Planning for Climate Change in Worcestershire

TECHNICAL RESEARCH PAPER

Effective spatial planning is one of the many elements required in a response to climate change and used positively has a significant contribution to make.

May 2008

worcestershire county council

Worcestershire County Council is a Beacon Authority for Tackling Climate Change 2008-2009

The Cover picture: Redhill Primary School, completed in June 2007, was designed and constructed following an assessment of the impacts of climate change on the new school.

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1. Introduction

Purpose

To examine how circumstances have changed since adoption of Regional Planning Guidance in 2004, and review emerging good practice, identifying key issues and options within Worcestershire, at a strategic level[1], on mitigating and adapting to a changing climate, making recommendations on how policy can best serve the sub regional interests as part of the Regional Spatial Strategy review process and in preparation of Core Strategies and Community Strategies in order to contribute towards the governments aspiration of a 60 per cent reduction in CO2 levels by 2050.

How has this paper been prepared?

This paper has been prepared through a review and drawing together of the key policies, guidance, best practice and available evidence as it relates to Worcestershire. A consultation exercise has been undertaken with key stakeholders on the draft paper (see appendix 1).

Audience, Scope and Status

This is one of a series of technical briefing papers[1a] prepared by Worcestershire County Council to assist the preparation of a response to the review of the Regional Spatial Strategy, Community Strategies and to assist in the preparation of Local Development Documents. The intended audiences for this paper are planning officers, the development industry, utility companies, the local strategic partnership members and anybody interested in how to plan for Climate Change within Worcestershire. Although the paper has benefited from scrutiny and consultation with stakeholders it is not a statutory document and holds the status of a research paper that provides evidence to inform the development of statutory documents such as Local Development Frameworks and Community Strategies. In drawing together the available evidence and key policies the paper intends to be a useful tool to policy makers, however no list can be entirely exhaustive in identifying the opportunities that can be taken as part of the plan preparation process to address climate change. The paper intends to be a useful tool to policy makers but does not diminish the need for the reader to be alert to both existing and emerging evidence and policy upon climate change.

[1] Detailed guidance such as relating to design issues, being left to a separate document.

[1a] Others either prepared or in preparation include Planning for Renewable Energy and Planning for Water.

2. Background

The Greenhouse Effect is a natural process, allowing life as we know it to exist on earth. Human activities since the industrial revolution have led to increased accumulation of greenhouse gases. These gases have been released through the burning of fossil fuels like coal, oil and gas. Increasing amounts of greenhouse gases in the atmosphere will create a warmer planet which will alter weather patterns. Climate change is already being observed and due to the gases already emitted into the atmosphere further changes are inevitable. However it need not be inevitable that we should suffer from such changes if we take proactive actions. The extremity of change will depend on future levels of emissions of climate change gases. The effects of future climate change will mean more extreme weather events which in Worcestershire is likely, for example, to have the effect of more frequent and greater magnitude of the floods we experience. The UK CIP02 climate scenarios, based upon observations of UK climate trends since 1961, are set out in more detail in appendix 3 but some key points are given below. Although not possible to single out particular events being caused by our changing climate here in Worcestershire we have in recent years come to experience quite regular extreme weather events particulary in the form of flooding but also drought like conditions (e.g. 2003, 2006 and Easter 2007) which in turn has contributed to wild fires. Data on the changing climate is provided in annex 3 and the table opposite.

- Warming of the global climate system is unequivocal, with global average temperatures having risen by nearly 0.8c since the late 19th Century, and rising at about 0.2c/decade over the past 25 years
- It is very likely (90% probability) that manmade greenhouse gas emissions caused most of the observed temperature rise since the mid 20th century.
- Central England Temperature has risen by about a degree Celsius since the 1980's, with 2006 being the warmest on record. It is likely that there has been a significant influence from human activity on the recent warming.
- Predictions of summer precipitation in Worcestershire show some severe changes. By the 2020s, a decrease in rainfall over the whole County of 11-12% is predicted.
- By the 2080s the annual average minimum temperature.
- By the 2080s, the annual average maximum temperature is expected to be between 2.6ºC and 4.5ºC warmer than the 13.4ºC that it is today (1961-1990 average) in Worcestershire.

Source: The Worcestershire Climate Impacts Study

The weight of scientific evidence is now such that climate change is a politically accepted phenomenon that requires urgent, if not radical, actions. There is also no doubt that addressing the challenges we face from climate change should be a key priority of planning. Indeed there is much that planning can do to make a positive difference. If there was any doubt as to planning's role Planning Policy Statement 1 dispels this:

> *Climate change is real and is happening now. The recent Stern Review, in assembling an overwhelming body of scientific evidence, makes it clear that human activity is changing the world's climate and, as these changes deepen and intensify, there will be profound and rising costs for global and national prosperity, people's health and the natural environment. Even with effective policies for reducing emissions in place, the world will still experience significant climate change over the coming decades from emissions of carbon dioxide and other greenhouse gases already released. Equally, the Review makes it plain that we can act to avoid the worst of these costs. It sets out how and demonstrates that the price of doing so is much less than doing nothing.*
>
> *Effective spatial planning is one of the many elements required in a successful response to climate change. But used positively it has a significant contribution to make. Planning and Climate Change sets out how spatial planning, in providing for the new homes, jobs and infrastructure needed by communities, should help shape places with lower carbon emissions and resilient to the climate change now accepted as inevitable. Spatial planning, regionally and locally, provides the framework for integrating new development with other programmes that influence the nature of places and how they function. This means that it has a central part to play in enabling local action and in creating an attractive environment for innovation and investment by the private sector. Where there is any difference in emphasis on climate change between the policies in this PPS and others in the national series, this is intentional and this PPS should take precedence*[2].

The aforementioned Stern Review of 2007 commissioned by the then Chancellor of the Exchequer, reporting to both the Chancellor and to the Prime Minister sought to assess the evidence and build understanding of the economics of climate change. Stern concluded by advocating a 'no regrets solution' in the way we plan for our future.

> *"The evidence shows that ignoring climate change will eventually damage economic growth. Our actions over the coming few decades could create risks of major disruption to economic and social activity…….Tackling climate change is the pro growth strategy for the longer term…….The earlier effective action is taken, the less costly it will be. At the same time, given that climate change is happening, measures to help people adapt to it are essential. And the less mitigation we do now, the greater the difficulty of continuing to adapt in future."*

[2] Planning and Climate Change: Supplement to Planning Policy Statement 1, page 1.

3. The Approach Towards Addressing Climate Change

The challenge of climate change will need to be addressed via a holistic approach that includes:

1. Reducing/Mitigating emissions of greenhouse gases, in particular CO2, in line with national and regional targets;
2. Adapting to the effects of climate change, particularly in those areas vulnerable to its effects, recognising that emissions into the climate already are having an effect i.e. designing in resilience to effects of climate change beyond that of the plan period and being prepared to revise plans and strategies as evidence as to the impacts of climate change becomes available;
3. Taking action to understand the impacts and risks of climate change will improve resilience and reduce the cost of adapting to future changes in the climate.
4. Capitalizing on the opportunities presented by a changing climate
5. Taking a precautionary approach (seeking a no regrets solution) towards climate change but not placing unnecessary burdens on the development industry;
6. Considering obstacles that may arise such as: a perceived uncertainty of climate change; and lack of consensus, awareness and political will; resource constraints, no easy answers; and public opposition to projects such as renewable energy schemes; as well as the need to bring about behavioral change.

The case examples cited in the evidence base in appendix 4 illustrates how some of these issues are being addressed and show that significant progress is possible (with awareness and will). The Regional Spatial Strategy and Local Development Framework should inform local strategies on addressing climate change including the sustainable community strategy acknowledging the challenges of climate change including the requirement to address both the causes, and minimise the impacts and costs of climate change, whilst also to provide a pro-growth framework for the longer term. Therefore climate change should be a material consideration in planning decisions.

Regional Spatial Strategies, Local Development Frameworks and Community Strategies will each need to develop differing scales of response to these challenges.

In the remainder of this paper these differences are identified and where possible a distinctive Worcestershire context is provided.

Note: A range of actions beyond the direct remit of the planning system to tackle climate change is identified in the County Climate Change Strategy.

4. Issues to consider in planning for Climate Change

Topics that have a particular climate change dimension and are of direct concern to Local Authorities and other stakeholders include infrastructure, economic development, energy (efficiency and generation), transport, water resources and quality, flood risk management, biodiversity and landscape, sustainable waste management, built and historic environment and mineral extraction. More detail on these topics is provided in appendix 3.

1. **Infrastructure** - The Governments study of the Economics of Climate Change by Stern in 2006 stated that the costs of making new infrastructure and buildings more resilient to climate change in OECD countries could range from $15 - 150 billion each year with higher costs possible with the prospect of higher temperatures in the future. Much of this huge figure assumes the need to rebuild and repair infrastructure damaged directly or indirectly by climate. Repairs to the B4084 at Cropthorne in Worcestershire following flooding in the summer of 2007 cost the County Council approximately £500,000 and illustrates the potential cost of future extreme weather events. An Environment Agency report has identified 5,000 critical infrastructure sites across England that are at high risk of flooding (2007, Planning, 12 Oct). It is important therefore that infrastructure development is adaptable to future climate change scenarios.

Infrastructure	Weather Event			Effect on Worcestershire
	Intense rainfall and flooding	Strong winds and storms	Drought, heat, fires and subsidence	
Transport	Routes and bridges damaged /unusable. Landslides Increased demand for aggregate. Blocked drains.	Obstruction on rail and road routes.	Road and rail structures prone to contract, move, split or melt. Fire along rail routes.	Road closures i.e. Hylton Road Worcester. Subsidence on roads & railways i.e. Cropthorne & The Severn Valley Railway.
Energy	Flooding of sub-stations. Exposure of cables.	Damage to power lines.	Air con increased demand pressures on supply of energy.	Damage to buildings. Toppling of power lines from subsidence.
Water and sewage networks	Flooding and failure of water supply plants and sewerage stations and associated networks.	-	Network damaged by subsidence. Demand for new reservoirs.	Loss of water supply i.e. the Mythe Water Treat-ment Works. Pollution of watercourses. Flooding of property & businesses with sewage.
Telecomm-unications	Loss of communication	Damage to equipment.	Toppling of overhead cables.	Loss of communications and reliability.

Adapted from Planning Response to Climate Change, ODPM, 2004

The table above provides a basic summary of the ways in which County infrastructure may be affected by our changing climate. Maps of areas at risk from subsidence, fire and flooding are available at appendix 5.

2. **Energy (efficiency and generation) -** The means of generation, and its consumption, has a critical role to play in achieving carbon reduction targets but primary consideration should be given to means of demand reduction and energy efficiency. With appropriate building design and choice of materials in construction, levels of efficiency can be greatly improved. With existing building stock representing by far the greatest proportion of total stock even by 2026 refurbishment of existing stock will be an even more vital priority. With regard to generation Worcestershire is starting at a very low baseline with no de-centralised energy schemes and just a few schemes which have integrated renewable energy as part of existing development e.g. Worcestershire County Council, County Hall offices which has heating provided by a woodfuel boiler.
It will be a significant challenge to meet Government targets of increasing the proportion of electricity generated by renewable energy to 10% by 2010 and 20% by 2020. The role of the planning system in regard to addressing this challenge in Worcestershire is set out in the accompanying paper Planning for Renewable Energy in Worcestershire (March, 2008).

3. **Transport -** Transportation accounts for roughly a third of Carbon Dioxide emissions in the County and nationally is the only sector where emissions have not reduced. Transport, but in particular road transport, is clearly a priority area for attention. Planning has a clear role to play in its allocation of land uses to help in reducing the need to travel and in ensuring good access to public transport provision. In Worcestershire 64.4% of people aged 16-74 used a car to get to work; considerably more than the figure for England and Wales, which was 55%.

   This reflects the largely rural nature of the County. Only 9.4% of people in Worcestershire walk to work whilst 1.6% uses the train and 3.4% use a bus/minibus/coach; again lower than the figures for England and Wales at 4.1% and 7.4% respectively. Planning must look to promote sustainable transport choices for people and for moving freight, and reduce the need to travel, especially by car.

4. **Water Resource & Quality -** Even within existing patterns of rainfall there is a pressing need to recognise the importance of limited availability of water and water quality. In parts of the County there is already limited capacity for further increases in sewage treatment because of the ecological and water quality issues associated with low water levels. These can be expected to be exacerbated by decreased rainfall, and hotter summers (which in turn will lead to greater demand for water!), as well as the requirements under the Water Framework Directive for water bodies to be at good ecological status by 2015. Likewise water supplies from groundwater sources, which account for 53% of the County's water supply, are at levels where demand is exceeding supply and may result in refusal of further abstraction licenses. This issue is addressed in detail within the Planning for Water Paper (February, 2008).

