilient to future weather conditions, we will reduce the impacts of climate change on our economy and our quality of life. By factoring climate change into our planning and investment decisions now, we can minimise the costs of adapting to that change. While there are economic costs associated with climate change, there are also some economic benefits.

Case Study: Renewable Energy

Severn Trent Water Ltd provide sewage services to 8.5 million people in the Midlands and mid Wales which requires treating about 2500 million litres of waste water per day. A by-product of treating this sewage is sludge, Severn Trent now use this waste to produce green electricity, digesting sludge to produce methane that fuels combined heat and power plants.

This also reduces the amount of sewage sludge spread on agricultural land. The company now leads the industry in renewable energy producing 17% (163GWh) of their gross electrical usage (97% from sludge and 3% from hydrogenation). This demonstrates how the water industry can contribute toward the UK target of sourcing 15% of energy from renewable sources by 2020.

A warming British climate and the escalating cost of foreign travel should benefit the West Midlands tourist industry. The benefits - social, cultural, educational, economic and health - of tourism and recreation are considerable. They have a key role to play in regeneration, as the catalyst for improvements to local environments. Community recreational opportunities and facilities generate value and a sense of local ownership. There are spin-off benefits for employment and the economy in both the town and country. Visits to inland and coastal waters contributed an estimated £5.6Bn to local economies (2002/3 UK Day visitor survey); however climate change will put pressure on the very rivers and landscape we want people to visit. Lower river flows and higher temperatures will lead to increased nutrient levels; storm events lead to sediment and pollution run-off from urban and agricultural sources and can lead to polluting discharges to our rivers from storm relief sewer overflows.

Businesses and domestic water customers can gain financial savings by improving water efficiency and reducing consumption. Increasing water efficiency will reduce demand and greenhouse gas emissions. Metering household supplies will reduce consumption and reduce some households' water and energy bills. Agricultural abstractors can benefit from investing in storage reservoirs. While the initial investment is costly, their security of supply would increase.

Over 1,000 square kilometres of land in the West Midlands are at risk from flooding, containing approximately 85,000 properties. Flooding causes considerable social and economic costs, damaging buildings, transport infrastructure, crops and drainage. During the summer of 2007 over 55,000 homes and businesses were flooded across the UK in economic terms, insured losses alone approached

2 Department for Environment Food and Rural Affairs (2009) Safeguarding our soils, A strategy for England

Natural Resources (water, land use and food)

£3 billion. Flooding of agricultural land and farms in the West Midlands in 2007 caused £15.5 million in damage, costing on average £96,596 per farm. This is likely to increase in hotter drier summers due to wind and through runoff during flooding events

Adapting to flood risk can potentially lead to cost savings by avoiding disruption to business. Effective flood planning can save small businesses an estimated 50 days recovering from a flood. Planned adaptation is more efficient and cost effective than last minute reactive adaptation. Every £1 spent on flood risk management measures saves £8 in long term economic damage avoided in the future.

Poverty, community cohesion and building resilience

Climate change is likely to disproportionately affect the poorest communities around the world, and this will be reflected in the West Midlands, impacting on quality of life and forcing many people further into poverty.

According to research commissioned by the Environment Agency and others, people living in deprived areas are 62% more likely to be at high risk of flooding in affected areas. Those most at risk from flooding need to be better informed and prepared, particularly those in our most vulnerable communities. Local resilience and multi-agency forums have a key role in promoting understanding and raising awareness of critical facilities and vulnerable infrastructure. Losses, clean-up and adaptation costs are hardest felt by small businesses and poorer households affected by flooding.

Flooding can result in more mobile people leaving areas at risk, leaving behind friends and older, poorer residents who can't afford to relocate. It is worth noting that flood events can also bring communities together, forging new relationships though and a sense of shared resilience.

Green Infrastructure projects should be supported as they can help meet the environmental, social and economic needs of communities across the Region. They can enhance the quality of life for present and future residents and visitors, and deliver more sustainable communities.

The global consequences of climate change on the natural environment, not just the local impacts, must also be acknowledged in our regional response to the challenges we face. The global effects of climate change including floods and droughts, and the increasing pressure on other natural resources, will have significant impacts in terms of population movements particularly in under-developed countries. People moving away from these vulnerable areas may increase migration to the Region, which could impact deprived areas where international communities already have significant presence. This may exacerbate the issues poorer communities will face in responding to climate change.

Infrastructure needs

The impact of polluting discharges from sewage treatment plants needs to be controlled in a new way, moving away from heavy infrastructure "end of pipe" solutions that can be energy and embedded-carbon intensive, to more holistic approaches. We need to consider banning the use of phosphates in detergents to avoid the need for chemical and energy intensive nutrient removal processes at sewage treatment facilities.

Water companies will need to continue to invest in their infrastructure, to address leakage, and in domestic meter installation. Installing water meters significantly reduces domestic water consumption, but currently only about 30% of West Midlands' homes are metered. Water neutrality should be considered as a way to manage demand in the face of climate change and population growth. That is, the total demand for water in a pre-defined area does not increase after a new development is built. This is achieved by offsetting the demand from the new development by "retro-fitting" existing homes and buildings in the wider area to make them water efficient. Agricultural abstractors will have to consider developing storage reservoirs in order to increase their security of supply and reduce demand when resources are scarce. Using water more efficiently and storing winter water will be crucial to meeting growing demand.

Natural Resources (water, land use and food)

Case Study: Water Efficiency

The Environment Agency Water Efficiency Awards are the leading scheme in England and Wales for recognising water efficiency initiatives. In 2009 Lafarge Cement UK won the Water Save Award for a water conscious project at its Cauldon Cement Works in Staffordshire where measurable environmental and financial savings were achieved. The project, at a Site of Special Scientific Interest and a Special Area of Conservation, replaced the abstraction of water from the nearby River Hamps with a closed system reducing water use by 95% (from 290,000 down to only 15,000 cubic metres).

We need to build resilience to flooding in the region. Owners of critical infrastructure must ensure their assets are protected from an increased risk of flooding and no new infrastructure is built with a risk of flooding. This includes electricity infrastructure and water supplies, hospitals and key roads. Developers and house builders must avoid areas of high risk, such as developing on flood plains and we need home owners and businesses to take important steps to reduce their risk to flooding.

We need policies which protect essential infrastructure, support the objectives of Flood Management Plans and discourage development behind engineered flood defences. The right solutions must be found for flood water storage. We need to promote the use of water cycle studies, surface water management plans, Strategic Flood Risk Assessments and Sustainable Urban Drainage Systems (SUDS) in the planning system to minimise the impact of urban drainage from new developments and regeneration projects.

The Region needs to develop ecologically resilient landscapes and Green Infrastructure that can cope with the expected changes to our climate. Green spaces provide a variety of ecosystem services - flood mitigation and carbon storage (for which the protection of wetlands and woodlands is particularly important). The ecosystem services that Green Infrastructure can provide have an economic value but also a cost. The capital costs of creating green spaces or a Green Infrastructure network can often be met as an incidental additional expenditure arising from engineering projects to provide transport, energy production or water management services. However, it is vital to secure the long-term management of green spaces, for example through a Section 106 agreement or Community Infrastructure Levy, so that they remain in good condition and continue to serve the community in the future.

Urban and Rural West Midlands

While climate change will impact the whole of the West Midlands the solutions needed to combat these impacts and secure our natural resources will differ between urban and rural communities.

The rural environment offers the most opportunity to implement catchment solutions influencing land management practices using voluntary and legislative pressure to deliver multiple environmental benefits including improved surface and groundwater quality. This approach to tackling nutrient and pesticide issues within the Midlands should be supported as it prevents the need for further carbon intensive treatment of drinking waters.

In rural areas climate change will put increasing pressures on land due to an increasing need for both food and energy crops as well as for other uses such as flood attenuation. Biomass has the potential to contribute to a reduction in carbon emissions, but we need to understand the potential environmental impacts of this land use and the life cycle emissions of using biomass.

Peat landscapes, such as the upland areas of the Peak District, can help us both mitigate and adapt to climate change. They store 40 to 50 per cent of our carbon, even though they only make up eight per cent of our land. Restoring degraded peatland prevents these huge carbon stores becoming a carbon source, which will only add to climate change.

Natural Resources (water, land use and food)

This is because, if managed properly, peat acts as a carbon store, preventing carbon being lost to the atmosphere, as well as acting to absorb heavy rainfall, preventing flooding downstream. Peatlands form the biggest terrestrial carbon store in the UK.

The redevelopment and regeneration of our urban areas will provide significant opportunities to make space for water and ensure that new development is appropriate and sustainable. Opportunities should be taken to relocate existing development away from high flood risk areas, open up culverts, recreate green river corridors and restore natural floodplains. Locations where this approach should be encouraged include Birmingham, Black Country, Stoke on Trent, Stafford, and Burton on Trent. In central Birmingham and other heavily urbanised areas where space is severely limited, we should encourage the use of green roofs to help reduce the rate and volume of surface water runoff.

In our urban areas Green infrastructure provides a space for wildlife as well as people. Greenspace will become increasingly important in helping people and wildlife adapt to climate change. It can reduce surface temperatures and the Urban Heat Island Effect. At a local scale, a park will provide cool relief during hot weather but it could also be used to store local flood waters during the extreme weather events we can expect with a changing climate.

Conclusion

When people consume resources - through the manufacture of goods, driving a car or turning on a tap - there are associated impacts on the environment. For many resources, consumption levels have historically been linked to economic growth. As our society has become richer we have bought more goods, travelled further and demanded greater convenience. If this continues we risk causing irreparable harm to the environment with serious consequences such as increased flooding due to climate change and human health impacts resulting from poor air quality.

Over the years, we have made significant progress in tackling environmental pollution and degradation in the West Midlands but there are still many pressures on our natural resources. With a changing climate these challenges are becoming more complex. The increasing stress we are putting on our Region's resources and environmental systems cannot go on forever, especially as the Region's population continues to increase.

Unless we start to make real progress toward reconciling these contradictions our Region will face a future that is less certain and less secure. Policy makers need to make a decisive move toward more sustainable development. Not just because it is the right thing to do, but also because it is in the long-term best interests of a prosperous West Midlands.

Transport

With thanks to Danny Lamb, Strategic Transport Adviser, West Midlands Leaders Board.

Transport has a key role to play in both mitigating against, and adapting to, climate change. We have all become used to the ease with which we can travel and the options available to us to make those journeys. The scale of the emissions from the transport sector mean that we need to both reduce our journeys and develop more efficient means of transport. This chapter considers the policy framework within which current transport programmes exist.