5. **Flood Risk Management -** Flooding is a natural occurrence but one that can be expected to increase in frequency and magnitude with our changing climate. Within Worcestershire we have become very aware, over a long history, of the impacts of flooding. In recent years we have come to experience flooding and its negative impacts not just when, or even where, we would perhaps expect, as in winter months, but now also summer months e.g. June/July 2007. Urban flooding from surface water is of increasing concern, not least as its locations are currently difficult to predict. It is sobering to note that 'approximately 10% of the land area of Worcestershire is at risk of flooding (about 167km2) with over 9,146 properties at risk of flooding approximately 4% of the total number of properties, 38% of the 9,146 properties being at significant risk[3]. Areas of the County considered at risk of fluvial flooding are shown on the Environment Agency flood zone maps. The location of future development is an important factor in reducing future risk both directly (e.g. from rivers) and indirectly (e.g. from increasing of hard surface areas leading to surface run off to other areas). Whilst not being able to stop flooding we can manage the risk. For example through safeguarding land as areas for water storage in the form of flood retention reservoirs and marshlands along water courses or through storage within SUDS schemes as part of development. Further advice on flooding can be found within the Planning for Water Paper (February 2008).

Worcestershire faces a dual flood threat from:

1. Fluvial (river) i.e. on the floodplains of the three rivers that traverse the County, namely the Severn, Avon and Teme and the tributaries that feed them.

2. Intense rainfall in urban and rural areas that is often unpredictable in terms of timing and areas of risk and causes surface flooding which is also referred to as 'pluvial flooding'.

'The Pitt Review: Lessons learned from the 2007 floods', final report was published in June 2008 and made a number of recommendations for planning and reducing the risk of flooding. Submissions to the Review have called for a complete end to building on the flood plain and the Review has recognised this as a largely unrealistic goal. However the Review has recognised the role of planning and particularly development control as being central to the process of managing flood risk by avoiding development in risk areas where possible and, where such building does take place, by ensuring that risk is reduced both to the development itself and for those living nearby. The Review also supports the use of planning policies such as PPS 25 - Development and Flood Risk, which promotes a strategic approach to managing flood risk by ensuring that flood risk is considered at all stages of the planning process and the supplement to PPS1 Planning and Climate Change that also notes the importance of strategic role of land use planning in adapting to climate change.

[3] Environment Agency comments January 2008.

6. **Biodiversity and Landscape -** Worcestershire has 115 Sites of Special Scientific Interest; 2 of which also have protection under the EC Habitats Directive. Nineteen distinct habitats and twenty species have been identified within the County on basis of their threatened status or because they represent important national strongholds occuring within Worcestershire, or both. Within the County there has also been identified 23 different types of landscape. The special qualities of the Worcestershire landscape has resulted in two national landscape designations (the Malvern Hills, and, the Cotswolds Area of Outstanding Natural Beauty). It is essential therefore that the quality of the Worcestershire natural environment is protected and enhanced.

   The future impacts of climate change on biodiversity are difficult to predict accurately and the best response to this uncertainty is to develop ecosystems that are generally 'resilient' to the stresses and changes that climate change might lead to.

   Defra's document Conserving Biodiversity in a Changing Climate provides a set of guiding principles that summarise current thinking on how to reduce the impacts of climate change on biodiversity and how to adapt existing plans and projects in the light of climate change. Measures or plans will need to be reviewed frequently and systematically to take account of current research on the impacts of climate change on biodiversity. Climate change does however bring threats to such an objective. Research by Defra has highlighted the sensitivity of UK Biodiversity Action Plan (BAP) habitats to climate change and in Worcestershire may include increased risk of fire to heathlands, vulerability of hedgerow trees such as Beech to drought and the impacts of both winter flood events and low summer river flows on Salmonid breeding habitats. More knowledge of the impacts of climate change on species is needed but it is likely that there will at least be the need to maintain habitats connectivity and enable species to adapt to new habitats through dispersal and to plan biodiversity on a whole ecosystem approach and avoid further habitat fragmentation. The inventory of land use and habitat mapping prepared by the County Council will prove very useful in helping to re-establish connected habitats. It should also be noted that Worcestershire is at the northern limits of some species distribution.

   The natural environment may also have a role to play in the mitigation of climate change. Carbon dioxide is stored in the woody living matter of trees and vegetation such as trunks and stems (Leaves also absorb carbon as they grow but release it as part of respiration and when they fall and decompose, some of which is stored within the soil that acts as a carbon sink). These potential 'carbon sinks' may play a role in capturing carbon from the atmosphere but this should only be seen as a short term option as the effect is only beneficial as the trees and vegetation grow because once they mature they become carbon neutral as growth is balanced by decay (Royal Forestry Society/Woodland Trust[4]).

[4] The Woodland Trust - http://www.woodland-trust.org.uk/campaigns/index.htm

7. **Sustainable Waste Management**
Greenhouse gases such as methane (65%) and carbon dioxide (35%) are emitted from biodegradable waste as it decomposes. The most important greenhouse gas for waste management is methane, which although being second to carbon dioxide in volume of emissions is 23 times more potent than carbon dioxide in terms of global warming potential. In terms of the impact of climate change temperature changes will affect the biological processes of waste management e.g. composting and landfill. It may also lead to increased numbers of vermin and pests such as flies as well as odours, which will require innovative solutions from building layout and design and in the ways we collect, store and treat waste.

8. **Built and Historic Environment**
Buildings contribute nearly 50 per cent of UK carbon dioxide emissions, and energy consumption specifically in households contributes 27 per cent (Energysavingtrust.org.uk). A buildings energy efficiency is determined by a number of factors but chief amongst these are the issues of design and the materials used in construction. In tackling climate change it is imperative that all new buildings are designed to high-energy efficiency standards as well as having regard to issues of their energy source, collection of waste, accessibility of their location to essential services and green infrastructure. This is particularly important given that the Regional Spatial Strategy (Jan 08) is proposing approximately 36,600 more homes to be built in the County by 2026. Climate sensitive design will need to be holistic in its approach e.g. adapted to a hotter climate yet not creating extra energy demands through use of air conditioning. A WWF study cited in Friends of the Earth report into Planning and Climate Change (May 2006) compared the impact of building 200,000 homes at different building standards and found that:
EcoHomes very good standard would produce a 32 per cent reduction in CO2 emissions, a 39 per cent saving in water use and up to a 25 per cent in reduction in household waste sent to landfill, compared to current building regulations.

Note: EcoHomes was a former rating system for sustainable construction. The Code For Sustainable Homes is now the adopted national sustainability standard, which has 6 levels, for new homes (mandatory for public funded homes). Eco home 'very good' standard is equivalent to Code for Sustainable Homes level 3. In December 2006, the Government issued a consultation document on moving towards 'zero carbon development' within ten years, i.e. by 2016. In July 2007, the Government published a policy statement which confirms this ambition together with the progressive tightening of the energy efficiency building regulations - by 25 per cent in 2010 and by 44 per cent in 2013 - up to the zero carbon target in 2016 (Energy Saving trust.org.uk) further details are available in appendix 8.

The historic environment including Old buildings, archaeological sites, and historic parks and gardens are at risk from the dangers of future climate change including flooding, subsidence and increased storms. The historic environment may be especially imperiled by changes in rainfall patterns and temperatures, although perceived as a threat to modern buildings they are also likely to have a dramatic effect on buried or exposed archaeological sites whilst parks,

gardens and historic landscapes will be faced with shortages of water making maintenance increasingly troublesome. It may become difficult to propagate even endemic species. Old buildings and their preserved contents are extremely permeable to environmental changes of air and soil and moisture with rainwater goods being unable to cope with changed patterns of rainfall, and acute events such as flooding. Mitigation and adaptation strategies will be necessary to cope with these greatly increased dangers, and these will therefore require careful planning based on a controlled assessment of risk.

Government policies advocate the sustainable reuse of land and buildings and it should be recognised that historic buildings represent a significant amount of embodied energy in their past construction. To demolish and replace such buildings will mean the loss of this embodied energy and will require further investment in energy and the resultant emissions from the production and transport of new construction materials.

It should also be recognised that many historic buildings could be adapted to climate change in a sympathetic manner. Many traditional materials can have a longer life if properly maintained and can also have a reduced impact on the environment in their production i.e. timber framed windows as opposed to PVCu.

At least 75% of existing properties are still expected to be in use in 2050, the year by which government hopes to have cut carbon emissions by 60% from 1990 levels. To deliver a 60% reduction in carbon emissions the existing housing stock will clearly need to be retrofitted to improve standards of energy efficiency and reduce water consumption and cut the amount of waste going to landfill (Sustainable Development Commission, taken from BBC website 21st July 2006).

The opportunities to reduce the emissions from existing stock through the Local Development Document and planning decisions are limited. However the recent introduction of permitted development rights for the installation of micro renewables may promote the retro fitting of existing properties. Planning authorities may also consider seeking developer contributions to enable local off setting schemes to provide grants and incentives for people to invest in energy efficiency and renewable energy measures for existing stock [5].

Being resilient to the impacts of a changing climate will also need to become a requirement of future building design. This will include the ability to withstand and adapt to floods, storms (including strong gusts/winds) and heat. In addition buildings will need to be designed to accommodate water saving devices and be water efficient as well as sourcing renewable forms of energy on site. As changes to the climate become more pronounced buildings will need to demonstrate that the entire life of the building has been designed to be flexible to adapt to a changing climate.

Without action to mitigate and adapt to the impacts of climate change serious impacts and disruption will be caused to the historic environment. Whilst recognising the need to improve the resilience of historic buildings and

[5] For an example see Uttlesford District Council SPD - Energy Efficiency and Renewable Energy - Adopted October 2007.

landscapes to climate change the potential detrimental impacts of such measures should be taken into account and draw upon the advice of partner organisations such as English Heritage.

Direct impacts on the historic environment will include extremes of wetting and drying that heighten the risk of ground subsidence and landslides and accelerate the decay of stonework and pose a threat to historic buildings.. The map at appendix 5 identifies areas at increased risk of subsidence in Worcestershire. More frequent intense rainfall and flooding may cause increased erosion of archaeological sites and damage to buildings and settlements.

Adaptation responses will also need to be considered. New flood defences particularly in historic towns can cause major archaeological damage along historic waterfronts and may impair the character of historic quaysides and waterside buildings[6].

9. Minerals

There are also a number of climate change issues relating to minerals planning. These include mitigation in terms of the energy used in extraction and processing and emissions from transport of minerals. However it is more likely that adaptation will be of most significance with two major factors being:

- The levels of water consumption utilised in the extraction process when set against a context of water shortages and changing water tables. This contrasts with potential problems of flooding of works and the need to pump the water away from the working.

- Restoration of mineral sites will bring potentially significant opportunities in the way we plan for climate change. For example exhausted workings may prove to be valuable areas for floodwater storage or locations for habitat creation to re-connect fragmented habitat as part of wider green infrastructure.

[6] English Heritage - http://www.englishheritage.org.uk/upload/pdf/Climate_Change_and_the_Historic_Environment_2008.pdf

10. Tourism and the Economy

As well as the cost of making new and existing infrastructure & buildings more resilient to climate change, the Stern Report estimates the cost of carrying on with Business As Usual (could shrink the global economy by up to 20%).

Industry and commerce contributed 30% of the County carbon emissions in 2005 (see appendix 3). Climate change will create economic development opportunities and constraints. New opportunities could arise from warmer drier summers e.g. longer growing seasons in rural areas and benefits to tourism. Economic opportunities will arise in environmental technologies and rural diversification for the growing of biofuels. Agriculture may also be affected by restrictions on water extraction in summer months and conversely by heavy rainfall or flooding in summer months. Whilst the climate predictions are uncertain, increased intense rainfall activity could also lead to greater storm damage and lower yields. Increased drought occurrence may lead to greater annual variability in yields creating more challenges to the farming community. Tourism will also benefit from warmer, drier summers due to increased demand for leisure and outdoor activities.Increased tourism will increase pressure on transport infrastructure and on water demand. The increase in visitor numbers will therefore need to be sustainable and aim to reduce the impact of tourism on the environment through reduced car use and efficient use of natural resources.

11. Health and Well Being

In planning for climate change it is vital that the cross cutting nature of climate change and the impacts on the health and well being of the county's residents are recognised and integrated into policies. The potential impacts of future climate change on people's health may include heat exhaustion as a result of rising temperatures or incidents of injury or loss of life due to flood events as demonstrated in the summer of 2007. Planning for health and emergency infrastructure should therefore assess the potential risks to infrastructure and ensure that mitigation and adaptation measures are fully incorporated into infrastructure. Measures to mitigate and adapt to future climate change such as the provision of sustainable transport, green infrastructure and energy efficiency measures can also help to address health inequalities.

12. Carbon off setting

Off setting is a way of compensating for the emissions produced with an equivalent carbon dioxide saving. Carbon off setting involves calculating your emissions and then purchasing 'credits' from emission reduction projects. These projects prevent or remove an equivalent amount of carbon dioxide elsewhere. Off setting is not a cure for climate change; the most effective way to combat climate change is to reduce emissions. There may however be some exceptional situations where carbon neutrality may not be achievable and carbon off setting may be a viable alternative. The creation of a carbon off setting fund can help to reduce emissions e.g. by funding energy efficiency measures or producing renewable energy or through the creation of local community tree planting schemes which can also deliver other gains including biodiversity & green infrastructure improvements, solar shading, flood management and improvements to air quality. The government is currently in the process of developing a code of practice for off setting schemes[7].

[7] DEFRA - Draft Code of Best Practice for Carbon Offset Providers: Accreditation requirements and procedures. -

5. Local evidence to support policies on tackling climate change within Worcestershire

The box below summarises just some of the evidence currently available to support the drafting of climate sensitive planning policies. A more comprehensive source of evidence is included in appendix 3 to this paper. The generic and national effects of climate change are well documented and so are not documented here links are available in Appendix 2 (see UKCIP[8] and the Tyndall Centre for Climate Change[9]). Instead a snapshot of the anticipated local effects and vulnerable locations, communities, infrastructure and ecosystems are detailed as currently understood. This section is largely sourced from the work undertaken in Sept 2004 as part of the County Climate Change Strategy (the reader is referred to Worcestershire Climate Change Impact Study www.worcestershire.gov.uk/sustainability).

[8] UKCIP - http://www.ukcip.org.uk/

[9] Tyndall Centre for Climate Change Research - http://www.tyndall.ac.uk/

Headline evidence

Temperatures

- The annual mean temperature is likely to increase by between 2.5-4.1°C whilst the annual maximum temperature is expected to increase by 2.6-4.5°C by the 2080's.
- Warmer summer temperatures are likely to cause overheating of buildings with an associated increase in demand for mechanical air conditioning.
- Warmer summer temperatures will cause problems for working conditions for staff and customers, especially those working outside.

Rainfall

- Predicted increases in short intense periods of rainfall will cause more problems inundating drainage and sewer systems causing flash flooding and it is very difficult to predict where these events will happen.
- Winter precipitation may increase by between 12%-23% by the 2080s.
- Worcestershire already experiences frequent severe flooding however higher winter precipitation is likely to lead to increases in flood frequency and the length of the flood season.
- Summer precipitation may decrease by between 29%-50% by the 2080s.
- Lower summer rainfall and higher temperatures are likely to cause the incidence of fires to increase in Worcestershire; the most vulnerable locations include the Wyre Forest, Lickey & Clent Hills, Kempsey, Malvern Hills and Hartlebury Common.
- In the floods of 2000, 140 properties were flooded in Bewdley and 505 in Stourport.

(table continued on next page)

Headline evidence (continued)

Soils

- Soil moisture is predicted to decrease by between 12% to 23% annually, and a dramatic change is expected in summer of 22% to 42% by the 2080s, due to a likely drier and warmer Worcestershire (Worcestershire Climate Change Impacts Study, 2004).
- Lower soil moisture due to lower summer rainfall and higher temperatures is likely to increase the risk of subsidence. Areas particularly at risk are buildings on clay soils, including areas in eastern Worcestershire, especially Evesham and Pershore.

Potential Benefits

- Increased summer temperatures and lower cloud amounts could increase demand for outdoor recreation and leisure.
- A longer growing season may have potential benefits for the agricultural sector including the possibility to grow new crops such as lavender, sunflowers, mint and hemp as well as exotic crops.

Although not possible to single out particular events being caused by our changing climate, Worcestershire has in recent years experienced quite regular extreme weather events in the form of floods in particular:

- **1998** - The Easter river floods brought severe disruption to many low-lying areas in central England. The extent and height of the floods rank the event as the UK's worst flood disaster since the devastating spring floods of March 1947. The heaviest reported daily rainfall total came from Pershore where 80mm (3.12inches) fell in the 24 hours ending 6am on Good Friday the 10th. In terms of return periods, the Pershore rainfall total is a once in 100-year event. At Evesham the peak flow and flood height in 1998 were the highest on record, with the Avon exceeding the 1947 flood height by 0.6m and were estimated to be a once-in-150-year event.
- **2000** - In the autumn of 2000, the worst flooding for over 50 years devastated the length of the River Severn, hitting Bewdley particularly badly with levels reaching 5.6 metres above summer levels. The town was extensively flooded three times in the space of six weeks.
- **2007** - 58mm of rain fell in 2 hours on the 19th of June and 226mm as a whole in June. This is over four times the monthly average.
- **2007** - in July flooding at Worcester reached a peak of 5.3m the previous highest recorded level was 5.22m in March 1947.
- **2007** - at Upton upon Severn 90mm of rain was recorded on the 20th of July this equated to almost two months rain in one day. River levels near Upton reached a peak of 5.93m on the 22nd of July. The previously highest recorded level was 5.76m in March 1947.
- **2007** - the River Avon in Evesham reached a peak of 5.52m on the 21st of July almost 300mm higher than the previous peak in the 1998 floods of 5.23m and is approximately five metres above normal summer river levels.

- **2004** - on the 26/27th of April Worcestershire was hit by storms with many homes and businesses struck by lightening, 43mm of rain fell near Worcester in 2 hours the equivalent of 1 months rainfall.
- **1990** - The highest maximum temperature recorded in Great Malvern Worcestershire since 1983 was 35.9°C, recorded on 3rd August 1990.
- The growing season in Worcestershire is an average of 304 days and evidence shows that this has increased by 30 days since the 1900s.

The carbon emissions in Worcestershire

Defra have produced estimates of the CO2 emissions for each local authority in the UK from the following broad source categories:

- industry, commercial & public sector (including electricity-related emissions)
- domestic (including electricity-related emissions)
- road transport
- land use, land use change and forestry

Defra estimates of the overall emissions in 2005 for each District Authority are provided in the table below:

District Authority	CO2 emissions (kt CO2) 2005
Wyre Forest	654
Redditch	539
Worcester	665
Malvern	717
Bromsgrove	1006
Wychavon	1419

Defra estimates that domestic CO2 emissions for the County are approximately 1,398,000 tonnes per annum, which equates to roughly 2.6 tonnes of CO2 per capita[10]. This is slightly higher than the Regional and UK averages, at 2.4 and 2.5 tonnes per capita, respectively. Domestic CO2 emissions account for around 28% of Worcestershire's total CO2 output, with industrial and commercial emissions accounting for around 30%. The greatest contributing sector is road transport, with 40% of the county's total CO2 emissions. However this is influenced by the impact of major road corridors passing through the County such as the M5 motorway".

[10] Full statistics are available from: http://www.defra.gov.uk/environment/statistics/globatmos/galocalghg.htm

6. Opportunities for a way forward

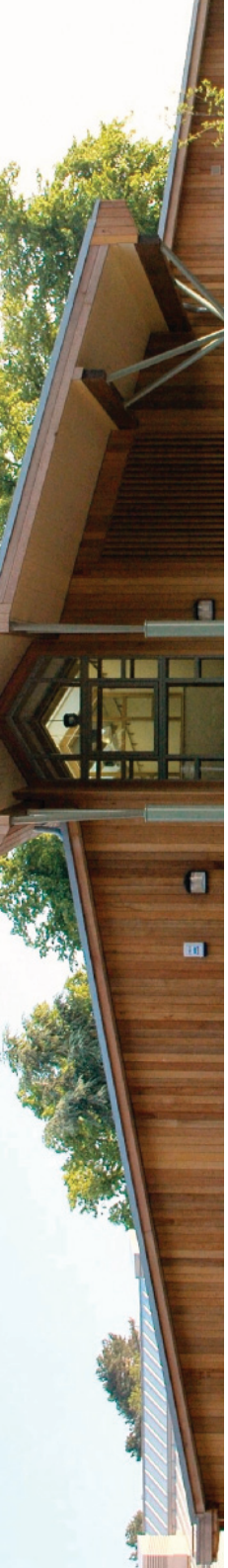
As demonstrated by the models described, climate change will affect different parts of the County in different ways thus necessitating different responses. Coupled with the real pressure for significant growth in the County it is clear that climate change needs to be integrated and taken into account in preparing future planning policy. Well thought out planning policies can make a significant positive contribution to meeting the challenge of climate change. The following section sets out potential means of addressing the climate change challenges, in terms of both mitigation and adaptation, in Worcestershire via planning policy.

There may be scepticism to radical steps but undoubtedly they are technically feasible and are already being implemented in other parts of the country and indeed within Worcestershire and are illustrated where possible in the case studies in annex 4.

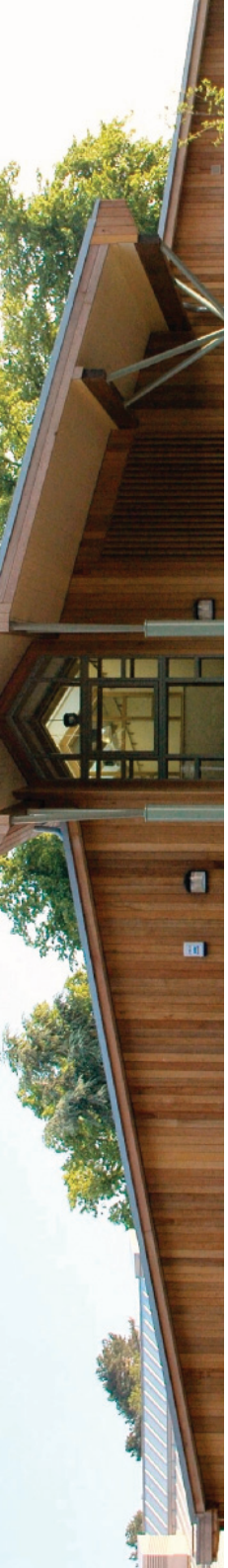
7. Menu of adaptation and mitigation options and delivery mechanisms

Regional and local planning strategies should implement the key objectives of the Climate Change PPS by tailoring policies to local circumstances and need. In delivering an appropriate response to climate change strategies should be widely applicable rather than attempting to cover every eventuality.

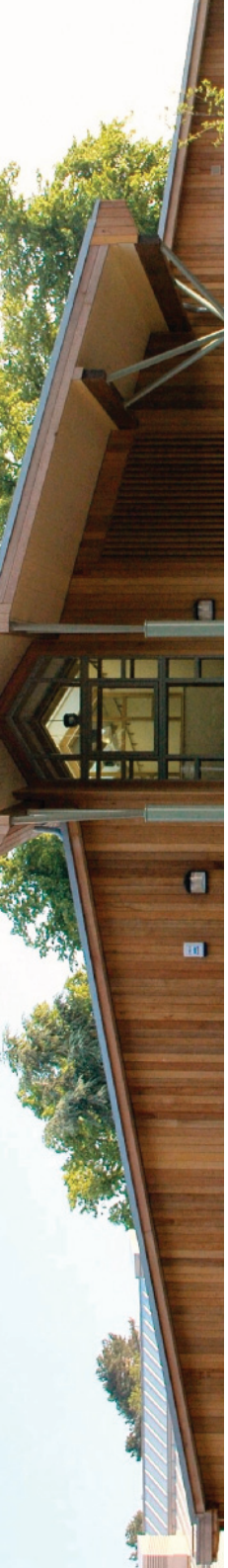
Climate Change issue	Regional Spatial Strategy	Community Strategy / Local Area Agreement	Sustainability Appraisal	Minerals Core Strategy	Waste Core Strategy
Mitigation (of cause)	• Include CO2 reduction policies in line with regional carbon reduction targets and promote low or zero carbon emissions development. • A requirement that Local Authorities in their LDD's will need to demonstrate how they intend to contribute towards the required 60% cut in CO2 emissions by 2050. • Planning authorities should utilise the current (UKCIP02) and future (UKCIP08) climate change scenarios to assess the likely impacts of current and future climate change. • Regional planning authorities should adopt a cross boundary approach to addressing climate issues. Collaboration will be needed between neighbouring authorities and also partnerships and infrastructure and utilities providers. Consideration should be made of the cross boundary impacts of extremes of weather, areas of water stress i.e. Redditch, Bromsgrove and Stratford upon Avon district councils.	• Give local commitment to tackle climate change. • Implement the County climate change strategy reflecting national obligations. • Seek demonstration projects for sustainable construction methods including the Code for Sustainable Homes, BREEAM, SUDS and renewable energy. • Promote exemplar zero carbon initiatives and disseminate lessons learnt and best practice. • Promote the use of low carbon materials in construction. • Support the extension and creation of new woodland habitats to act as both wildlife corridors and carbon sinks and to provide a future source of biomass fuels.	• The Sustainability Appraisal should explain how climate change issues have been identified, managed and how they will be resolved. In developing climate change indicators for LDD's regard should be given to the Sustainability Appraisal of the Regional Spatial Strategy to inform likely future trends. Climate change objectives and indicators should take account of both climate change mitigation and adaptation.	• Restore minerals sites to act as carbon sinks and/or to link semi natural habitats. • Set policies to maximise the use of recyclable materials on construction sites.	• Promote positive energy from waste policies including the capture of methane and separation of food waste for anaerobic digestion, pyrolysis or gasification. • Utilise heat from such processes for community heating schemes or for heat intensive industries via heat mapping. • Allocate sites for the separation and recycling of waste materials i.e. Norton CMRF.