One of the key issues with transport policy is the need to think longer term. Transport projects take many years to come to fruition and therefore need to be considering issues coming years in advance. Transport policy is becoming more joined up and this will need to continue to be the case as individual transport modes should not be planned in isolation. The desire to get people travelling by public transport and out of their cars will only be achieved if an acceptable public transport system is in place.

Transport decisions will need to be made strategically whether they be local, regional or national schemes. A coordinated approach to planning is vital.

Finally the transport sector needs to work with other sectors to develop innovative approaches to the challenges it faces from climate change. These solutions may include: the development of more efficient vehicles; alternative fuels; more walking and cycling; integrated land use and transport planning, and 'softer' factors such as personalised travel planning and travel blending.

The rest of this chapter focuses on the existing situation and looks at some of the drivers and opportunities that face the transport sector because of climate change.

Introduction

Sustainable transport is supported at the local, regional, national, European and international levels. Sustainable transport provides public and private partners with opportunities to reduce carbon emissions and address the climate change agenda.

The 1997 Kyoto Protocol has had the most significant influence on policy. Over the last few years there has been a significant increase in the activity across the piece - leading towards Copenhagen Climate Change Conference in December 2009.

The most important action in the UK is the Climate Change Act 2008. An important action in the transport sector is the Department for Transport's (DfT) recent plan, 'Low Carbon Transport: A Greener Future'⁽¹⁾. This is a detailed plan which builds on five goals identified in 'Towards a Sustainable Transport System'⁽²⁾ and 'Delivering a Sustainable Transport System'⁽³⁾. The relevant goal being to:

"reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change".

The Government has also emphasised the importance of sustainability and climate change in the consultation document 'Policy Statement on Regional Strategies and Guidance on the establishment of Leaders' Boards'⁽⁴⁾. This approach aims to "put in place an integrated strategic framework for the long-term sustainable development of each of the English regions, aimed at delivering sustainable economic growth and tackling climate change".

1 Department for Transport (2009) Low Carbon Transport: A greener future

2 Department for Transport (2007) Towards a sustainable transport system

3 Department for Transport (2008) Delivering a Sustainable Transport System (DASTS)

4 Department for Communities and Local Government (2009) Policy Statement on Regional Strategies and Guidance on the establishment of Leaders' Boards: Consultation

Transport

Sustainability and climate change have been at the core of West Midlands' regional strategies since their inception (building on 'Our Common Future'⁽⁵⁾).

National Context

In addition to the Climate Change Act, since Kyoto the UK Government has published a number of White Papers, guidance documents and reports that point to transport's role in tackling climate change, notably:

- A New Deal for Transport White Paper 1998;
- Transport Act 2000;
- European Transport Policy White Paper 2001;
- Planning Policy Guidance 13: Transport 2001;
- Future of Air Transport White Paper 2003;
- Future of Rail White Paper 2004;
- Future of Transport White Paper 2004;
- UK Sustainable Development Strategy 2005;
- Planning Policy Guidance 1: Delivering Sustainable Development 2005;
- Eddington Transport Study 2006;
- Stern Review 2006;
- Planning for a Sustainable Future White Paper 2007;
- Delivering a Sustainable Railway White Paper 2007;
- Energy White Paper 2007;
- Towards a Sustainable Transport System 2007;
- Delivering a Sustainable Transport System 2008;
- Climate Change Act 2008;
- Low Carbon Transition Plan 2009;
- Low Carbon Transport: A Greener Future 2009;
- Policy Statement on Regional Strategies and Guidance on the establishment of Leaders' Boards - Consultation 2009

Evidence

This legislative and policy framework has directed planning and transport, but the evidence shows that transport related CO₂ emissions have continued to increase. In 2006 West Midlands residents produced an average of 2,282 kg CO₂⁽⁶⁾.

A useful source of evidence for transport is the DfT's UK Transport and Climate Change data factsheet⁽⁷⁾.

This evidence shows that the transport sector has much more to do:

- Between 1990 and 2007 CO₂ emissions have increased - by 12% for domestic transport, 72% for domestic aviation and 123% for international aviation.
- For 2007 domestic transport (road, rail, aviation and shipping) emitted 24% of all UK CO₂ emissions (131 mtCO₂). Passenger cars were responsible for 58.5% of domestic transport (circa 77 mtCO₂).
- Transport statistics (Transport Trends 2008 Edition) show that traffic has increased by a quarter between 1990 and 2007. And the number of licensed motor vehicles has risen steadily from 19.2m in 1980 to 34m in 2007⁽⁸⁾.

5 United Nations World Commission on Environment and Development (1987) Our Common Future. Also known as the Brundtland Report

6 West Midlands Regional Observatory (2009) Decoupling into a low carbon economy

7 <http://www.dft.gov.uk/pgr/statistics/datatablespublications/energyenvironment/climatechangefactsheets.pdf>

8 <http://www.dft.gov.uk/pgr/statistics/datatablespublications/trends/>

This trend is expected to continue and projections indicate a 30% increase in the distance travelled by car drivers from 2003 levels in England⁽⁹⁾.

Within the West Midlands region people are aware about climate change - they are concerned and willing to change their behaviour. In the DfT's latest national Omnibus Survey⁽¹⁰⁾, which segregates responses by region, 51% of respondents in the West Midlands knew a lot/fair amount about climate change. 86% were very/fairly concerned about it and 75% agreed strongly/agreed a willingness to change behaviour⁽¹¹⁾.

In a national survey of UK motorists⁽¹²⁾ 77% believe that the most important aspect to consider when buying a new car is how much fuel it uses. CO₂ emissions were the second highest consideration, with 45% saying they would prioritise this factor⁽¹³⁾.

So the strategies and policies are in place and a substantial proportion of the travelling public is willing to change - BUT that is not enough. Not only is transport's CO₂ footprint getting bigger, but this is against a background of less people travelling by public transport:

- In 2006/7, 89% of households in the West Midlands are within 13 minutes walk of a bus stop with a service at least once an hour (compared to 76% in 1992/94) the number of people travelling by bus/light rail has dropped from 471 million journeys in 1997/08 to 420 million in 2007/08⁽¹⁴⁾.
- As bus/light rail usage has declined the number of people travelling by rail in the region has increased by 80%, between 1995/6 and 2007/8⁽¹⁵⁾.
- This results in some 74% of workers in the West Midlands travelling to work by car, with 24.2% travelling by public transport, bike, walking or working at home⁽¹⁶⁾.

What can we do to address the Issues?

Transport is an important part of both the problem and the solution, but CO₂ emissions from buildings (including new homes) will contribute significantly. Emerging (unpublished) findings from the East of England Development Agency show that the quantum of new houses planned have a much greater impact than transport in the region.

It has been clear for many years that there is no single 'magic bullet' that will help transport to reduce its carbon footprint. In 1995 the Parliamentary Office of Science and Technology published 'Transport: Some Issues in Sustainability'. This cites technical, psychological, logistical factors as well as land use priorities as issues to be addressed. It suggests the need for "a number of interrelated measures, which set the tone for a change in national priorities over the medium term". The Climate Change Act and subsequent Low Carbon Transition Plan⁽¹⁷⁾ provide that "tone", but it has taken many years to get there⁽¹⁸⁾.

Transport cannot solve these problems in isolation. For transport to achieve meaningful targets (locally, regionally or nationally) there must be a multi-disciplinary, holistic 'toolkit' approach. The Visioning and Backcasting for UK Transport Policy (VIBAT) research identifies the need for "a combination of strong behavioural change and strong technological innovation. There will be a major role for a wide range of policy packages - including more efficient vehicles, alternative fuels, more walking and cycling, better quality and more public transport, lower speed limits, integrated

9 Department for Transport; National Transport Model

10 Department for Transport (2008) Omnibus survey February and August

11 <http://www.dft.gov.uk/excel/173025/221412/221513/4387651/climatechngranstablesb1to14.xls#B.3!A1>

12 Auto Trader (2008) National Survey of UK motorists

13 <http://www.tradermediagroup.com/2009/03/demand-for-green-cars-is-at-its-highest-ever-level-according-to-auto-trader/>

14 Department for Transport; National travel survey

15 National Rail Trends, Office of Rail Regulation

16 Labour Force Survey, October to December 2007

17 Department of Energy & Climate Change (2009) The UK Low carbon transition plan

18 <http://www.parliament.uk/post/pn070.pdf>

Transport

land use and transport planning, reduced car occupancy, new information and communication technology developments, national road pricing, long distance travel substitution, reduced emissions from freight and 'softer' factors such as personalised travel planning and travel blending. Vehicle technologies and individual travel behaviour are likely to change very markedly in the future. However, the old debate of relying on technological improvements to help maintain our current CO₂-intensive lifestyles seems to be obsolete. We need a renewed emphasis over a very wide range of fields. Multi-disciplinary thinking and action is critical⁽¹⁹⁾.

Much of this is now being pursued and the major components of the 'toolkit' are in place i.e. national policies, particularly the Low Carbon Transport Plan, and regional and local strategies and policies, particularly the Climate Change Action Plan, Regional Spatial Strategy (RSS) and West Midlands Economic Strategy (WMES)⁽²⁰⁾ and the local transport plans. But the critical link is still missing: that is, a holistic approach to delivery.

The West Midlands Climate Change Action Plan sets out the actions required at the regional level in the short-term, including a review of regional targets for reducing greenhouse gas emissions. These targets will need to take account of the growth aspirations for the Region and the emphasis on urban renaissance in the RSS, as well as the national imperative to reduce emissions. They reflect contributions through the RSS and WMES.

The RSS sets out the contribution that spatial planning can make to achieving national targets. The RSS is currently being revised and includes a specific policy for climate change and highlights the importance of two transport policies (T1: Developing accessibility and mobility within the Region and T2: Reducing the need to travel). The RSS proposes a dual approach to addressing climate change, by enabling and promoting measures to reduce emissions, and ensuring that new developments are adaptable to the changing climatic conditions likely to be experienced into the future.

The WMES is the UK's first low-carbon regional economic strategy⁽²¹⁾, responding to current challenges and opportunities by adopting a consistent approach to mitigation of and adaptation to climate change throughout. It proposes additional regional carbon saving measures including road traffic reduction, behavioural change, shift to low-carbon public transport modes, industrial and commercial waste reduction and decentralised energy, such as combined heat and power.