Climate Change issue	Regional Spatial Strategy	Community Strategy / Local Area Agreement	Sustainability Appraisal	Minerals Core Strategy	Waste Core Strategy
Mitigation (of cause)	• The capacity and constraints for renewable energy within the region and sub regions should be explored. Such a study can include heat mapping of potential large scale heat users, the energy characteristics of future developments to explore the capacity constraints on renewables technologies including connection to infrastructure, availability of fuel supply, wind mapping and environmental constraints i.e. areas prone to subsidence or statutory designations.	• Sign up to the Nottingham Declaration and the Worcestershire Climate Change Strategy pledge. • Host climate change conference/ work shops to disseminate best practice. • Address the energy efficiency of existing housing stock. Develop and implement local carbon off setting schemes. • Develop means of monitoring progress in reducing CO2 emissions.	• The Sustainability Appraisal should explain how climate change issues have been identified, managed and how they will be resolved. In devel oping climate change indicators for LDD's regard should be given to the Sustainability Appraisal of the Regional Spatial Strategy to inform likely future trends. Climate change objectives and indicators should take account of both climate change mitigation and adaptation.	• Restore minerals sites to act as carbon sinks and/or to link semi natural habitats. • Set policies to maximise the use of recyclable materials on construction sites.	• Promote positive energy from waste policies including the capture of methane and sep aration of food waste for anaerobic digestion, pyrolysis or gasification. • Utilise heat from such processes for community heating schemes or for heat intensive industries via heat mapping. • Allocate sites for the separation and recycling of waste materials i.e. Norton CMRF.

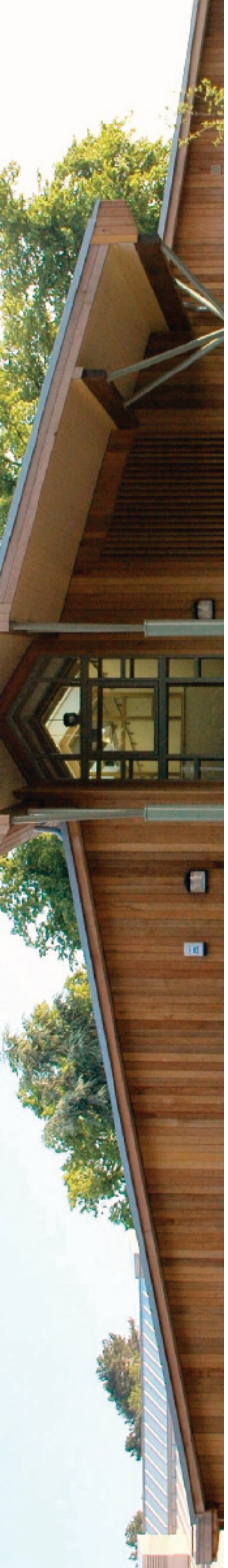


Climate Change issue	Regional Spatial Strategy	Community Strategy / Local Area Agreement	Sustainability Appraisal	Minerals Core Strategy	Waste Core Strategy
Adaptation (to impact)	• Require Local Development Documents to demonstrate how they will respond to the impacts of future climate change in their area. • Guide strategic development to locations offering greater protection from flooding. Erosion, subsidence, fire and water shortages. • Develop policies to minimise the extent of hard land surfacing or landscaping. • Develop strategic policies for land management in rural and urban localities as carbon sinks, flood management, reducing the 'heat island' effect and providing open space. • Opportunities should be explored for the identification of cross boundary adaptation measures for natural processes such as migration corridors or floodplain restoration i.e. Severn and Avon Wetlands Partnership.	• Reduce water usage from 130 litres per person per day in line with the minimum standards within the Code for Sustainable Homes. • Develop and maintain a data base of evidence to inform the Local Climate Impacts Profile (LCLIP). • Implement NI 188: Planning to Adapt to Climate Change from levels 1-4. • Develop a means of monitoring impacts of climate change.			



Local Development Frameworks - Mitigation

Climate Change issue	Local Development Frameworks
Mitigation (of cause)	• Promote exemplar/demonstration projects on improving the energy efficiency of traditional buildings. • Waste - reduce construction waste arisings by promoting the sustainable reuse and refurbishment of the existing building stock. • Incorporate the recommendations of the Pitt Review. • Develop CO2 reduction policies to reduce the amount of CO2 from new developments. • Equal weight should be given to Climate change as against other policies • Evidence base for the district should be established to identify, the capacity and vulnerability of local infrastructure, the capacity and constraints for renewable energy technologies within the district, impacts of future development on biodiversity and the opportunities for open space and green infrastructure. • Planning authorities should utilise the current (UKCIP02) and future (UKCIP08) climate change scenarios to assess the likely impacts of current and future climate change. • Indicators should be developed to measure and monitor performance against climate change adaptation and mitigation. • Apply the West Midlands Sustainability Checklist to development proposals. • Reduce the need to travel and provide good accessibility to public and sustainable modes of travel. • Require passenger transport services to be phased at the same time as housing developments. • Require travel to work plans for all new developments. • Avoid development in areas of flood risk. • 'Consider Greenfield/Greenbelt sites'. • Adopt strategies that recognise win-win situations. • Develop policies to minimise the extent of hard land surfacing or landscaping. • Develop policies to incorporate on site renewable energy equipment to reduce carbon emissions by at least 10% after energy conservation measures installed, without placing an undue burden on the developer. • Use local development orders to extend permitted development rights for renewable energy and low carbon energy systems. • Develop flexible renewable energy policies that promote both on site or decentralised near site proposals for district heating or private wire schemes. • Opportunities for decentralised energy opportunities should consider cross boundary opportunities. • Introduce policies that promote CHP schemes particularly on industrial sites or locations of new community infrastructure i.e. leisure centres, schools, health facilities. • Use section 106 agreements to fund energy efficiency & renewables in associated area /contribute to carbon off setting funds. • Further advice on the above topics can be found in the Planning for Water and Planning for Renewable Energy papers.



Local Development Frameworks - Adaptation

Climate Change issue	Local Development Frameworks
Adaptation (to impact)	• Promote exemplar/demonstration projects on improving the energy efficiency of traditional buildings. • Require a site waste management plan for all developments. • Develop CO2 reduction policies to reduce the amount of CO2 from new developments. • Encourage SUDS in areas vulnerable to flooding/catchments of rivers that are vulnerable to flooding. • Encourage the use of the UKCIP Adaptation Toolkit as used in the development of Redhill School Worcester. • Promote exemplar/demonstration projects on adapting traditional buildings (e.g. Natural England pilot project in the Shropshire Hills Joint Character Area on traditional farm buildings and maintenance). • Seek win-win situations from adaptation strategies eg flood defence and green infrastructure. • Presumption against development that is not climate change ready. • Develop policies that bring forward national sustainable development standards where local circumstances require this i.e. areas of water stress or prone to flooding. • In bringing forward sustainable development standards targets should be set in line with national policies such as the Code for Sustainable Homes. • Develop guidelines for the use of passive building principles including solar orientation and natural ventilation eg Redhill School. Worcester. • Vulnerability to climate change should be assessed and adaptations options considered in LDD's. • Biodiversity - identify, promote and protect species at risk and their favourable habitats and reinstate fragmented habitats to enable dispersal and adaptation to climate change thus giving importance to habitats outside of the statutorily designated system. • Identify and create green corridors to promote connectivity of semi natural habitats to allow species to migrate and adapt. • Safeguard open space and its multi functional role for floodwater storage, reducing the urban heat island and habitat migration. • Encourage sustainable urban drainage systems and high water efficiency standards in new and existing building stock particularly in areas of high water stress. • Require Flood Risk Assessments from new developments. • Adopt a precautionary approach by guiding new developments and infrastructure to locations that best offer protection from flood, subsidence, erosion, water shortage whilst adapting development design to such effects. • Develop opportunities to adapt existing building stock including the extension of CHP schemes and explore the potential of carbon off setting schemes from developer contributions to assist with retro fitting of existing building stock. • Encourage practice that helps to reduce the heat island effect by maximising green space including street trees, provide areas of open water and features and the use of green roofs particularly on non domestic buildings. • Prepare an open space strategy following guidance in PPG17. • Consider emissions from infrastructure and identify potential to reduce by exploring the potential of energy from waste, efficiency measures and improving resilience.

8. Monitoring and further work required

As the previous pages illustrate the implementation of the suggested actions in this paper will principally be via various planning policy documents. These will each in turn be monitored by Local Planning Authorities who will report on progress through their annual monitoring reports. For each of the climate change related policies included in the planning documents there will need to be an associated indicator. This may require the development of additional indicators for which Annual Monitoring Reports (AMR) may make use, and these are already being collated in the County via the Worcestershire Partnership Environment Group's State of the Environment Report[11] and the County Climate Change Strategy which include data for Worcestershire on:

- Eco Foot Printing
- Number of properties at risk of flooding
- Number of days exceeding high rainfall and temperature
- Carbon dioxide emissions
- Mitigation of Climate Change
- Impacts of Climate Change
- Awareness raising

Further information on climate change indicators is included within appendix 5.

Local Development Documents may be reviewed at regular intervals and it will be important that they are reviewed with regard to their impacts on, and the effects of, climate change as they set the framework for built development that may last 50 years or more.

Information reporting, again via the Local Planning Authorities annual monitoring report, on the significant sustainability effects forecast in the Sustainability Appraisal but also Strategic Environment Assessments of other plans, will provide further data on climate change. Other existing sources of indicators at a UK and regional scale include Defra's Sustainable Development Indicators in your Pocket 2007. These include additional indicators although at a national scale only on:

- Greenhouse gas emissions
- Carbon dioxide and other emissions by end user

A potential source of indicator are the Local Area Agreement Indicators used by government to evaluate the effectiveness of local service delivery for which planning authorities already collect data. The new performance framework set out by the Local Government White Paper contains 198 performance indicators and include new indicators on climate change. NI 188: Planning to Adapt to Climate Change insert NI 186 CO2 Emissions per head and NI 187 Fuel Poverty.

As work on the requirements for Code for Sustainable Homes and carbon monitoring by local authorities progresses there will be developed a detailed monitoring programme to assess progress towards achieving targets.

Planning for climate change is a relatively new policy arena for the planning system. Accordingly it is proposed that this paper be reviewed and updated on a regular

[11] Worcester Partnership Environment Group - www.worcestershirepartnership.org.uk/wpeg/soe

basis so to revise suggested actions and report on the improved evidence base and the legislative requirements. A significant but essential challenge will be to refine the data in the monitoring reports to a Worcestershire and district scale so as to help establish the future evidence base and to update targets as evidence becomes available.

Effective monitoring and review is essential in securing responsive action to tackle climate change. The successful implementation of policies on climate change depends on active stewardship regionally and locally (Para 34 of PPS 1 annex).

Further Work

This paper represents the first attempt within the County to bring together the latest guidance and approaches towards addressing climate change. In its preparation it has become apparent that much further work is required to fully embed climate change into policy making. To this end the paper will be reviewed as legislation and guidance becomes available and a programme of further work developed to address the ideas within the paper. Whilst the County Council has produced/drafted this guidance it will look to District Planning Authorities, stakeholders and partnerships to contribute toward areas of further work that may include:

1. Exploring how Worcestershire's landscape character and biodiversity will be affected by climate change and what we can do to help adapt to it. This study can inform reviews of this paper and RSS phase 3
2. Look at ways to restore exhausted minerals sites in light of climate change e.g. flood storage/ re-connecting habitats and opportunities to do so within Worcestershire.
3. Explore the rural economic renaissance opportunities arising from climate change e.g. tourism, new crops and longer growing seasons.
4. Explore the potential for a carbon off setting fund and criteria/policy.
5. Assessment of the County's potential to accommodate renewable and carbon technologies including landscape sensitivity, availability of fuel sources and identification of sites suitable for technologies and supporting infrastructure.
6. Modeling of climate impacts using the UKCIP08 tool (when launched) to identify areas of risk or impacts on those areas as identified as being at risk within the county.
7. A quantitative and qualitative assessment of carbon emission in order to create a baseline in which to accurately monitor and evaluate reduction options for integration into policies including emissions scenarios testing using the Resource and Energy Analysis Programme (REAP) to model likely trends in emissions under alternative forecast scenarios.
8. Complete a risk based assessment and compile a register of vulnerabilities of infrastructure and locations within the county to climate change both now and under future scenarios in line with National Indicator NI 188: Planning to Adapt to Climate Change.
9. Investigate potential for a future Countywide Green Infrastructure project.

Appendix 1
Consultees

Advantage West Midlands
British Waterways
Bromsgrove District Council LPA
Central Networks/EON
Civic Trust
Cotswold AONB Conservation Board
DEFRA
Destination Worcestershire
District Local Strategic Partnerships
English Heritage
Environment Agency
Forestry Commission
Government Office West Midlands
Hereford and Worcestershire Chamber of Commerce
Home Builders Federation
Malvern Hills AONB Partnership
Malvern Hills District Council LPA
Natural England
Redditch Borough Council LPA
Severn Trent Water
Sport England
Sustainability West Midlands
Transco Gas
University of Worcester
WEEAC
West Midlands Centre for Construction Excellence
West Midlands Climate Impacts & Adaptation Partnership
Woodland Trust
Worcester Bosch
Worcester City Council LPA
Worcestershire NHS Primary Care Trust
Worcestershire Local Strategic Partnership
Worcestershire Wildlife Trust
Wychavon District Council LPA
Wyre Forest District Council LPA

Appendix 2 - Policy and Further Advice

The Government has set a target to reduce carbon dioxide emissions by 60% in 2050 and 26-32% by 2020, against a 1990 baseline. The Government has also put in place a number of policies with the aim of delivering this ambitious target.