The strategic policy framework for transport is complemented by the Regional Transport Priorities Action Plan⁽²²⁾. This Action Plan builds on both regional strategy and the Department for Transport's 'Towards a Sustainable Transport System'⁽²³⁾ and Developing a Sustainable Transport System⁽²⁴⁾, taking a strong lead from the Eddington Study⁽²⁵⁾ and Stern Review⁽²⁶⁾. The Action Plan's goals include a sustainable region that is prepared for a low-carbon future and objectives which include reducing transport's CO₂ emissions to tackle climate change.

In the light of all of the above, the transport component of the recent Regional Funding Advice (RFA) (reference) still does not support a reduction in CO₂ emissions. The potential CO₂ impact of the RFA Transport Programme was assessed by independent consultants. Their assessment considered the different CO₂ predictions for two scenarios in 2026.

19 http://www.vibat.org/vibat_uk/pdf/vibatuk_stage2.pdf

20 Advantage West Midlands (2007) Connecting to success, West Midlands Economic Strategy

21 Ibid

22 Advantage West Midlands and West Midlands Regional Assembly (2008) West Midlands Regional Transport Priorities Action Plan

23 Department for Transport (2007) Towards a Sustainable Transport System

24 Department for Transport (2009) Developing a Sustainable Transport System (DASTS)

25 Department for Transport (2006) The Eddington Transport Study

26 HM Treasury Cabinet Office (2006) Stern Review: The economics of climate change

The Do-Minimum scenario included a number of transport schemes that are already well progressed, while the Do Something scenario included a further representative package of schemes that could be completed by 2026. The assessment did not consider individual schemes in detail, as that work will be carried out in preparing the necessary evidence to support major scheme business cases. The results show that the Do Something package increases the carbon footprint by 2,724 tCO₂ per year - a very small percentage change of 0.2%.

The DfT's DaSTS⁽²⁷⁾ process and the emerging single regional strategies provide an opportunity for a holistic approach, but action is required now, not in 10-20 years time.

The next round of Local Transport Plan need to emphasis the importance of reducing transport emissions and the framework for the next round of Local Area Agreements (LAA) will encourage local authorities to tackle carbon emissions (currently only Birmingham, Coventry, Dudley, Herefordshire, Sandwell, Staffordshire, Stoke, Telford and Worcestershire have included National Indicator NI186 - CO₂ reduction per capita in their LAA).

Many individuals and organisations understand there is a relationship between transport, climate change and CO₂. Historically most of us have failed to act on that information. Traditional, typical behaviour - including the individual's decision to travel to work in a car they are still paying for or a business decision not to support Travel Wise, or the Government's decision to promote housing development in places that are hard to reach by public transport - does not support CO₂ reductions.

Collectively we need to change behaviour and we need to start doing a better job of that soon. While a holistic approach is needed it is very difficult to change behaviour at zero cost - someone has to pay. The cost of carbon needs to be factored into all our decision making processes.

The cost may be to the individual in or society as a whole. Reducing transport's CO₂ emissions cannot rely on significant shifts to public transport or a sea-change in new fuel usage. There will be a need to provide new 'traditional' infrastructure (such as railways or bus priorities) and new 'low-carbon' infrastructure (such as electric vehicle plug-in stations). There will also be a need to provide high speed broadband (and emerging communication technology) to enable remote working.

It is important to recognise that services need investment as well as infrastructure. So choices will need to be made about providing smarter choices (such as individual travel plans - these are revenue 'hungry' measures and revenue is difficult to sustain).

The challenges and opportunities vary significantly between the urban and rural parts of the region. In the urban areas there is a scale of density that supports investment in e.g. public transport options. This is more difficult to achieve in rural areas. The whole smarter choice agenda is difficult to sustain in rural areas (as recognised in the Low Carbon Transport Plan⁽²⁸⁾). Communities in rural (particularly remote rural) areas have a greater dependence on private transport. So investment in roads or car travel is needed. This is exacerbated by the issue of flooding. Infrastructure resilience is an important consideration that is more prevalent in rural parts of the region - and it requires investment.

If the West Midlands is to experience anything like the Forum for the Future's 'A low carbon vision for the West Midlands in 2020'⁽²⁹⁾ there has to be a significant amount of co-ordinated effort and investment over the next few years. And given the likely cuts in public expenditure it is difficult to be optimistic about a successful outcome⁽³⁰⁾.

27 Department for Transport (2009) Developing a Sustainable Transport System (DASTS)

28 Department for Transport (2009) Low Carbon Transport: A greener future

29 Forum for the future (2009) A low carbon vision for the West Midlands in 2020

30 <http://www.forumforthefuture.org/library/low-carbon-vision-west-midlands-2020>

Health

With thanks to Dr Jammi Rao, Deputy Director of Public Health, West Midlands.

Climate change has two potential areas of impact on the health sector. The first is the impact that the NHS itself has in terms of the emissions that its estate and its work create. The second is the effect that the change in climate could have on the health of the public.

This chapter explores some of the key challenges to the health sector and looks at some of the options for addressing the challenges that are being considered in the West Midlands. These are not the only ways that the challenge can be addressed and lessons will be learned from the experiences of other regions. As with many of these policy areas the region will not be able to tackle the problem on its own and national strategies will have an important part to play.

What can the NHS do about its own impact?

The NHS has an interim target to reduce its emissions by 10% by 2015. Emissions from the NHS currently constitute 2.8% of the UK's emissions. One of the big challenges facing the NHS is to accurately baseline the current performance of its estate and operations to fully understand where and how savings can be made.

The advantage the health sector and the NHS in particular have over many policy areas is that it knows the scale of its emissions. It also knows where in its operations these emissions come from. As we highlight later in the chapter, the NHS attributes 60% of its emissions to its procurement. Having this understanding allows for better planning which will help reduce emissions. This is a lesson that other areas could learn.

There are a number of strands of activity whereby the NHS in the region can begin to produce a reduction in emissions.

The first of these is to develop "low carbon clinical practices". This means the delivery of care with as little unnecessary waste as possible. Waste includes unnecessary journeys, so avoiding asking patients to travel to NHS premises where this is not required. Work is ongoing to develop ways of delivering some aspects of healthcare remotely through "tele-healthcare". The key to this is applying the techniques appropriately so as to give the right kind of care while avoiding unnecessary travel.

The main aim of the current Tele-Healthcare Project in the West Midlands is not one of reducing emissions but one of improving the healthcare delivered to patients.

Tele-Healthcare is a combination of equipment, monitoring and response that can help individuals to remain independent at home. It is important to help people remain independent by providing support for patients to better self care and self manage conditions. Investment in self care is estimated to reduce GP visits by between 24% and 69% and hospitalisation by 50%. It can also help monitor incidents, such as falls, and monitor people, for example to detect early changes in conditions.

The West Midlands Tele-Healthcare project aims to: promote innovative ways of working to reduce unnecessary admissions and utilisation of services; to put patients and their carers in control; to provide increased satisfaction amongst consumers and commissioners.

It is also trying to promote partnership working and cultural development to support mainstream integration of tele-healthcare throughout the health and social care workforce.

In this context the key fact is that if tele-healthcare can significantly reduce the number of GP visits and reduce the number of patients in hospital at any one time it has real potential to help reduce emissions and waste levels.

Other quite straightforward ways the NHS could improve its day to day practices include multi-skilled staff that reduce the number of individuals who need to visit patients. Most interventions and procedures done in the community are simple and can easily be taught to a range of professionals. Linking this to communication with community staff so that receive home visit itinerary and travel routes direct to their home avoiding the need to travel to a central base every day can reduce NHS travelling.

The NHS also attributes 60% of its CO₂ emissions to waste and the waste of prescribe medicines is a part of that. Smarter prescribing could help reduce that waste though there is in built resistance to such an approach at present due to the nature of the supply of the medicines.

The NHS is also working to improve the impact of its infrastructure. This extends from the application of BREEAM⁽¹⁾ for healthcare standards to all new buildings to more simple measures such as lights that turn on and off based on movement.

BREEAM Healthcare was commissioned by the Department of Health and Welsh Health Estates and has now replaced NEAT (NHS Environmental Assessment Tool) as the preferred environmental assessment method for healthcare buildings in the UK.

As of 1st of July 2008, the Department of Health require, as part of the Outline of Business Case approval, that all new builds achieve an Excellent and all refurbishments achieve a Very Good rating under BREEAM Healthcare.

As well as reducing journeys to NHS property there is also the option to make travelling more sustainable and the NHS in the region is attempting to work with public transport providers to make sure that there is a more sustainable method of getting to its properties. The NHS is also considering the use of electrical vehicles.

The NHS is also the largest employer in the UK and as such has the opportunity to influence the behaviours of its staff. The NHS in the region is trying to work with its staff to develop a staff transport plan that encourages them to travel to work more sustainably. This includes better use of public transport and car sharing.

Case Study: 'The Green Wing' - University of Warwick

The Green Wing is Warwick Medical School's Student Environmental Society. It was set up by a group of medical students in 2006 with the aim of raising awareness of environmental issues at Warwick medical school and in the wider community.

To date the group have set up a number of projects including:

- *Environmental awareness teaching project in Primary schools;*
- *Removal of 10,000 plastic cups used yearly at medical school;*
- *Sustrans transport survey at University Hospital Coventry Warwickshire;*
- *Research project with Dr Frances Griffiths on medical students opinions on climate change;*
- *Proposal to include a special study module into the medical school curriculum entitled 'topics in global health' and a non-compulsory lecture in the Ethic module on Climate change.*

1 BREEAM (BRE Environmental Assessment Method) is the leading and most widely used environmental assessment method for buildings

Case Study: Addenbrooke's Hospital Travel Plan

Addenbrooke Hospital is the centre of the Cambridge University Hospitals NHS Foundation Trust⁽²⁾. In addition to medical facilities, it also provides teaching and research facilities. The daily movement of staff (more than 7,000⁽³⁾), patients, students, visitors and deliveries, has positioned Addenbrooke Hospital as one of the largest traffic generators within Cambridgeshire.

In order to tackle this, the Hospital decided to promote initiatives that can facilitate access to the site through the use of more sustainable ways of transport. In 1997 a 'Travel Plan' was born with the main objectives of⁽⁴⁾:

Increase travel choices and make them safe and accessible;

- Reduce demand for car parking;
- Encourage healthy transport options;
- Reduce the environment impact of the travel needs of the campus.