The **Draft Climate Change Bill** will see the delivery of these carbon reduction targets placed in statute and set of carbon budgets will be produced limiting carbon dioxide emissions in successive 5-year periods starting in 2008-2012. The series of carbon budgets will provide a framework for the reduction of carbon emissions. The Government has however recognised that the targets set within the Draft Bill may have to increase to 80%.

The **Local Government White Paper** notes the pivotal role that Local Government has in achieving sustainable development and mitigating and adapting to the predicted future effects of climate change. Worcestershire has adopted a Climate Change Strategy and most authorities including Redditch, Worcester City and Worcestershire County Council have signed up to the Nottingham Declaration[12] and in so doing have pledged to *"actively tackle climate change and work with others to reduce emissions".*

Both the Local Government White Paper[13] and the supplement to PPS1 Planning and Climate Change recognise the role of planning in championing climate change issues, and notes that *"spatial planning should be used to achieve more sustainable development and support the move towards low carbon living"* (Annex F21).

Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1. Sets out how planning should contribute to reducing emissions and stabilising climate change and take into account the unavoidable consequences. The policies in this PPS should be fully reflected in the preparation of Regional Spatial Strategies and by planning authorities in the preparation of Local Development Documents.

The **Code for Sustainable Homes** confirmed a mandatory rating to be implemented for new homes from 1 May 2008. The Code measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level and, within England, replaces the EcoHomes scheme, developed by the Building Research Establishment (BRE). Since April 2007 the developer of any new home in England can choose to be assessed against the Code.

The **West Midlands Climate Change Action Plan** aims to provide a strategic framework for actions to address climate change. The Action Plan aims to target and monitor progress in reducing carbon emissions;

The Worcestershire Partnership Climate Change Strategy covers the period 2005 - 2011 and provides a framework for actions by members of the Worcestershire Partnership to tackle climate change. The Strategy sets out what can be done to achieve these aims. The strategy identifies areas of activity that will have the biggest impact and over which Partnership members may have either control and/or influence and highlights, in particular, the importance of awareness raising and education on climate change.

[12] Nottingham Declaration - http://www.energysavingtrust.org.uk/housingbuildings/localauthorities/NottinghamDeclaration/

[13] Local Government White Paper - Strong and Prosperous Communities, Annex F, DCLG.

Advice and Further Reading

CABE - Building for Life: Delivering Great Places to Live.

Cambridgeshire Horizons - Quality of Life Programme: Green Infrastructure Strategy.

CIRIA report C624 Development & Flood Risk - Guidance for the Construction Industry.

CLG - Improving the Flood Resilience of New Buildings: Flood Resilient Construction

Communities and Local Government - (2006) Planning for a Sustainable Future: White Paper.

Communities and Local Government - (2006) Building a Greener Future Towards Zero Carbon Development.

DCLG - Code for Sustainable Homes.

DCLG - Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1 (December 2007).

DCLG - Planning Policy Statement 22: Renewable Energy, (August 2004).

Defra - Conservation in a Changing Climate.

Defra (2007) Conserving biodiversity in a changing climate: guidance on building capacity to adapt.

DTI - Planning for Passive Solar Design.

Energy Savings Trust - Energy Savings Trust Planners Pack.

Energy Saving Trust (2005) Community heating for planners and developers.

English Heritage - Climate Change and the Historic Environment (2007).

English Nature (2006) Spatial planning for biodiversity in our changing climate.

Milton Keynes Council - Supplementary Planning Document: Sustainable Construction Guide (April 2007).

ODPM - Planning Response to Climate Change - Advice on Better Practice. (September 2004).

ODPM - Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents (2005).

Securing the Future - Delivering the UK Sustainable Development Strategy.

South East Regional Assembly - Adapting to Climate Change Impacts on Water Management: A Guide for Planners (March 2007).

South East Regional Assembly - Climate Change Mitigation and Adaptation Plan. (March 2007).

Sustainability West Midlands - The Potential Impacts of Climate Change in the West Midlands (2004).

Sustainability West Midlands - West Midlands Sustainability Checklist.

Sustainability West Midlands - Planning for Sustainable Homes: Meeting the Low Carbon Challenge (February 2007).

Town and Country Planning Association - Biodiversity by Design: A Guide for Sustainable Communities (2004).

Town and Country Planning Association - Climate Change Adaptation by Design: A Guide for Sustainable Communities (2007).

Town and Country Planning Association (2006) Planning For Renewable Energy.

Town and Country Planning Association (2006) Sustainable energy by design.

UKCIP, LGA and I&DeA (2003) Climate change and local communities - How prepared are you? An adaptation guide for local authorities in the UK.

UKCIP (2005) Beating the heat: keeping UK buildings cool in a warming climate.

West Midlands Regional Assembly - Green Infrastructure: A Prospectus for the West Midlands Region.

West Midlands Regional Assembly - West Midlands Regional Spatial Strategy: Phase 2 Revision - Draft Preferred Option.

Wood Energy Strategy for the West Midlands. Wood for Energy - Energising the West Midlands for the 21st Century.

Woking Borough Council, Climate Neutral Development: A Good Practice Guide.

Worcestershire County Council - Worcestershire Climate Change Strategy (2004).

Worcestershire Climate Change Impacts Study - Worcestershire County Council (2004).

Appendix 3 - Worcestershire's Contribution and Vulnerability to Climate Change

The planning system has a significant role to play in Worcestershire's efforts to tackle climate change. Adaptation and mitigation measures taken now will determine how robust Worcestershire's built and natural environments will be when faced with future climate change predictions. There are only a small number of developments in Worcestershire that have systematically addressed mitigation of greenhouse gas emissions and a few that have attempted to take into account adaptation to climate change.

The Earth's climate is changing. Global surface temperatures have increased in the last century with nine of the ten warmest years occurring in the last two decades. The Central England Temperature has risen by nearly 1° through the twentieth century, and 2003 was the sunniest year on record.

The Worcestershire Climate Change Impact Study (2004) investigated the impacts of climate change on Worcestershire. Using a baseline climate for the County 1961-1990 as average the study investigated the future consequence of a changing climate on Worcestershire. The study looked at predicted changes for three thirty-year periods centred on the 2020s, 2050s and the 2080s under two different global emissions scenarios.

The study identified that by 2080 the annual average temperature will be 2.6 - 4.5C warmer than the 13.4C that it is today. By the 2080s there will also be changes in precipitation with a reduction of 6.7 - 13.7% an annual reduction of 100mm or 11/2 months rainfall. Changes in average annual wind speed are predicted to be small however winter wind speeds may increase by 3.6 - 6% by 2080.

Climate change is already having a wide-ranging impact on Worcestershire. Future climate change scenarios predict a range of impacts upon the climate of the UK and Worcestershire including:

- Increased average maximum temperatures - up to 4.5C by the 2080s.
- More frequent very hot summers and less frequent very cold winters.
- Summer rainfall to decrease by up to 50% by the 2080's.
- Winter rainfall to increase by up to 23% by 2080's.
- More frequent extreme weather events such as storms and floods.

The unseasonal and significant flooding that occurred in the summer of 2007 is a clear indication of the predicted future extreme weather events that will have an adverse impact upon the County's residents and economy. These types of events are not new but are part of an increasing trend of storms, floods and droughts that have already impacted upon the county. With Climate Change accelerating, it is expected that the intensity and frequency of extreme weather such as heavy rain, heat waves and drought will increase.

Research by Worcestershire County Council as part of the UKCIP Local Climate Impacts Profile (LCLIP) has highlighted a range of weather related events that have impacted upon the Built and Natural environment of Worcestershire. The research included a trawl of local media articles and interviews with members of staff from the County and District Councils as well as partner organisations including Worcestershire Fire and Rescue Services and the Environment Agency.

The research highlighted a list of 47 events over a 10-year period 40% of which were flood related and also included Storms, Gales, Drought and Heat waves. The research highlights the impact on infrastructure; homes, agriculture, recreation, tourism and the local economy, some of the key findings from the impacts of the flooding of summer 2007 are noted below:

The number of houses believed to be at risk of flooding across Worcestershire from Environment Agency predictions, (i.e. homes at 1 in every hundred years or less risk of river flooding), is 4,784. During this event approximately 3,366 homes were believed to have been flooded in Worcestershire.

Highways and Transport were probably the most seriously affected County Council service during this flooding event. A large number of roads across Worcestershire were flooded and many damaged. By the afternoon and evening of the 20th July around 88 roads and bridges were closed to traffic. Many cars were abandoned where floodwaters were too deep to pass through; some vehicles became completely submerged as water levels continued to rise. These abandoned vehicles created hazards once the water receded. Floodwater and the debris it was transporting caused damage to roads countywide. Most notable of all is the B4084 at Cropthorne where a 15m section of road collapsed exposing utility pipes. The costs for repairs to this section of road are expected to be £500,000. A further 29 roads have repair work planned as of September 2007.

A number of flood defences did serve to protect properties including a £6 million flood alleviation scheme completed in 2003 to protect 180 properties in Kidderminster. The system stores water upstream of the town in the 700,000m^3 reservoir of Puxton marshes and later the water is slowly released when river levels drop. This was a joint funded project between the Environment Agency and a private developer. (Environment Agency (a), 2007).

In Tenbury 80 (95%) of businesses in the town centre have been seriously affected as a result of multiple flooding events with loss of stock and damage to buildings.

The estimated cost to tourism of the flooding in June and July of 2007 is £150 million[14].

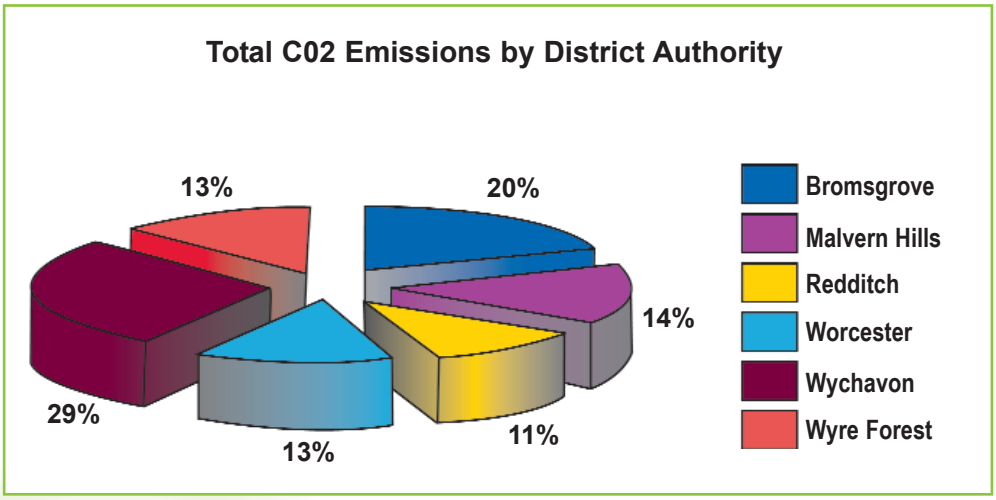
Much of the change in climate over the next 30 to 40 years has been determined by historic greenhouse gas emissions and the inertia of the climate system and we therefore need to adapt to some degree of climate change whether or not future emissions are reduced. Rising concentrations of greenhouse gases from the burning of fossil fuels are contributing to warming of the atmosphere and are contributing to the weather events witnessed in recent years.

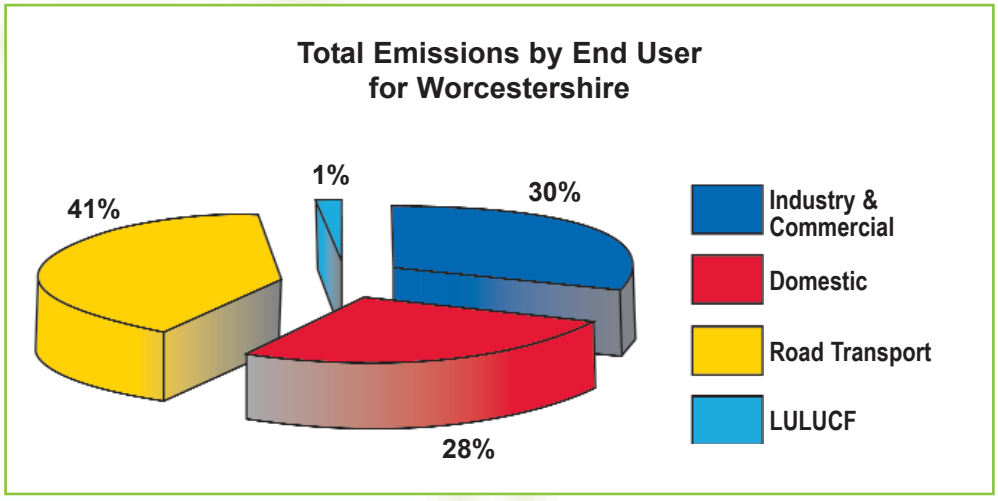
In order to mitigate the impact of future climate change we need to reduce Worcestershire's carbon dioxide emissions. The County as a whole produces approximately 5.4 million tonnes of carbon dioxide (CO2), every year and there are indications that this is continuing to rise in particular due to increased transport and domestic emissions.