Key initiatives put in place by Addenbrooke Hospital involve:

- Join Travel for Work, a network of employers working to reduce traffic congestion;
- Provide staff discounts for buses and train fares;
- Develop a car share scheme;
- Provide Interest-free loans for cycle purchase;
- Offer cycle repair service for staff;
- Deliver the first public bus service in the country to be commissioned and managed by the NHS; Creation of the scheme 'Walk to work' in which employees are encouraged to think about healthier and greener options to get to work.

There are also plans to look at the use of other natural resources such as water and food within the service. The opportunities to develop rain water capture techniques within the service and to reduce wastage are good. In terms of food the sourcing and wastage are areas which can be improved to make a difference to the footprint.

Will climate change alter the types of care needed?

In May 2009 The Lancet⁽⁵⁾ had a detailed report on 'Managing the health effects of climate change'. This report was based on the global implications of climate change but had some very clear messages that are relevant to the West Midlands.

The research presented showed that "the effects of climate change on health will affect most populations in the next decades and put the lives and wellbeing of billions of people at increased risk."

The impacts it covers are both direct and indirect. Some will come directly from increase in diseases or from natural disasters that may become more prevalent. Others will come as knock on effects from water and food shortages and population growth.

2 Sustrans (2006) *The Network*, Issue 2, p. 11

3 Cambridge University Hospitals, *Working for us*, http://www.cuh.org.uk/addenbrookes/working_for_us/working_index.html

4 Sustrans (2006) *The Network*, Issue 2, p. 11

5 Managing the health effects of climate change, Lancet and University College London Institute for Global Health Commission, *The Lancet*, Vol. 373 May 2009

The current climate means that the NHS faces particular pressures during the winter that aren't faced in the summer. This allows for the scheduling of non-urgent procedures during the less pressurised summer months. The change in climate suggests that these pressures will begin to be felt throughout the year and therefore the service will need to be geared up for year round pressure. The hotter, drier summers that are predicted combined with wetter winters offer a new challenge.

Some indication of the impact a changing climate can have was seen in France in 2006 when unseasonably high summer temperatures saw an increase in heat related deaths of over 15,000 more than the average. These deaths were particularly focussed on the large urban areas where the type of buildings prevalent were not designed for such temperatures and created major problems particularly for the elderly.

The predicted rise in temperatures has the potential to make some diseases more likely to survive and flourish in the UK. Warmer weather sees an increase in prevalence of food poisoning and water-borne disease. Higher temperatures and worsening air quality could lead to an increase in pollution related diseases. Other risks come from increased rates of skin cancer and sun burn related problems.

Some of the other challenges faced by climate change have health implications too. Increased incidences of flooding pose initial health risks from injury due to the event followed by the risk of disease from contaminated drinking water and water-borne disease.

Many of these potential problems are not yet fully understood and more work is being undertaken to gauge what the impacts could be. The NHS has a series of events running looking at "Scenario's for the future" which are bringing health professionals together to consider these challenges.

Energy and Waste

With thanks to Graham Waddell, Tim Baldwin and Thomas Anderson at Advantage West Midlands.

A feature of cross-cutting issues such as climate change is that there are synergies to be found and explored between apparently unlikely sectors. In this example, the need to generate renewable energy as part of the approach to reducing carbon emissions correlates well with the requirement to reduce waste going to landfill and the release of greenhouse gases from organic matter.

It is important to note, that this particularly example is only a small part of a much bigger picture on energy and waste.

The UK Low Carbon Transition Plan⁽¹⁾, commits us to obtaining 40% of our electricity from low carbon resources by 2020 (30% from renewables and the rest from nuclear, carbon capture and storage), as well as radically reducing our emissions from households, business and transport. This is a significant challenge and an opportunity for the West Midlands, where currently we produce only 0.4% of our electricity from renewable resources and are unlikely to reach our target of 5% by 2010.

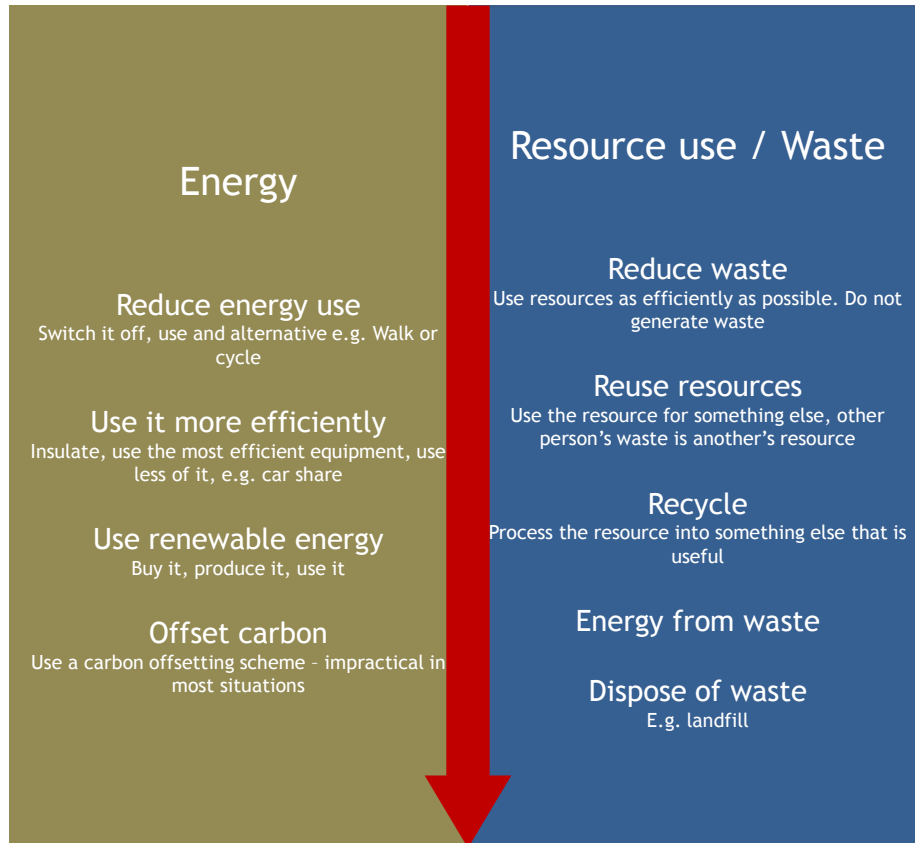
Our use of resources and management of waste has profound effects on both the local and global environment. Inefficient use of raw materials, wastes, energy and water is a direct cost on businesses, as well as being a wasted economic opportunity. Furthermore landfill is responsible for 4% of UK greenhouse gas emissions. Therefore, the National Waste Strategy⁽²⁾ has set challenging targets for reducing landfill.

Both energy and waste have similar hierarchies for intervention, if we are to meet the challenges that face us.

1 Department of Energy & Climate Change (2009) The UK Low carbon transition plan

2 Department for Environment, Food and rural Affairs (2007) Waste Strategy 2007 for England

Figure 6



In the West Midlands we need to ensure that households, businesses and other organisations are highly resource and energy efficient and that the right infrastructures are in place to enable people to do the right thing. For both sound economic and environmental reasons we should be managing both energy and waste as far up the hierarchy as possible, ensuring that we use only the energy and resources that we really need, and when we do so as little as possible results in carbon emissions or disposal to landfill.

The West Midlands has particular skills in waste processing. Through some innovative thinking we have a chance to turn two significant challenges into an environmental and economic opportunity. This chapter explores how we might do so.

Energy

Ensuring a low carbon Energy future is a massive challenge internationally, nationally and locally. The manner in which we generate, supply and consume energy in future will be critical to reduce the potential impacts on climate change.

The use of Energy cuts across all aspects of society: at domestic level through homes and communities; business, industry and workplaces; and transport. Our predominant dependence on fossil fuels and fossil fuel-derived energy - oil, natural gas and electricity - presents significant negative climate impact from carbon emissions resulting from the generation, distribution, consumption and use of energy for our electricity, heat and transport.

Two of the most effective measures for reducing the impact of Energy on climate change are:

Energy and Waste

- To significantly increase energy efficiency across the built environment and all sectors of the economy to reduce energy demand and consumption
- To increase the proportion of our energy generated and consumed from low carbon and renewable sources to reduce the proportion of energy consumed from fossil-fuel sources.

However the achievement of these measures must be managed within the fundamental requirement to ensure that the UK, and the West Midlands, maintains a secure energy supply to meet demand now and in the future to ensure a secure, affordable low carbon energy supply to all parts of society.

Future Challenges

The UK now has the strongest legislative climate change targets of any nation:

- 80% carbon emissions reduction by 2059 from the 1990 baseline
- 26% carbon emissions reduction by 2026 from the 1990 baseline
- Three cycles of five-yearly national carbon budgets to drive national achievement of the 2026 target

In addition the UK has introduced a binding target of 15% of energy (electricity, heat and transport) to be produced from renewables by 2020, and is a significant contributing factor to meeting the UK's carbon reduction targets. This is also the UK's contribution to the European Union renewable energy target of 20% of EU energy consumption by 2020.

To ensure the UK has a secure supply of energy, whilst reducing its impact on our climate, will require a mixed portfolio of energy generation sources that necessarily includes renewable technologies such as wind and solar; decentralised energy and combined heat & power; nuclear power; and grid electricity and natural gas. The challenge is to ensure that an increasing proportion of our generation capacity in this mix is from low carbon and renewable sources.

Reducing the demand for energy (*efficiency*); changing the way we use and consume energy (*technology development and behaviour change*); and increasing development and deployment of low carbon energy technologies (*market and infrastructure development*) are significant challenges to be faced in reducing the impact on our climate from meeting our energy needs.

In 2004 the West Midlands Regional Energy Strategy set out the challenge for the region to improve its energy efficiency; increase the use of renewable energy resources; and to maximise business opportunities resulting from the low carbon energy sector in support of an overall strategic target of reducing regional carbon emissions by 60% by 2050 from the 1990 baseline. The West Midlands faces a number of challenges if it is to transform the way we produce and consume energy.

The West Midlands is a net importer of energy meaning that less than 40% of energy consumed here is actually produced here, limiting the control available over how and where energy is most effectively provided. The majority of the regions housing stock and built environment could benefit from improving its energy efficiency and reduce the collective amount of energy consumed. The achievement of large scale increase in energy efficiency will require major investment and behavioural change to realise.

The West Midlands faces significant geographical constraints compared to other regions that hinders the amount of renewable energy we can generate, particularly the lack of natural coastline. This reduces our ability to deploy large scale renewable energy technology that is most effective and most economically viable, such as offshore wind turbines. This also limits our ability to be part of the expansion in marine energy including wave and tidal, other than through exploiting commercial supply chain opportunities. The region is also hindered by a modest potential for onshore wind turbines given the topography and technical requirements to make them commercially viable.

These factors make it essential that the region identifies the right locations to encourage the right types of renewable energy technologies to suit our geographical strengths. These include Combined Heat & Power, bioenergy such as anaerobic digestion and gasification, onshore wind and micro renewables. On a larger scale, improving our energy infrastructure and decentralised energy solutions will enable larger scale local generation.

To facilitate increased deployment of these energy solutions will require two major challenges to be addressed, both in the West Midlands and nationally. Firstly the need to ensure the ability of decentralised energy generators to be able to connect and supply to the national electricity grid. Secondly is the need for radical improvement of the national planning process to encourage, rather than hinder, renewable energy schemes.

Opportunities

There are a significant range of commercial opportunities presented by the transition to a low carbon energy future, with additional benefits for domestic and commercial consumers. A number of the measures to reduce the climate impact of energy generation and consumption are necessarily at national scale. These include transmission and infrastructure modernisation as well as new technologies such as Carbon Capture and Storage and 'clean coal' power stations for nationally significant generation plants. However there are a large number of opportunities at local level through decentralised energy and renewable generation suitable for urban and rural locations at different scales of size.

Large and Medium Scale

Large and medium scale schemes are those which generate and supply energy to serve a large number of local users through district or community networks, either exclusively through an 'off-grid' network or through connection to the local electricity grid. An example of this scale of production is Combined Heat & Power (CHP) plants usually powered by natural gas, or combined with biomass, that provide heat and electricity, increasing the efficiency of the energy produced and reducing carbon emissions. These schemes are often of a scale to power industrial parks or urban development's where high and constant heat demand is required.

The challenges at this scale are that such generation requires implementing new infrastructure development and facilities, detailed planning consents, securing finance and in many cases arranging connection to the electricity grid. However successful schemes demonstrate the potential to meet the power requirements of cities and communities.

Urban Case Study: Birmingham District Energy Scheme

The Birmingham District Energy Scheme is operated by the Birmingham District Energy Company Ltd (BDEC), which is wholly owned by Utilicom but is run in partnership with Birmingham City Council. The International Convention Centre (ICC) Energy Centre in Broad Street, Birmingham houses a 1.5MW Combined Heat and Power (CHP) unit.

The unit generates electricity using a gas powered engine. The electricity generated is supplied by "private wire" to the ICC where it is synchronised with the national grid supply.

The heat generated as a by product of the electricity production is harvested and used to heat and chill water. Hot & chilled water is supplied to a number of customers around the local area, including The National Indoor Arena (NIA), The ICC, The Hyatt hotel, The Rep Theatre, Birmingham Town Hall and Birmingham Council House. In the first year of operation the Broad Street scheme has saved nearly 3,000 tonnes of CO2 emissions and supplied its customers with lower cost energy.

Energy and Waste

In rural areas different options of decentralised low carbon energy generation are available, including biomass boiler units and anaerobic digestion. In these processes materials such as wood, straw and energy crops such as miscanthus (biomass) or food and agricultural wastes (anaerobic digestion) are used as fuel sources.

Rural Case Study: Eccleshall Biomass Power Plant

The Eccleshall Biomass Power Plant was commissioned in September 2007 and has a capacity of 13 MW thermal producing 2.65 MW of electricity. The fuels burned range from woodchips, compost oversize, straw and miscanthus, at an annual rate around 30,000 tons. These renewable energy resources save about 18,500 tons per year of fossil fuels, equivalent to reduction in CO2 emission of 36,500 tons per year.

The plant is owned and operated by Eccleshall Biomass Limited (EBL), who has a number of long-term contracted fuel suppliers. Feasibility study of the project began in 2003, and in 2006 contract was signed between EBL and Talbotts Biomass Power for the design, erection and commissioning of the plant. The project was financed by private funds and got support of £1.5 million from Advantage West Midlands and DTI green-energy reward.

The plant produces 20,800 MWh of electricity per year, 90% of which is exported to the grid. The expected financial return of the plant is about 6 years. This green-energy power plant really generated enthusiasm among the local community, who proudly claim that they are making a great contribution to combat global warming, in such a small town in the West Midlands.

Small Scale

Small scale measures are predominantly available to business and domestic users, with specific measures centred on increasing energy efficiency of buildings to reduce energy demand and deploying renewable energy generation technologies to contribute to meeting the energy demands of the building.

The opportunities for making a difference come through new build properties being designed and built to zero carbon standards and through the retrofit of existing properties. As 85% of the regions housing stock is anticipated in 2026 to be built prior to 2006, retrofitting energy efficiency measures will be crucial in lowering the energy use from the domestic market, which also presents significant commercial opportunities to supply this market.

The increased deployment of small scale renewable energy technologies to homes and businesses presents significant economic opportunities for companies manufacturing, installing and servicing them as well as stimulating wider supply chains. It also offers secure low carbon sources of energy to the consumer, reducing exposure to increasing market energy costs from large suppliers and reducing their consumption of grid electricity resulting in reduced carbon emissions. For businesses installing renewable energy this can also reduce their energy costs in the long term and increase their profitability.

Case Study: RE:think Energy grant funding

RE:think Energy is a capital grants programme supporting rural enterprises in the West Midlands' Rural Regeneration Zone. The scheme is designed to support the uptake of renewable technologies by SME's through providing grant support for energy efficiency surveys and up to 50% of the cost of suitable renewable technologies. A range of energy solutions have been supported to date including biomass boiler systems, solar hot water panels and small wind turbines.

Through the scheme a Shropshire farmer has proven that businesses can use renewable sources to power themselves and become self sufficient. Mr Hudson fitted a 15kW wind turbine at his farm, to convert wind into energy. He decided to do this because his energy costs were too high and he wanted to capitalise on the area's plentiful wind supply. Mr Hudson is already feeling the benefits of the turbine which powers his whole farm for free and provides energy for others as it exports surplus energy back to the grid.

Some of the benefits presented through this agenda include:

- Commercial opportunities: Research & Development; Innovation and technology development
- Supply Chain growth: business diversification into new environmental technology markets creating new jobs and raising skills
- Domestic and commercial benefits: reduced energy bills, increased efficiency and comfort in homes and buildings.

The introduction of Feed-in-Tariffs (FIT) in April 2010 will further incentivise small scale renewable energy generation in the UK. Already well established in certain EU countries, FITs will reward domestic householders and businesses who generate electricity from renewable sources in excess of their own requirements that are then sold to the national grid. Priced at a specific pence per kilowatt hour this mechanism will reward those who produce increasing amounts of renewable energy over and above their own requirements. The planned introduction of a Renewable Heat Incentive (RHI) from April 2011 will offer the same financial incentives to generators of renewable heat under the same reward mechanism principles. It is anticipated that this will support large-scale uptake of micro-renewables by increasing their financial viability and competitiveness to consumers in comparison with traditional grid electricity and gas prices.

What will this mean for the region's economy?

With finite natural resources and increasing energy costs a lack of action to minimise the risk of reliance on fossil fuel energy supply will increase the cost to both business and domestic customers, reducing profit in the former and increasing living costs and possible fuel poverty in the latter. This will have significant negative impact on the region's commercial and consumer economy.

The inevitable increase in future regional energy demand as a result of economic and housing growth will not be met by our existing generation and transmission capacity. This will result in energy shortages and could lead to potential black outs at peak times due to an inability to meet demand, negatively impacting on communities and business competitiveness.

Increasing the amount of decentralised and renewable energy generation across the region will directly tackle this power gap to provide greater energy security and with it significant economic opportunities and job creation. Developing, manufacturing, supplying and installing these schemes will stimulate large sections of our economy, creating new jobs and increasing the demand for skilled people to undertake new jobs.

Energy and Waste

Behavioural Changes

Ultimately a range of large scale behavioural changes are required. Increasing awareness and understanding amongst domestic households and communities of the need to improve energy efficiency of their properties, consider the goods they purchase as well as the financial benefits that saving energy brings is required.

Increasing understanding and communicating the benefits of energy and resource efficiency to small, medium and large companies is required to reduce their energy consumption and reduce the costs to their business making them more profitable and competitive.

Increasing public perception of the benefits of renewable and decentralised energy, encouraging greater education and awareness of what this will mean to them in their communities will encourage greater scales of development and deployment. In turn this will increase understanding amongst householders and businesses of how they can generate their own low carbon energy, how they can receive support to do so and how they can receive the benefits.

More joined up decision making is required between local, regional and national decision makers to improve the planning process for decentralised and renewable energy solutions to encourage infrastructure development and investor confidence. This will require public organisations to identify appropriate sites, technologies and developments to encourage private sector confidence and investment in large and medium scale installations to generate larger quantities of low carbon energy close to the sources of consumption.

Community cohesion benefits

Decentralised and local renewable energy will provide the region's communities with greater security of supply and access to affordable low carbon heat and electricity.

Localised supply, particularly at domestic level, will prevent more households falling into fuel poverty and will address disparities experienced in rural off-gas grid network communities to source affordable heat.

Micro-generation and small scale decentralised energy generation will encourage more local and community ownership over how their energy is produced and supplied. This will encourage more social enterprises to operate schemes for community benefit and to establish community-owned Energy Service Company's (ESCO's) to commercially manage local energy generation, creating local wealth.

Waste

The connection between waste and climate change is complex. How much we waste and how we treat it have major roles to play in tackling climate change. Most of us now accept the need to recycle as much of our waste as possible and do so at home and in the workplace. What then happens to our waste is less well understood. Emissions from landfill form a large part of the UK's greenhouse gas emissions as well as requiring large swathes of land. There is also a significant economic driver away from landfill. The current landfill tax rate is £40 per tonne in 2009/10. The escalator applied to this rate means that it will double by 2015 and the £100 per tonne waste is not too far off.

However there is growing recognition of the role that waste can have in generating renewable energy. There is also a growing awareness of the market for resource recovery - connecting businesses that can utilise waste products from another industry and producing a market for waste.

Future challenges

The West Midlands Regional Spatial Strategy forecasts over 14 million tonnes of municipal and commercial and industrial wastes will be generated by the year 2020/21. The forecasted gap in treatment capacity by the year 2020 is anticipated to be at least 3.7 million tonnes, despite an estimated current treatment capacity of 7 million tonnes across the region. This means that however we choose to approach waste we'll have 3.7 million tonnes more waste than we can treat.