[14] Unpublished research Worcestershire County Council Local Climate Impacts Profile (LCLIP) 2007. Further information contact Sustainability Team, Worcestershire County Council.

CO2 emissions (tonnes) Domestic per capita local authority (2005)	
Wyre Forest	2.5 (16%)
Redditch	2.3 (15%)
Worcester	2.7 (18%)
Malvern	2.6 (17%)
Bromsgrove	2.7 (17%)
Wychavon	2.6 (17%)

The graphs below illustrate the carbon emissions in 2005 for each of the District Authorities in Worcestershire and by end user group and are extracted from Defra's 2005 Experimental Carbon Dioxide Emissions Statistics at Local Authority Level[15].





[15] Full statistics are available from: http://www.defra.gov.uk/environment/statistics/globatmos/galocalghg.htm

The Worcestershire Draft Climate Change Strategy covers the period 2005 - 2011 and aims to reduce climate change causing emissions by a minimum of 10% from 2001 levels by 2011 and 20% by 2020. These targets are broadly inline with regional and national policies. There are a number of means by which CO2 emissions can be reduced through the planning, construction and design processes.

There is a close relationship between climate change and sustainable development considerations. What is clear is that urgent action is needed on the twin challenges: mitigation to reduce emissions to help avoid more dangerous changes in the future; and adaptation to help us to prepare for unavoidable impacts that are already stored up in the climate system.

Failing to take action and plan for the future could increase risk and incur higher costs as the climate changes. The recent Stern Review on the economics of climate change has raised awareness that the cost of action is nothing compared with the cost to economies and societies from runaway climate change.

When planning for adaptation to future climate change a long lead-in time may be required especially when planning for water resource or habitat creation and particularly when considering future housing requirements. By building adaptive capacity and delivering sound adaptation solutions we can also make our towns and cities more attractive with a better quality of life. The following pages identify some of the measures that can be taken to mitigate and adapt for the affects of future climate change and where possible includes case studies of measures utilised throughout Worcestershire. The areas or potential solutions identified are by no means an exhaustive list and readers need to be alert to both existing and emerging evidence and policy upon climate change.

Appendix 4 - Topics

Topic: Energy (Efficiency and Generation)

This chapter should be read in conjunction with the accompanying paper Planning for Renewable Energy in Worcestershire Research Paper. In order to develop further policies and guidance on renewables, the paper seeks to collate relevant baseline information, to allow an informed view to be taken on the need and support for an expansion in renewable energy capacity.

The RSS Phase 2 revision paragraph 2.26 requires that design and construction will need to ensure that buildings are adaptable to the changing climatic conditions predicted for beyond the plan period and evolving socio-economic circumstances. This should include maximising thermal insulation through efficient design and technology and renewable energy technology, where feasible. Natural ventilation, lighting and shading should also be used to minimise resource use.

In order to be on course for the 2050 target of a 60% reduction in emissions the Government states in the Energy White Paper that by 2020 emissions need to be 11-18% lower than they would be if no additional efforts to reduce them were made. For the West midlands this equates to a reduction from the current 41.6 Mt of CO2 to 38.2 Mt (8%) by 2010 and 33.0 Mt (21%) by 2020[16].

In the RSS Phase 2 Preferred Option Policy SR3 C requires that developers should "Ensure that all new homes meet at least level 3 of the Code for Sustainable Homes and considering the potential for securing higher standards of energy efficiency for new homes at level 4 before 2013 and zero carbon level 6 before 2016 (further information see appendix 9). Offices and other non-domestic buildings should aim for 10% below the target emission rate of the current Building Regulations by 2016. "Household energy use accounts for more than a quarter of all energy used in the UK. The use of energy in our homes, businesses and public services and in Worcestershire homes accounted for 28% of CO2 emissions[17] and Industry and commercial accounting for 30%

A large proportion of Worcestershire's existing housing stock is in need of adequate insulation & energy efficient heating & lighting systems whilst the business sector uses much of its energy for heating and lighting. New development presents an opportunity to integrate higher standards of energy efficiency. There is great potential to reduce emissions from both domestic and residential properties by encouraging greater energy efficiency through a mixture of Planning Policies, Building Regulations and Design Guidance including:

- The Code for Sustainable Homes
- The Home Energy Conservation Act (1996) HECA
- Part L Building Regulations
- BREEAM, BRE's Environmental Assessment Method.
- West Midlands Regional Spatial Strategy
- West Midlands Regional Energy Strategy
- West Midlands - Sustainability Checklist[18]

[16] Sustainable Housing Action Programme 2006-2007 Planning for Sustainable Homes: Meeting the Low Carbon Challenge. http://www.sustainabilitywestmidlands.org.uk/assets/userfiles/shap/planning/000181.pdf

[17] Full statistics are available from: http://www.defra.gov.uk/environment/statistics/globatmos/galocalghg.htm

[18] Checklist West Midlands - http://www.checklistwestmidlands.co.uk/

Affordable warmth is the ability to heat your home adequately for household comfort and health, without getting into fuel debt as a result. The lack of affordable warmth is known as 'fuel poverty'. A household in fuel poverty is defined as one needing to spend 10% or more of income to achieve adequate warmth for health and comfort.

Assessment of the levels of deprivation and other indicators examined during the drafting of the affordable warmth strategy for Worcestershire (2003) suggest that more than 13% or up to 30,000 households in Worcestershire were experiencing some degree of fuel poverty with very high percentages in some parts of all 6 authorities. These figures are expected to increase in light of increasing fuel and energy prices.

The age of housing has a bearing on the building methods and materials used, and so on the energy efficiency and potential for improvements in energy efficiency. The existence of cavity walls first introduced in the mid 1930s provides an opportunity for significant improvement in energy efficiency through cavity insulation. The Energy Efficiency of buildings can be improved by installing proper roof and wall insulation, the use of low energy rated appliances such as fridges and freezers, installing double glazing and encouraging the use of low energy light bulbs.

Case Study 1 The Chase Technology College - Science Block

The project is to provide 14 new science laboratories, with preparation, storage and staff facilities. Worcestershire County Council already pursues an environmental agenda in its building projects, with good use of daylighting, natural ventilation wherever possible, and sophisticated controls systems. The design team have set themselves a target Very Good rating under the BREEAM process.

This building is being designed with a number of innovative and low impact features. Although a feasibility study considered renewable forms of energy such as photovaltaic panels and solar water collectors not to be viable, the design still reduces energy demand by lightwells and passive ventilation stacks. It includes a grass 'sedum' roof to absorb water and provide biodiversity habitats, and also a sustainable drainage scheme to reduce water run off and create educational landscape features.

As well as measures to reduce the carbon dioxide emissions of the finished building, steps will be taken during the construction process to reduce environmental impacts. The energy used by the contractor will be monitored, and it is planned that waste will be minimised[19] .

[19] The Chase Technology College - http://www.worcestershire.gov.uk/home/tourism/wcc-property-building-projects-the-chase

Topic: Solar Orientation and Design

By the 2080s, the annual average maximum temperature is expected to be between 2.6ºC and 4.5ºC warmer than the 13.4ºC that it is today (1961- 1990 average) in Worcestershire. The unusually hot summer of 2003 caused severe disruption and an estimated 2,000 excess deaths in the UK. Global climate models indicate that similarly hot summers could be the norm within 30-40 years.

Worcestershire is the warmest and sunniest county in the West Midlands with average annual mean temperature of 9.5°C slightly higher than Birmingham at 9.4°C. A failure to adapt buildings to predicted future summer temperature rises may in future result in overheating of buildings and increase the demand for energy to power air conditioning or cooling units which can in turn lead to increasing emissions.

The adoption of design standards such as BREEAM can also help to reduce the potential for over heating and create energy savings when site layout optimises passive solar gain. Design may include solar orientation to reduce the risk of overheating or incorporating natural cooling to avoid the need for mechanical air conditioning. Other measures may include shutters to prevent excessive solar gain particularly on large glazed solar-orientated windows.

Case Study 2 Red Cross HQ, Worcester.

In June, the British Red Cross opened its new £1.4 million headquarters in Worcester, an environmentally friendly office building.

The building has 'wind catchers' installed on its roof, with two of each set of four acting as inlets, bringing cool, fresh air into the building, and two acting as outlets, regardless of the wind direction and this allows natural ventilation into the deeper parts of the building.

The system uses the pressure exerted by the wind to move fresh air into and around the building. Air is also sucked into the building through louvres in the walls above windows and by automated window opening at night, controlled by a Building Management System (BMS).

Economic factors have been at least as important as environmental ones in persuading the Red Cross to invest in these technologies. Buildings that use passive ventilation use less than half the energy of ones with air conditioning.

Other aspects of the building also help reduce energy consumption. Its lowest elevation faces south, where the sun shines when highest and hottest, to reduce the amount of heat absorbed by the building at that time.

The building has also been designed to take maximum advantage of natural light, thus cutting lighting bills, and solar shading technology is used in the glass on the building to stop solar radiation heating up the building like a greenhouse. In addition, the building makes use of motion sensors in some meeting rooms that dim or turn off lighting if nothing has moved in the room for a certain period of time.

Topic: Water Resources and Management

This chapter should be read in conjunction with the accompanying paper *Planning for Water in Worcestershire*. This paper seeks to bring to the attention of policy makers and decision makers the water issues and options facing the County over the next 20 years and provide options for how we might manage/plan our water resource in the future.

Predicted changes in precipitation as a result of climate change are likely to have wide ranging impacts to people, infrastructure, environments and agriculture. Worcestershire has in recent years witnessed extremes of water availability from prolonged dry periods to the flooding in 2000 and 2007.

The Worcestershire Climate Impacts Study suggests that future climate will see a reduction in annual precipitation by 13% by the 2080's, the 2007 cost of flooding in Worcestershire was estimated to be £150 million.

Summer Flooding 2007
Sedgeberrow - Heavy rain on 20 July caused extensive flooding over the Avon Catchment. In July 234mm of rainfall was recorded at the Langley gauge near Sedgeberrow which is four times the long term average for the area. At the gauge in Hinton the River Isbourne rose by 4.6m in approximately 12hours to an estimated level of 4.93m, which is over a metre above the levels reached in the floods of April 1998. Approximately 90 properties were flooded with flood levels overwhelming the flood alleviation scheme due to design standards being exceeded; the flood defences required repairing due to damage sustained during the floods.
Tenbury Wells - During June and July, Tenbury Wells was flooded three times due to exceptionally heavy rainfall. Between the 24-26th of June 45 properties were flooded, on the 17th July the surface water drainage system was overwhelmed and further flooding on the 20-21st led to the flooding of 150 properties. The Teme catchment experienced almost a month rain in 2 days. Record river levels seen during the June floods were topped by a further 0.22m, reaching 5.97m - that's almost 15 times higher than the levels we can normally expect during the summer.
Pershore - On the 20th of July a rain gauge near Pershore recorded 90.6mm of rain in 11 hours, nearly double the monthly average. As a result river levels were at some of the highest ever recorded. Pershore has no raised defences and consequently the riverbanks and drains were overwhelmed causing flooding to 120 properties severe traffic disruption and the closure of the B4084 at Cropthorne.

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Summer Flooding 2007
Evesham - the River Avon in Evesham reached a peak of 5.52m on the 21st of July almost 300mm higher than the peak reached in the floods of 1998 and was approximately five metres above normal summer river levels. Approximately 330 properties were flooded in and around Evesham by both river and surface water. This included properties along Port Street, Waterside, Fairfield Road and surrounding areas, and properties in Hampton. Approximately 20 children became trapped at their school and guests and staff were confined to the upper floors of the Northwick Hotel on Waterside in Evesham.
Upton Upon Severn - was affected by heavy rainfall in both June and July on the 20th of July approximately 90mm of rain fell equating to two months rain in one day. Around 70 properties were affected by flooding in Upton. Temporary flood barriers used in June and past floods in December 2006, January 2007 and March 2007 were unable to be deployed on time due to delays caused to the transport infrastructure by surface flooding elsewhere. However had the defences been deployed they would have still been overwhelmed.
Worcester - record flood levels were recorded in Worcester as a result of exceptional flows in the River Teme and heavy rainfall across Worcestershire. River levels at the Diglis gauge in Worcester reached a peak of 5.3m.The previously highest recorded level was 5.22m in March 1947with normal summer levels being around 0.7m. On the 26th and 27th of July 50 to 95 homes were saved from flooding by utilising the Perdiswell floodwater storage area. Upstream of the area 12 to 15 industrial units were flooded on the Blackpole Industrial Estate. An estimated 205 properties were affected by flooding in Worcester.
Bewdley - In June as a whole more than four times the monthly average of rain fell and in July over three times the monthly amount fell. In total around 200 properties were flooded in the Bewdley area. The River Severn did not overflow its banks. However, around 100 properties were flooded as heavy rainfall resulted in surface water flooding the controls to the Water Company's pumping station in Severnside North. This caused the pumps to stop and foul water overflowed into the storm water sewers and the drainage to the flood barrier. These systems were then overwhelmed with the sheer volume of foul and storm water. Three sewers were damaged.
Kempsey - was affected by heavy rainfall in June and July with approximately two months rain falling in one day on the 20th of July. Over 150 properties were affected by flooding in Kempsey in the July flood. On Friday 20 July, properties were flooded by water from the Hatfield Brook, and later as a result of rising levels in the River Severn. Some properties flooded after road gullies and foul sewer drainage were overwhelmed. Some properties which flooded in July had also flooded in the June flood. The Environment Agency is currently assessing the feasibility of a flood alleviation scheme to protect the village.

As the events of the summer 2007 illustrate intense rainfall events can overload drainage systems and lead to localised flooding. The introduction of water management systems at the design stage can assist in mitigating the impacts of increased or sudden intense periods of rainfall predicted in climate change scenarios.

The consideration of water management during site and building design can include the use of SUDS (Sustainable Urban Drainage Systems), grey water recycling, permeable surfaces or the introduction of Green Roofs which can delay run off rates by retaining up to 90% of rainfall.[20]

[20] Green Roof Centre - http://www.thegreenroofcentre.co.uk/pages/Green%20Roofs%20Fact%20Sheet.pdf

Case Study 3 Hopwood Motorway Services Area M42, Bromsgrove.

The Motorway Service Area was constructed in 1999 and designed to meet a 1 in 25 storm return period with a variety of SUDS techniques in series to improve the flow and quality of run off in stages prior to release into the local watercourse. Areas considered to pose a pollution risk to the environment have used the 'management train' concept in full to ensure good water quality and to deal with unforeseen spillage events. The series of ponds, wetlands and low flow channels behind the Amenity building now form a 'SUDS walk' for visitors with information boards to explain the Sustainable Drainage approach to managing rainfall on development sites.

Topic: Sustainable Waste Management

The breakdown of waste in landfill emits green house gases such as carbon dioxide and methane (which is 23 times more potent than CO2). Typically 45% - 65% of landfill gas is methane. In addition waste also creates emissions through processing and transport and leads to the depletion of natural resources. Worcestershire produces relatively high levels of waste, most of which goes to land fill, (currently 77% of domestic waste) and in 2006 it cost over £28 million to dispose of waste in Herefordshire and Worcestershire.

In 1999 about 11.7 million cubic metres of licensed landfill void space was available within Worcestershire for biodegradable waste. This was equivalent to 10.4 years supply at current rates of input.

The National Waste Strategy 2000 sets a target, by 2005, to reduce the volume of industrial and commercial waste landfilled to 85% of 1998 levels. The waste strategy has set targets to manage waste more sustainably and to increase the recycling of municipal waste to recycle or compost at least 30% of household waste by 2010 increasing to at least 33% by 2015.

Reducing the amount of waste going to landfill can help to reduce the emission of greenhouse gases. The waste hierarchy aims to decrease waste production and increase the recovery of value from waste (re-use it, recycle it, or recover value in other ways i.e. through energy from waste).

Currently an estimated 5% of total renewable electricity produced in the West Midlands is generated in Worcestershire. This is mainly from energy from waste resources, for example generation of electricity from landfill gas at Hill & Moor landfill near Pershore, (equivalent to 2-3 1.8 MW wind turbines) and at closed landfill sites such as Martley. (Climate Change Strategy, Halcrow Report 2001).

The Joint Municipal Waste Management Strategy for Herefordshire and Worcestershire 2004-2034 forms the framework for the management of municipal waste in the Worcestershire. Policy 14 of the Waste Strategy states that "Opportunities for more sustainable waste management will be sought in new developments wherever possible as part of the planning process - such as provision of home composters and recycling sites".

% of Household waste recycled or composted by Local Authority (2005-06)	
Bromsgrove	36.7
Wyre Forest	23.6
Malvern	23.5
Worcester	19.8
Wychavon	18.6
Redditch	16.9
West Midlands	28.6% + 180%

The Code for Sustainable Homes has been developed to enable a step change in sustainable building practice for new homes. The Code measures the sustainability of a home against design categories and includes a minimum standard for waste helping to encourage household recycling and reducing the impact of future housing stock on the environment.

As a minimum standard a site waste management plan should be in place and provision should be made for adequate space storage of containers for relevant Local Authority refuse collection/recycling schemes.

Case Study Norton Co-mingled Materials Reclamation Facility (CMRF)

In July 2007, Worcestershire County Council approved a planning application from Severn Waste Services for a new Commingled Materials Reclamation Facility (CMRF) to be built at the Area 7 Business Park at Norton, approximately three miles south east of Worcester.

The new CMRF, to be commissioned in 2009, will receive, sort and despatch all the clean recyclables collected from households across Worcestershire and Herefordshire. It will have a capacity to receive and sort 105,000 tonnes of recyclable material per year.

Topic: Biodiversity and Landscape

Climate change is likely to have an effect on most or all ecosystems. The distribution patterns of many species and communities are determined to a large extent by climatic parameters. Worcestershire has many plants and animals that are national rarities and encompass species that are at the extent of either of their Northern or Southern ranges. Climate change should be seen as an important factor affecting biodiversity in the County and the indications are that it will become even more significant in the future, and should therefore be taken into account when developing action plans. The future impacts of climate change on Worcestershire's biodiversity may include:-

- Damage to trees and woodlands from high winds.
- Increased risk of wetland drying out as a result of higher temperatures in turn reducing species diversity.
- Warmer winters and fewer frosts may extend the growing season of some species but conversely may impact on the ability of some plants to produce fruits particularly commercial grown top fruits e.g. apples. The warm and wet summer of 2007 impacted on crops of Mistletoe and Holly at the December auction in Tenbury Wells. The annual auction, which has been held for 150 years, had bumper crops of Mistletoe that thrives on warm damp conditions however the summer weather increased prices for Holly due to the scarcity of berries. (BBC)
- Higher temperatures and reduced rainfall in summer may increase the risk of outdoor fires. Five main areas in Worcestershire have been identified as being sensitive to fire risk Lickey/Clent Hills, Malvern Hills, Hartlebury Common, Wyre Forest and Kempsey.

PPS 1 Planning & Climate Change notes that in preparing an appropriate response on climate change, planning authorities through their spatial strategies should "conserve and enhance biodiversity, recognising that the distribution of habitats and species will be affected by climate change". PPS 9 also notes that "development proposals offer the opportunity to build in beneficial biodiversity features as part of design".

The largest opportunities for continuous natural or semi natural habitat are likely to be located on the urban fringes. By bringing together new and existing land areas, a mosaic of native forest, wetland and grassland habitats can be established [21]. These habitats are the building blocks for green infrastructure that connect towns and cities and also the linkage between the mosaic of central urban habitats and the urban fringe. The planning of urban extensions should therefore explore the impact and interactions between these habitats in the provision of greenspace.

Green infrastructure is defined as the sub-regional network of protected sites, nature reserves, greenspaces and greening linkages. Green infrastructure should provide (where possible) multi functional uses, i.e. wildlife, recreational and cultural experiences, as well as delivering ecological services, such as flood protection and microclimatic control. Green infrastructure and links to biodiversity are not just an urban issues they are equally as important for rural communities and should therefore operate at all spatial scales from urban centres through to the open countryside.[22]

[21] Town and Country Planning Association, Biodiversity by Design
[22] Town and Country Planning Association, Biodiversity by Design

In planning for green infrastructure a number of benefits can be delivered in mitigating and adapting to climate change and this demonstrates the need for biodiversity to be designed into new and where possible existing developments;

- Carbon Sinks - Trees have the capacity to absorb carbon dioxide with 1 hectare of woodland able to absorb the emissions equivalent to 100 family cars.
- Vegetation and areas of open water can provide natural air conditioning helping to reduce the urban heat island effect.
- Vegetation can also provide shading for buildings reducing energy requirements for air conditioning.
- Flood risk can be reduced by reducing excessive run off and capturing rainfall helping to recharge soil moisture and groundwater supplies.

The contributions that green infrastructure can make in tackling climate change are recognised in PPS 1 in planning for new development planning authorities should take into account " the contribution to be made from existing and new opportunities for open space and green infrastructure to urban cooling, sustainable urban drainage systems, and conserving and enhancing biodiversity".

PPS 9 also recognises the opportunity that "Development proposals provide for building-in beneficial biodiversity or geological features as part of design" .

Sustainable development, conserving and enhancing biodiversity and the provision of green infrastructure can be viewed as cross cutting themes, examples of which are outlined below:

- The provision of green infrastructure in developments can provide a network of valuable habitats providing stepping stones for species migration and linking fragmented areas of biodiversity importance.
- The inclusion of SUDS schemes in new or existing developments can for instance be integrated within open spaces or in landscaping and the introduction of swales and balancing ponds can provide valuable habitats and increase biodiversity.
- As noted previously the use of green roofs can provide energy efficiency benefits by providing added insulation. Green roofs can also offer biodiversity benefits providing habitats for insects and birds whilst also offering the potential for additional outdoor space where applicable. Green roofs can also reduce rainfall run off rates by up to 90%.
- The planting of street trees can form an attractive and functional element of urban streets the planting of native species as a continuous canopy can increase their habitat potential, particularly for birds and insects.

In managing flood risk it is essential that account is taken of whole catchment interactions. Changes in land management can assist in increasing temporary storage and also be beneficial to flood management by directly affecting the rate of run off feeding water courses[23]. The long term effects of soil compaction and degradation has led to increased rates of run off and reduced the potential for storage of moisture deeper within soils.

The re-creation of wet grassland habitats is a key target within the UK Biodiversity Action Plan. Approximately 1% of Worcestershire is currently covered by wetland habitats compared to a previous figure of 20%. The Worcestershire Biodiversity Action Plan seeks to rehabilitate or create 50 ha of Wet Grassland, 50 ha of Marsh and Fen and 60 ha of Wet Reedbed.

The Severn and Avon Vales Wetlands Partnership has supported the restoration of 327 ha of wet grassland representing 54.5% of Worcestershires BAP target. Restoration work has been undertaken at Wyre Piddle, Pershore and Longdon Marsh. Improvements in floodplain management not only provide the opportunity to reduce the risk of flooding but also to provide valuable habitats for wildlife and opportunities for diversification by land owners and farmers.

Case Study Innovative planning: public park acts as valuable flood storage

For over 200 years the public water supply for Worcester came from a waterworks on a four-hectare site on the banks of the River Severn in the urban area. The site was within the functional floodplain but a flood defence was in place, consisting of a high concrete wall.

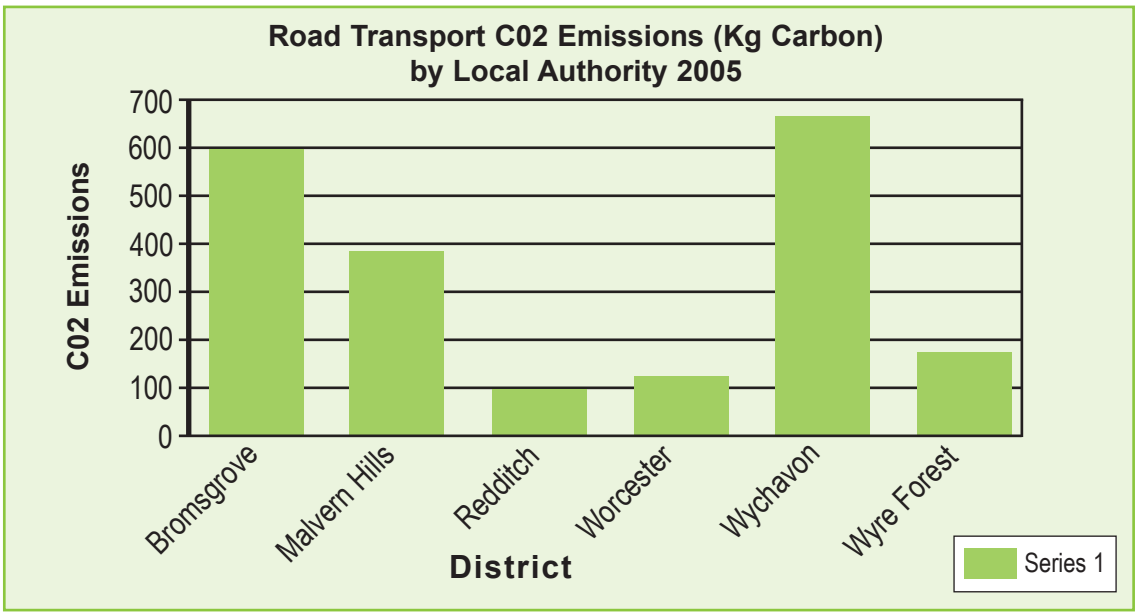
When the waterworks was decommissioned the owners, Severn Trent Water, in partnership with the City Council planning department and the Environment Agency, agreed a scheme to restore the land to a public park, Gheluvelt Park. Major improvements to flood management were achieved by removing the floodwall, removing the 17 brick and concrete tanks, recontouring the site and restoring the active floodplain. The spoil was used to fill the deeper tanks and housing was developed on an adjoining site, not at risk of flooding. A local river (Barbourne Brook) was also broken out of its culvert and allowed to flow freely through the park and into the river.