District level assessment of the future capacity gap identifies the high density urban areas of Birmingham, Coventry and Solihull with the greatest forecasted waste treatment capacity need.

Converting the forecasted 3.7 million tonne capacity gap in 2020/21 into a land take requirement indicates at least 140 hectares of land will be required for development of infrastructure to manage the capacity gap. The true land take is likely to be at least double, when factoring in facilities not operating at their maximum licensed capacity, relocation of facilities currently in sensitive areas, or situated on high value land suitable for regeneration and development.

So we need to find a way of reducing the predicted gap.

Another driver is waste management costs. Gate fee costs for the processing of materials through a recycling or organic treatment facility is already competitive with landfill costs, although collection costs currently act as barrier to immediate change. As highlighted earlier in this chapter landfill tax currently stands at £40 per tonne and is due to double in coming years.

This future increase should further narrow the cost gap between landfill and the development of recycling and organic treatment infrastructure. Other treatment processes are also likely to become economically viable in comparison by 2015.

The stand out opportunity in the West Midlands is to maximise the use of energy from waste. Waste to energy conversion is an increasingly recognised approach to resolving two issues in one - waste management and sustainable energy.

Waste represents an increasingly important fuel source. Using waste as fuel can have important environmental benefits. It can not only provide a safe and cost effective way of waste disposal but can also help reduce carbon dioxide emissions.

In the West Midlands we don't have the natural infrastructure to make some of the key renewable energy sources possible. We do have the raw materials and the expertise to take advantage of the opportunities to generate energy from waste. A recent study conducted by DTZ and SLR Consulting for Advantage West Midlands and the West Midlands Regional Technical Advisory Body (Waste) has set out a regional approach to developing landfill diversion infrastructure⁽³⁾.

The purpose of the report and the associated tools is to identify the appropriate locations to place new waste infrastructure. This will then allow the diversion of commercial and industrial waste from landfill, maximise carbon reduction and reduce the demand for new materials.

The West Midlands also has a strong resource recovery sector. Taking waste from one industry or business and using it as a resource for another sector. This allows a reduction in waste and creates commercial opportunities for businesses, generating money from their waste.

What behavioural change will we see?

In order for the waste sector to play a role in mitigating the effects of, and adapting to, the challenge of climate change there is a need for some radical behaviour change and some continuous improvement.

3 Advantage West Midlands (2009) The Regional Approach to Landfill Diversion Infrastructure

Energy and Waste

Recycling is already accepted practice and the public's acceptance of this needs to be built on allowing more and more materials to be recycled or reused. Some of this will continue to be driven by the services provided on the doorstep and these services, the types of material that can be recycled, will have to continue to expand. The general awareness will still need to be raised about other means of recycling that can be done. There is also a need for reinforcement of the message that we should be trying to reduce waste as well as recycle it.

On a more radical level there is a need for a change in both the public and policy makers perceptions of the waste industry. The regional Waste Infrastructure Advisory Group (WIAG) has recognised this and is working to raise the profile of the industry.

There is a strong perception that the waste industry is a dirty, low skilled industry that doesn't offer good career prospects or is not a desirable sector to work in. The increased promotion of the opportunities to have an impact on climate change through the sector and increased awareness of some of the high skilled opportunities is one way of tackling the perceptions. Another is through an industry led programme to raise their own standards through identification and sharing of good practice.

As well as improving the understanding of the industry with the general public, local planners need to better understand the issues involved to make informed judgements on new infrastructure development.

Investment in new infrastructure will come from the private sector in non-landfill projects. The new role for the public sector will be to act as an enabler to help with identification of appropriate sites and in informing the public of the benefits of the new infrastructure and the need for it to be built.

What will it mean for the region's economy?

Current levels of landfill allied to the forthcoming increases in landfill tax mean that the status quo will have a negative effect on the region's businesses. However there are real opportunities for the region's economy from the waste sector.

The region has a particular strength in resource recovery. There is a strong programme of industrial symbiosis. Industrial symbiosis brings together companies from all business sectors with the aim of improving cross industry resource efficiency. It does this by commercial trading of materials, energy and water and sharing assets, logistics and expertise. The UK has a National Industrial Symbiosis Programme (NISP) which is based in Birmingham. The West Midlands is considered to be one of NISP's more mature regions and NISP has been operating here since 2003.

The opportunity to develop renewable energy from waste allows the region to develop a local source of renewable energy. This will give greater energy security and allow some control over the supply of energy.

Case Study: Staffordshire's green energy plant

Staffordshire is now developing its second energy from waste operation. The scheme is a central plank in Staffordshire's drive to move away from unpopular and expensive landfill, saving Staffordshire tax payers £7.5 million a year for the next 25 years.

Staffordshire's drive towards zero household waste to landfill majors on maximising recycling and using residual waste to get the best package of benefits for the tax payer and the environment. The new facility, at Four Ashes industrial estate in the south of the county will generate enough energy for 24,000 homes.

The plant will be Staffordshire's second - with the Energy from Waste plant in Hanford already generating enough energy for 13,000 homes for over a decade.

Staffordshire's Waste to Resource project has been a real success story for the county - overcoming hurdle after hurdle while other councils across the UK have suffered from indecision and delays which cost tax payers dear.

The Government said Staffordshire's approach would contribute significantly towards the UK's landfill reduction target and in tackling climate change too.

A rural urban split?

The analysis conducted for AWM and the Waste RTAB reviewed every lower super output area (LSOA) in the region to assess its suitability for the development of new waste infrastructure. For simplicity of approach they broke down the technologies into three main types:

- Organic - including open windrow composting, in-vessel composting and anaerobic digestion;
- Dry Recycling - including primary segregation and secondary reprocessing;
- Recovery - including energy from waste/CHP, Mechanical Biological Treatment (MBT) and Autoclave⁽⁴⁾.

The report identifies that these different types of technology are more appropriate in different areas of the region.

The organic waste technologies are most appropriate in the rural west of the region particularly in Herefordshire and Shropshire. Recycling is strongest in Birmingham and the Black Country with pockets of opportunity in Stoke-on-Trent, North Warwickshire and Rugby. Recovery has most potential in the urban areas of the region.

4 A waste autoclave is a form of solid waste treatment that utilises heat, steam and pressure of an industrial autoclave in the processing of waste

Business, Skills and Education

With thanks to Thomas Anderson at Advantage West Midlands and Andy Phillips at West Midlands Regional Observatory.

“The UK market for environmental or low-carbon technologies is expected to grow to £10 billion within the next three years, with the worldwide market growing to \$1 trillion over the same period, followed by annual increases of £70 billion. This is an opportunity that the West Midlands is extremely well placed to exploit.

In addition, many low-carbon actions such as resource efficiency, lean manufacturing and flexible working will act to improve productivity while opportunities presented in the recycling and home insulation sectors can tackle economic inclusion”⁽¹⁾.

The low carbon economy is expected to witness extensive growth in the coming years. This chapter looks at what impact this may have on the region’s businesses, the skills needed to take advantage of growth opportunities and one of the key drivers for change, the education sector.

The outlook for the environmental technology sector is very positive, despite the current recession. But are businesses in the West Midlands set up to take full advantage of growth opportunities? Evidence suggests that they place little emphasis on R&D and have limited links with the region’s Higher Education Institutions, both key factors in ensuring that businesses are at the forefront of change. To take advantage of growth opportunities, ensuring that businesses have the appropriate skills needed in a low carbon is important. The education sector has the potential to be a significant legislative driver for change and opportunity.

Businesses will have to make sure they are well placed to take advantage of the expected growth. There will obviously be other impacts on the region’s businesses beyond those solely focused on market segments of the low carbon economy. The extent of these impacts is not covered in this chapter as they are likely to be highly varied, dependant on sector and company size. Inevitably, some businesses will see environmental legislation as a burden and a cost they cannot afford to incur. Others will see it as a growing market they can be part of, embracing the opportunity as a driver for growth and innovation.

Businesses & the low carbon economy

The UK Low Carbon Industrial Strategy⁽²⁾ launched in July 2009 spells out a strong message to the region’s businesses:

“The transition to a low carbon world will transform our whole economy. It will change our industrial landscape, the supply chains of our businesses and the way we all live and work. The vast majority of, if not all, economic activity in Britain will have to reduce its carbon impact significantly.

...The move to a low carbon economy will bring costs as well as economic benefits for Britain. But the costs of inaction will be far greater than the costs of action.”

The report believes that there are a set of low carbon activities and priorities which must be common across all parts of Britain. These include greater energy efficiency, smarter low carbon procurement and the construction or retrofit of low carbon buildings.

With its legacy of a dominant manufacturing base this region faces particular challenges in improving its energy efficiency. As discussed in the Energy & Waste chapter there are possibilities for resource reuse and localised renewable energy generation but improving the efficiency will still be vital.

1 Advantage West Midlands (2008) Low Carbon - Evidence of Success

2 Department for Business, Enterprise and Regulatory Reform (2007) The UK Low Carbon Industrial Strategy

The region has a strong environment technologies sector but the low carbon economic challenges and opportunities that will arise from climate change are just as relevant to the broader economy.

Moves to a low carbon economy will require innovation. Work carried out by the Observatory on behalf of the Regional Skills Partnership in 2009 found that while the region's environmental technologies sector has performed more strongly than many others in recent years there is a limited emphasis on R&D and new product development. While there are a few notable exceptions there is a widespread reliance on other organisations to undertake this activity, with firms tending to focus on either bringing technology developed elsewhere to the marketplace or improving the efficiency of existing technology.

Investment in R&D is vital if firms are to move into higher value added products, services and markets and fully capitalise on the potential for growth. Strong links between the region's businesses and universities are key to this process and a number of universities in the region have been their capability and expertise in environmental technologies recent years.

However, despite some notable exceptions (there are examples of firms working with Birmingham, Aston and Warwick Universities), the majority of businesses have no links with the region's Higher Education Institutions. Many of those that do work with universities tend to look further afield (for example to Imperial, Cranfield, Cardiff and Newcastle).

The strength of the environment technologies sector in the current market is borne out by the sector's performance through the current recession. Some 50% of the region's environmental technologies firms are looking to increase their employment. Many of these jobs are 'knowledge intensive' requiring high skills and therefore offering high value employment. There are also lower skilled opportunities.

For a significant proportion of companies the economic downturn does not appear to have had any significant impact on recent growth in turnover and profit. Turnover had increased in the recent past for over 70% of the companies interviewed as part of the Observatory's work.

More concerning is the fact that in the West Midlands the sector has an older than average workforce. Some 22,000 workers (30%) are aged over 55 compared with 25% across all sectors. This raises some succession planning issues that the sector and skills providers will need to tackle to avoid a serious loss of experience in the coming years.

Prospects for growth in the environmental technology companies interviewed appear to be very positive. Over two thirds of companies interviewed felt that the prospects for growth were good. Considerable market opportunities and potential for growth were identified these included:

- Renewable Energy - installation of small scale renewable energy technologies in a domestic and commercial setting to large scale energy production, larger scale waste to energy projects (e.g. biogas facilities) and large scale renewable energy generation (wind, solar, wave and tidal power).
- Recycling and waste management.
- Clean and waste water treatment.

Other business opportunities come with the climate change. An increase in warmer, drier summers will have a positive impact on the tourism sector. Tourism is already a valuable resource to the region and weather that is more reliable will only serve to increase the attraction of the region as a tourist destination.

There will need to be significant behavioural change from both businesses and consumers as we try to tackle and adapt to the effects of climate change.

Business, Skills and Education

Businesses will need to improve their efficiency to minimise the impact of rising energy costs. There is a good chance that some form of carbon legislation will be brought in which will further influence the need for increased efficiency.

How businesses manage their employees will need to change. Ways to reduce the amount of travel that their staff need to undertake will be a key plank of the efficiency drive as will how they actually travel. Home and remote working has been around for many years now but has not been embraced as fully as it might have been. The technology now exists for this to be relatively straight forward but it is still not core business practice.

More and more employers are moving towards developing employee travel plans which encourage their staff to travel to work by more sustainable modes of transport.

The role of behavioural change in consumers may also have an impact on the region's businesses. As consumers become more aware of the threat of climate change and ways in which they can make a difference this will influence their purchasing patterns. Ethical consumers make up a small part of the market place at present

The economic opportunities from that arise from climate change are not restricted by urban or rural location although the. Clearly some of the economic opportunities will arise from agriculture and therefore be focused on rural areas but in general they will be available to those businesses geared up to take advantage. Behavioural change is more complicated with elements of sustainable travel being much more difficult to implement in rural areas where public transport services are not so frequent and therefore less convenient to the user.

There is also a danger of a technology divide although work carried out by the Observatory in 2008 for the West Midlands ICT Cluster⁽³⁾ showed little variation in e-business adoption across the region. Just about the entire region has access to broadband technology now though the challenge will be to avoid a rural urban divide as the broadband speeds increase.

Work that the Observatory is currently undertaking on the vulnerability of jobs and businesses to carbon constraints has no clear divide between rural and urban areas either.

Skills issues

For the broader regional economy, identifying the skills needs of a low carbon economy is difficult as it is as yet unclear where the opportunities will come. However the work conducted by the Observatory with the Environmental Technology cluster businesses identified some of their skills challenges.

Their skills requirements can be split into broad changes in skill required and specialist skill requirements.

Broad changes in skills required included:

- The need for flexibility of skills deployment globally;
- The need to integrate technical engineering skills with commercial acumen;
- Awareness of environmental technology development globally;
- The need for a broad based understanding of sustainability issues;
- There is an increasing concern on the part of employers that all staff employed have sustainability built into their training, whether at university or elsewhere;
- The need for staff that are multi-skilled;
- The need to increasingly adapt to the implications of climate change.

Specialist skills identified included an increasing demand for:

3 West Midlands Regional Observatory (2008) E-business adoption in the West Midlands 2008

- Operational waste plant specialists;
- Scientific specialists;
- Installation skills specifically in relation to renewable energy systems;
- Appropriate skills and qualifications for energy assessors.

In general the incidence of skill gaps identified was relatively infrequent. Those skill gaps that were identified included the desire for a skills polymath, language skills, communication skills and marketing skills

Prior to the recession widespread recruitment difficulties were reported by environmental technology companies. Since the recession this situation has changed significantly with most companies indicating that recruitment is no longer an issue of concern

The key issue concerning recruitment relates to the skills that will be needed by environmental technology companies once the economy starts to grow. The indications from the companies interviewed are that future employment growth is likely to lead to an increased demand for skills that broadly mirror the existing workforce.

Many of the environmental technologies companies interviewed have common skill needs in that they are involved in the design and installation/manufacture of different types of plant and equipment, whether this be for particular processes (e.g. odour control systems within the water industry), particular activities (e.g. Combined Heat and Power plants) or building machines (e.g. wind turbines).

Fundamentally, many of these companies are engineering companies, but which specialise in different areas or types of environmental technology. They often employ the same types of engineers and installers/technicians offering similar skill sets. So, for example, in relation to graduate recruitment, these companies would be competing for the same building services, chemical, civil design, electrical, mechanical, plant, power and process engineers. It is often in the application of these skills to different areas of environmental technology where the specialisation of skills more specifically occurs, particularly through experience of working within different sub-sectors of activity.

In relation to the potential for environmental technology companies to take on skilled workers made redundant the general view of companies interviewed is that prospective recruits would not be job ready and would need to go through a programme of training in order to adapt their existing skills to meet specific job requirements within the industry.

Time, ability of the company to mentor potential apprentices and the nature of contracts undertaken by some companies were highlighted as the main barriers to their involvement in existing apprenticeship schemes.

The Education sector

The Education sector has the opportunity to impact on climate change through mitigation and adaptation. It is uniquely placed to have direct impacts through its building, purchasing and operations and also indirect impact through the teaching it provides to children.

In terms of behaviour change the education sector has a massive opportunity with the 'Building Schools for the Future' programme which will see every secondary school either rebuilt or renovated in the next few years.

All new schools built under this programme are expected to reduce emissions by 60% on 2002 levels. In the West Midlands we have the large single authority programme in Birmingham (see Case Study).

Schools are also large scale resource users with energy, water, food and drink areas where behaviour change could have a significant impact.

Business, Skills and Education

The Sustainable Schools programme is designed to support schools on their journey to sustainability. It covers a whole range of areas, including food and drink, energy and water, travel and traffic, purchasing and waste, and buildings and grounds. It includes guidance and a training pack for school governors, a bursar's guide to sustainable school operation, resources for teachers and an audit tool to help schools evaluate their impact.

Case Study: Building Schools for the Future

Building Schools for the Future (BSF) is a national building programme that will give Birmingham the opportunity to rebuild or refurbish all 76 secondary schools and 6 secondary special schools over the next decade. All schools constructed under the Building Schools for the Future programme are committed to reducing carbon emissions by 60% on 2002 levels.

Birmingham is the largest urban Building Schools for the Future project in the country. Due to the vast number of schools involved in Birmingham's programme the developments will take place over six phases. The complete list of all schools in each of the six phases is available.

£140 million from the government has been secured to redevelop ten sites within Phase 1. Transformation is already underway in the first four sample schools. The sample schools are involved in design, curriculum and ICT consultations to produce a model of what they would like their new / refurbished schools to look like. The models will reflect individual school needs and embrace 21st century learning. These schools are:

- *Broadway School (Perry Barr);*
- *Holte Secondary School (Lozells);*
- *Mayfield School (Handsworth);*
- *Stockland Green Technology College (Erdington).*

Schools have a role to play in teaching children about the natural environment and about how they impact on the world.

The Growing Schools programme encourages schools to use outdoor environments - the school grounds and beyond - as a cross-curricular learning resource. It focuses in particular on food, farming and the countryside. It aims to ensure pupils get first-hand experience of the natural world and that outdoor learning activities are integrated into everyday teaching in nursery, primary, secondary and special schools.

Case Study: Moorfield School, Newport, Shropshire

This project started when the school's head teacher and governors became concerned about the increasing cost of energy. The school buildings are not designed to be energy-efficient, so they took various steps to reduce energy use. They realised further reductions were only possible with long-term changes in behaviour by all members of the school community, including parents.

The primary objectives were to:

- *Improve pupils' awareness of energy use and energy saving at home and school.*
- *Relate pupils' understanding to social, economic and environmental implications of energy-saving decisions in the local area and the wider world.*
- *Show the relevance of schoolwork to the everyday lives of pupils and their families.*

All pupils were involved, from reception to year 6, and it was taught via a short session a week over an extended period of several terms. Over several weeks, teachers introduced pupils to the concepts of energy and energy use at work, in a variety of different curriculum subjects such as investigating miniature solar panels and designing and making draught excluders in art & design and design & technology. This work was also used to make pupils more aware of the practical measures the school was taking to reduce energy use, e.g. using energy-efficient lighting and turning off lights when leaving the room etc.

After introducing the topic, the school held an energy week. Pupils were given forms to record daily energy use in their homes, bringing in data each day. All classes collected data, and compared, analysed and displayed this information as part of their work in mathematics and ICT. Teachers helped pupils compare energy use in different homes on different days of the week, discussing patterns and suggesting reasons for similarities and differences.

The school also installed an electronic utilities monitor for collecting data about energy use at the school over a longer period time. This system used sensors and a data logger to record external and internal temperature and electricity, gas and water consumption. Pupils collected this information and investigated relationships between the different factors. This electronic monitoring has recently been improved to include an interactive VDU display the school entrance hall.

Parents showed an interest and supported many of these activities, assisting in energy-saving activities in classes and around the school. Many parents attended an energy evening, which highlighted pupils' work and shared information from the Energy Efficiency Advice Centre on ways to reduce energy use in the home. This included the opportunity to give every parent a compact fluorescent lamp, donated as part of this project. Year 5 pupils developed and performed an energy play as part of the energy evening.

This activity represents good education for sustainable development because it addresses the concepts of sustainable change, citizenship and stewardship and quality of life and encourages pupils to act as responsible citizens, while helping to develop a sense of responsibility for personal and group actions.

Outcomes of the project:

- *Understanding of energy issues at school and at home.*
- *Reduced energy consumption at the school.*
- *An improved attitude to measures taken around the school to use energy effectively.*

Planning for Climate Change

Planning for Climate Change

This report has considered climate change from a range of policy areas focusing in on some of the key issues and decision that need to be made. From this overview what practical considerations need to be made?

Recognise the challenge

Climate change needs to be recognised as a major challenge for all of us in the West Midlands, whatever role we may have. Recognising this, recognising how it cuts across every sphere of activity and recognising the scale of the challenges and opportunities it presents us with is fundamental. And if the West Midlands is to rise to the challenge, if it is to succeed economically, with thriving communities and a sustainable environment, we all need to respond proactively.

Do you know your position?

As outlined in the Health chapter the NHS has made a large stride forward in tackling its impact on climate change by identifying its carbon footprint. The work that has been carried out by the NHS shows that it contributes 2.8% of the UK's CO₂ emissions. Perhaps most interestingly from their work is that they can identify where, within the organisation, these emissions come from. Knowing that some 60% of their emissions can be attributed to their procurement process allows them to plan and act to reduce these emissions.

Many organisations try to start at the second step and plan to reduce their emissions without fully understanding where the emissions come from. Our recommendation is that organisations trying to tackle their impact on climate change start by getting an accurate picture of where their emissions come from. That then allows sensible planning and targeted action to be taken.

The first stage in identifying the scale of emissions and where they emanate from is not easy but it makes subsequent work significantly more effective and easier to target.

Choices - Individual & organisational

We need to be more efficient in terms of the energy we use and where possible to use renewable energy sources. We need to try and minimise the amount of waste we generate and view what waste we do generate as a resource, reusing and recycling the material. Design standards should come into play that both design out the need for high levels of energy and resource use and design in end of life solutions.

From all aspects we see the same mantra, we must take steps so that :

- our communities, businesses and places are less vulnerable to climatic changes;
- we use less resources and use them more efficiently.

On a consumer level, demand management in respect to the use of resources is important. This could be through increased water metering and water efficiency options or through increased use of energy monitoring in homes and businesses.

We need to plan for changes in our climate. Planned adaptation is more efficient and cost effective than last minute reactive adaptation. For example for every £1 spent on flood risk management measures saves £8 in long term economic damage avoided in the future; and effective flood planning can save small businesses 50 days recovering from a flood.

The planning system has a key role to play in driving this agenda.

There are key decisions that we need to be taking in the West Midlands if we are to maintain our life support systems, deal effectively with risks such as flooding and radically reduce our carbon emissions. We need to invest in our environmental infrastructure just to maintain our quality of life and a failure to do so will bring serious consequences. It is also clear that the choices that we make now about flooding and water use will have long term impacts and that there is an opportunity to gain the benefits of early decisions long into the future.

Within the West Midlands region people are aware about climate change - they are concerned and willing to change their behaviour. In the DfT's latest national Omnibus Survey⁽¹⁾, which segregates responses by region, 51% of respondents in the West Midlands knew a lot/fair amount about climate change. 86% were very/fairly concerned about it and 75% agreed strongly/agreed a willingness to change behaviour⁽²⁾.

Transport strategies and policies are in place and a substantial proportion of the travelling public is willing to change - BUT that is not enough. Not only is transport's CO₂ footprint getting bigger, but this is against a background of less people travelling by public transport

Procurement as a driver

Within the Business, Education & Skills chapter we talk about the contribution that 'green' consumers may make in pushing products to be more environmentally friendly. There is an opportunity for larger businesses or public bodies to replicate this influence on a much larger scale. Within the West Midlands the City Region is developing a project to look the procurement processes of its constituent authorities and the influence that they could have in driving innovative new products that are low carbon.

From a health perspective the patient will have the choice as to how best to manage follow up care and the choices made will impact on the NHS footprint. Better informed doctors may make smarter choices in terms of care and in terms of prescriptions, a key strand of the 60% of NHS emissions that are attributed to the procurement process.

Silos

One of the current issues that the region has is joining up the approach to tackling climate change. As this report illustrates even when trying to take a holistic approach to the problem there is a risk of different policy areas acting individually.

Many of the challenges cut across different policy areas and are best tackled in a cohesive fashion. Effective solutions will be developed only by the policy areas working together. The Climate Change Office has a vital role to play in joining up the region's approaches.

What is very clear is that none of these policy areas should act in isolation. The use of energy and waste is relevant to each of the policy themes; transport has a direct impact but also plays a key part in how the business and health sectors mitigate and adapt to climate change; how the health and education sector tackle procurement particularly of natural resources (food & drink in particular) impacts on the region's resources but also on the businesses that supply them. Planning has a role in bringing together effective approaches such as the development of sustainable communities.

Challenges & opportunities for the economy

We must plan and support how our economy adapts to our changing climate.

1 Department for Transport (2008) Omnibus Survey February and August
2 <http://www.dft.gov.uk/excel/173025/221412/221513/4387651/climatechngrntranstablesb1to14.xls#B.3!A1>

Planning for Climate Change

The Stern Review⁽³⁾ estimated the cost of not adapting to climate change as equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. Heat waves like that experienced in 2003 in Europe, resulted in agricultural losses reaching \$15 billion - this will be commonplace by the middle of the century. However, in contrast, the costs of action - reducing GHG emissions to avoid the worst impacts of CC - can be limited to around 1% of global GDP each year.

The main challenges to the economy relate to the need to operate far more efficiently and managing the risk of negative impacts of a changing climate on their premises, processes, staff, suppliers and markets. Water and energy costs are likely to rise and the added costs will impact on businesses and home owners. Planned adaptation is more effective and less expensive than last minute, reactive adaptation or damage limitation.

There are a range of opportunities: a growing market for those businesses that operate in the environmental technologies sector; huge potential for retrofitting buildings, new drivers for innovation; the opportunity to become self-sufficient in energy supply and the cost and security benefits that this offers.

A warming British climate and the escalating cost of foreign travel should benefit the West Midlands tourist industry. The benefits - social, cultural, educational, economic and health - of tourism and recreation are considerable.

Infrastructure

There are four strands to the infrastructure challenge. One is the need for new infrastructure to facilitate adaptation and mitigation of climate change. The second is the ability of large scale infrastructure procurement to drive low carbon development. The third is to ensure our critical infrastructure including power, water, and transport infrastructure is resilient to changes in our climate and can support our economy and communities. The fourth is to adapt our existing infrastructure so that it is resilient to climate change and produces the lowest greenhouse gas emissions possible. These require innovative approaches spatial planning at each level.

In terms of the new infrastructure required there is a real need to provide land for renewable and energy infrastructure in the region, while local opposition to development is strong from people directly affected by proposals.

Investment is needed in our environmental infrastructure in all parts of the region. This includes water availability and quality of the natural environment. It includes green infrastructure plans for all urban areas, delivery of regional biodiversity targets and landscape scale projects across the region. This would enable the region to adapt agriculture and our food supply chains to enhance our food security.

More innovative infrastructure will be required for example the development of shared flexible space infrastructure. "Tele-hubs" at transport nodes could replace office based work for people, reducing the need for travel as well as cutting journey times and congestion.

To have a real impact on the transport sector there will need to be new infrastructure. New high speed rail interchanges could form clusters of high connectivity within the UK and in Europe replacing short haul air journeys and freeing up existing airport infrastructure

The opportunity to use large scale infrastructure programmes to impact on climate change is apparent in the energy, health and education sectors. The implementation of low carbon energy will require the transformation of the existing energy infrastructure to handle intermittent renewable technologies and for micro generation feed in tariffs from dispersed locations.

3 HM Treasury Cabinet Office (2006) Stern Review: The economics of climate change

The education sector has a massive opportunity with the 'Building Schools for the Future' programme which will see every secondary school either rebuilt or renovated in the next few years. At the same time the NHS is also working to improve the impact of its infrastructure, a key strand of which is the application of BREEAM⁽⁴⁾ for healthcare standards to all new buildings.

Urban and rural differences

There are many issues which cut across both urban and rural areas but there are also some issues which are particular to either rural or urban. Many of the rural issues stem from the pressures placed on the land and the worry that economies of scale make many renewable energy or public transport options economically unviable. In urban areas many of the concerns raised are driven by the expected higher temperatures that will be more keenly felt than in the rural areas and the lack of available land.

In rural areas climate change will put increasing pressures on land due to an increasing need for both food and energy crops as well as for other uses such as flood attenuation. More land will be used for wetlands and water, linked to irrigation and to cope with increased flood risk management.

In the urban areas there is a scale of density that supports investment in, for example, public transport options. This is more difficult to achieve in rural areas. The whole smarter choice agenda is difficult to sustain in rural areas (as recognised by the Low Carbon Transport Plan⁽⁵⁾). Communities in rural (particularly remote rural) areas have a greater dependence on private transport. So investment in roads or car travel is needed.

Urban areas will become prone to increased summer temperatures, much higher in comparison to the surrounding countryside owing to the level of hard buildings and surfaces absorbing and retaining heat more than more open land. This will increase the need for cooling and development of water space and higher levels of green infrastructure to improve microclimatic conditions.

Poverty, community cohesion and resilience

Communities can be encouraged to work together to increase energy efficiency, for example by bringing people together around common actions on reduction of carbon as part of a shared future.

The development of sustainable communities includes design of places where there is a mix of houses, tenures and types to foster integration. On a broader level, failure to act on carbon reduction could see large scale environmental migration effects from areas affected by drought and excessive summer heat having significant adverse effects on levels of community cohesion.

The issues of security of energy, water and food supply have the potential to have the greatest impact here. Scarcity of supply will drive up prices and create divisions between richer and poorer members of society. This may be seen on a global scale but will impact within our region as well. Any scarcity of supply will impact on community cohesion as people begin to look out for themselves to the detriment of their community.

The indications are that globally, as well as in the West Midlands; climate change will impact the most on those who are poorest. They are in the places that are most vulnerable to impact and they have fewer resources available to avoid or respond to those impacts.

However many of the solutions offered in this report have the opportunity to avoid such issues by generating energy locally, ensuring a consistent supply that is locally controlled. More sensible use of water will help secure its supply and avoid many of the issues raised. More efficient use of resources also helps to minimise the risks that come from scarcity of supply.

4 BREEAM (BRE Environmental Assessment Method) is the leading and most widely used environmental assessment method for buildings

5 Department for Transport (2009) Low Carbon Transport: A greener future

Planning for Climate Change

What are the next steps?

The Observatory will work with the West Midlands Climate Change Office and the Regional Data and Intelligence Network (RDIN) Environment Group to ensure that the key messages from this report are used.

We will be seeking to use it to demonstrate, simply, the reasons why policy makers have to act on climate change but also why there are great opportunities to be had if they do act. This report highlights a range of compelling reasons why policy makers should take note of climate change. It also demonstrates some of the benefits of doing so.

The Observatory is already developing work on the opportunities that are available to the broader economy of the region from a transition to a low carbon economy. The results of this work are due to be published later this year.

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