Worcester was flooded during the summer and the design worked. The park kept flood levels down in the city by providing a much-needed extra four hectares of flood storage capacity (and throughflow of flood water) and the new housing on its edge did not flood. The park was back in use shortly after the floods, hosting a folk and craft fair. (The Pitt Review 2007, Learning Lessons from the 2007 floods).

[23] Wetlands, Land Use Change and Flood Management http://www.defra.gov.uk/environ/fcd/policy/wetlands/Wetlands3.pdf

Topic: Transport

Increased levels of mobility and the rise in private vehicle ownership means that transport is one of the fastest growing sectors for CO2 emissions. The County has above average emissions from transport (approximately 40% of county emissions) and this is in part due to the largely rural nature of the county resulting in a higher dependence on private transport and also the influence of major transport infrastructure such as motorways.



The effects of predicted future climate change will have an impact on transport infrastructure and can include;

- Surface flooding or flash flooding from sudden intense down pours of rain.
- The melting of road surfaces from periods of high temperatures.
- Hot temperatures can cause railway lines to expand and buckle.
- High summer temperatures may lead to increased risk of fires along railway track corridors causing damage to infrastructure and signalling cables.
- Blockage of roads and railways due to fallen trees in storms and high winds.

Weather events have already impacted on Worcestershire's transport infrastructure. Flash flooding in the summer of 2007 led to the closure of 88 roads and bridges in Worcestershire and sections of the railway network between Worcester and Hereford. In July of 2006 the Worcestershire Highways partnership used sand to soak up melting bitumen as temperatures of 34C or more led to melting of the road surface (Lammas, 2007).

Mitigation and adaptation of climate change should be built into transport planning. The development of sustainable transport can help to mitigate for future climate change by reducing reliance on private transport and in turn reducing emissions.

The supplement to PPS 1 Planning and Climate Change requires planning authorities to develop spatial strategies that deliver sustainable development by delivering "patterns of urban growth and sustainable rural development that help secure the fullest possible use of sustainable transport for moving freight, public transport, cycling and walking; and which overall, reduce the need to travel, especially by car".

RSS (draft) Policy SR2 F notes that Local Authorities should make provision for the full range of sustainable development options and should "provide the necessary public transport infrastructure so as to improve accessibility to employment, services and facilities both within and between settlements, particularly for the least affluent members of society, and give priority to the most low carbon forms of transport, such as walking and cycling, and reducing the need to travel by car, thus minimising the generation of transport-related emissions and the adverse effects associated with such emissions".

In designing new transport infrastructure consideration should be given to the integration of SUDS to improve surface water drainage and reduce the impact on drainage systems.

The creation of green infrastructure and public space in new developments provides the opportunity for the integration of sustainable transport i.e. cycling and walking or the use of existing corridors such as canal networks.

Topic: Tourism and the Economy

The impacts of future climate change are likely to mean economic constraints from increased frequency of flooding, storm damage and periods of drought will particularly affect rural locations. However new economic opportunities may also be created in a variety of areas including;

- Agriculture - from increased growing seasons and diversification into new crops i.e. grapes, olives, biofuel crops and exotic crops.
- Tourism - warmer drier summers will increase demand for outdoor activities. Increased visitor numbers will bring benefits for accommodation providers, shops, businesses and visitor attractions.
- Environmental Industries - opportunities will arise from the uptake in emerging environmental technologies presented by government policies that promote renewable energy, biofuels, energy efficiency, waste minimisation and research.
- Forestry - increased use of renewable fuels such as biomass from woodfuel will provide economic opportunities for woodland managers, processors, fuel suppliers and diversification opportunities for farmers and land owners.
- Management and professional employment - engineering, accountants, lawyers, architects, environmental consultation.

There are opportunities for Worcestershire businesses to access the growing Low Carbon Market (Energy efficiency and renewables). If 50% of the domestic energy efficiency measures listed in Annex B of the West Midlands Energy Strategy were implemented then this would mean expenditure of approximately £1,500 million.

Research has shown that for every £40,000 invested this would create 1 job therefore the potential level of expenditure could create 37,000 in the West Midlands.

Tourism in Worcestershire is a major part of the economy and is the third largest sector behind retail and manufacturing. However it must be managed to mitigate the effects on the natural environment and climate from tourism activities and development. A growth in tourism will bring increased pressure on transport infrastructure with public transport currently only making up 6% of visitor transport.[24] Increased visitor numbers may also bring pressure on water resources particularly in drier summer months.

The planning system can play a pro-active role in helping tourism and the economy to develop and thrive by mitigating against and adapting to future climate change and this can be achieved by ensuring that benefits are delivered in the most sustainable manner possible. The careful design of tourism and business/industrial park locations can help to make them more sustainable and opportunities should be sought for exemplar developments.

[24] Worcestershire Climate Change Impact Study, 2004. http://worcestershire.whub.org.uk/home/wcc-sustainability-climate-impactstudyfullreport.pdf

Case Study Heat wave Summer 2003

The heat wave of summer 2003 saw temperatures in the Vale of Evesham reaching 36.4C. Across Worcestershire tourism levels increased with the Severn Valley Railway receiving 5,000 more visitors than the previous year and Worcester City tourism receiving 400 enquiries a day for accommodation.

Topic: Health and Well-Being

PPS1 paragraph 16 requires development plans to *"deliver safe, healthy and attractive places to live, and, support the promotion of health and well being by making provision for physical activity."*

The built and natural environment in which people live can impact on their health and well-being. The threat of climate change and the urgent requirement to adapt to and mitigate future effects present an opportunity to reduce health inequalities as environmental and health issues are inextricably linked. In planning for climate change it is vital that the cross cutting nature of climate change and health are recognised and integrated. Some of the potential effects of climate change on people's health are outlined below:

- Extremes of heat may lead to cases of heat exhaustion.
- Extreme weather events or flooding can cause injuries or drowning as illustrated in the floods of Summer 2007.
- Levels of stress and anxiety may increase due to repeated incidents of flooding and lead to ongoing mental health problems.
- Incidents of flooding may cause damp leading to respiratory problems.
- Longer hotter and drier summers can lead to increased incidents of respiratory problems including asthma and hay fever.
- Water-borne disease - climate change might increase levels of cryptosporidium and campylobacter in water. Secure sanitation systems should safeguard supplies of drinking water, but possible contamination of storm water outflows could carry disease into basements and nearby rivers, affecting the health of residents and river users. [25]

Environmental improvements and measures to adapt and mitigate for climate change can provide opportunities to maintain or enhance a community's physical health and well being of which some are outlined below:

- The provision of green infrastructure can provide opportunities in hot summer months to shelter from the sun whilst also providing spaces for increased physical activity.
- The shift toward more sustainable methods of transportation including cycling and walking can not only provide the opportunities to reduce carbon emissions but also to improve air quality and provide opportunities for physical exercise.

As noted previously assessment of the levels of deprivation and other indicators examined during the drafting of the Affordable Warmth Strategy for Worcestershire suggest that more than 13% or up to 30,000 households in Worcestershire are experiencing some degree of fuel poverty with very high percentages in some parts of all 6 authorities. Fuel poverty and poor housing can result in cold and damp conditions and be linked to ill health and a rise in winter death rates. In the 5-year period 1993-1998, excess winter deaths in Worcestershire averaged 352 and in much of the county were higher per 1000 population than the average for England and Wales.

[25] UK Health Impacts of Climate Change - http://www.parliament.uk/documents/upload/POSTpn232.pdf

The Home Energy Conservation Act (HECA) is part of a national strategy to combat climate change and is primarily focused on the reduction of carbon emissions from homes. Improvements in energy efficiency are also crucial in the achievement of affordable warmth and reducing fuel poverty. Local authorities are required to ensure all social rented housing and 70 percent of vulnerable households in the private sector meet the Decent Homes Standard. Initiatives to improve the energy efficiency and reduce greenhouse gas emissions from existing housing stock also offer opportunities to reduce the negative health impacts of poor quality housing and fuel poverty and to mitigate the impacts of future climate change.

Intact and accessible health and emergency service infrastructure are key requirements in emergency situations such as flood events, yet infrastructure such as hospitals and health centres may often be vulnerable to flood hazards. Any resulting breakdown of services thereby creates a situation of double jeopardy for populations suffering the outcomes of flooding or other storm events. Overall planning for health care and emergency infrastructure should therefore take these risks into account.

Infrastructural problems related to climate change may include physical damage to health facilities; communication or power failures, water shortage or contamination and physical damage may render services inoperable. The planning, design and construction of health and other emergency facilities needs to take account of future climate change and avoid physical threats from events such as flooding. Such measures may include

- Designing and constructing facilities that include adaptation and mitigation measures and should be adapted for local requirements.
- Ensure that healthcare and other facilities are built outside flood zones and designed to function effectively in a flood environment.
- Vulnerability analysis of existing facilities may inform the need for redesign or relocation.

Topic: The Historic Environment

Historic buildings, sites and landscapes have already experienced climatic changes in the past and may demonstrate considerable resilience in the face of future climate change. Many historic assets may be at risk from the impacts of future climate change. Without action to adapt to a changing climate and limit further changes it is likely that these will be irreparably damaged and the cultural, social and economic benefits they provide will also be lost.

Adaptation and mitigation measures should consider the cultural significance and integrity of important historic assets. The non-renewable character of historic features and the potential for their damage and loss should, therefore, always be taken into account when adaptation and mitigation responses are being planned and executed.

Guidance from English Heritage has considered the direct and indirect impacts of climate change on historic assets and these assets may include the built environment, parks and gardens and archaeological remains some of which are outlined below:

- Increased extremes of wetting and drying that heighten the risk of ground subsidence and accelerated decay of stonework and thus pose a threat to many historic buildings
- More frequent intense rainfall that causes increased erosion of archaeological sites and damaging flooding in historic settlements, the latter making historic buildings difficult to insure
- Changes in hydrology that put buried archaeological remains, including well-preserved wetland archaeology, at risk
- Changes in vegetation patterns that threaten the visibility and integrity of archaeological remains and historic landscapes
- A warming climate that makes some historically authentic tree plantings difficult to conserve

Some adaptive responses to climate change may also have an impact on the historic environment, for example:

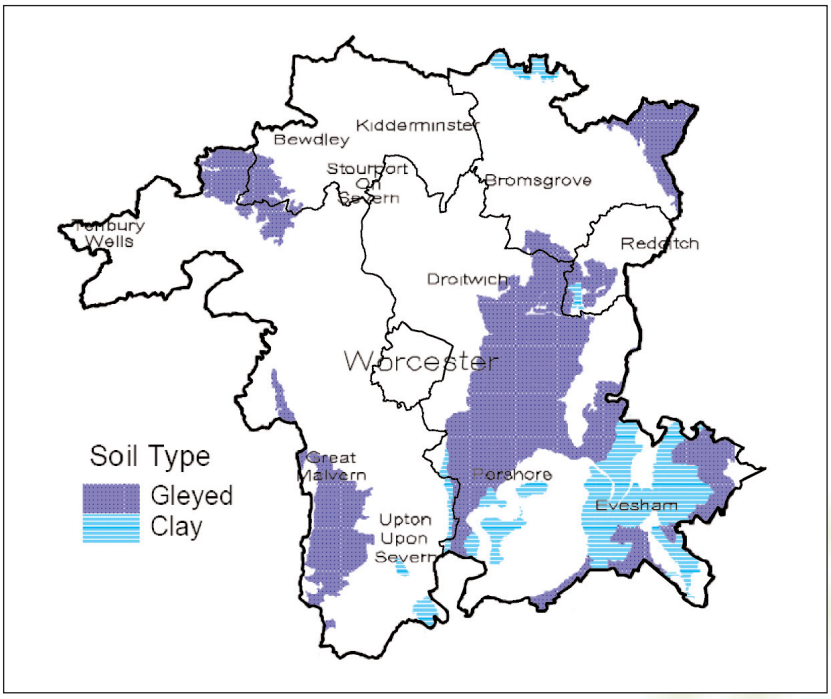
- The design integrity of some historic buildings and landscapes could be damaged by the need to provide new and more effective rainwater disposal or storage systems or flood protection features.
- Some types of micro-generation equipment, such as mini wind turbines, or micro combined heat and power plants, are unlikely to present problems if sensitively located on historic buildings; others may be more visually intrusive and difficult to accommodate. Consideration should be given to minimising physical impacts on the historic fabric of buildings and ensuring reversibility wherever practicable.
- Poorly designed or inappropriate energy-saving measures could seriously detract from the historic character and fabric of buildings and landscapes, whereas well-designed measures can make considerable savings with little or no damage.
- New flood defences, particularly in historic towns, can cause major archaeological damage along historic waterfronts and may impair the character of historic quaysides and waterside buildings and gardens.

Appendix 5 - Maps of Areas at Risk of Subsidence, Outdoor Fires & Flooding

The impacts of climate change are likely to vary and the county will become increasingly at risk from extremes of weather and physical changes. The ability of the county and its communities to adapt will vary depending on local geographical, environmental and climatic factors. The maps below illustrate areas at risk from a series of physical and environmental factors including

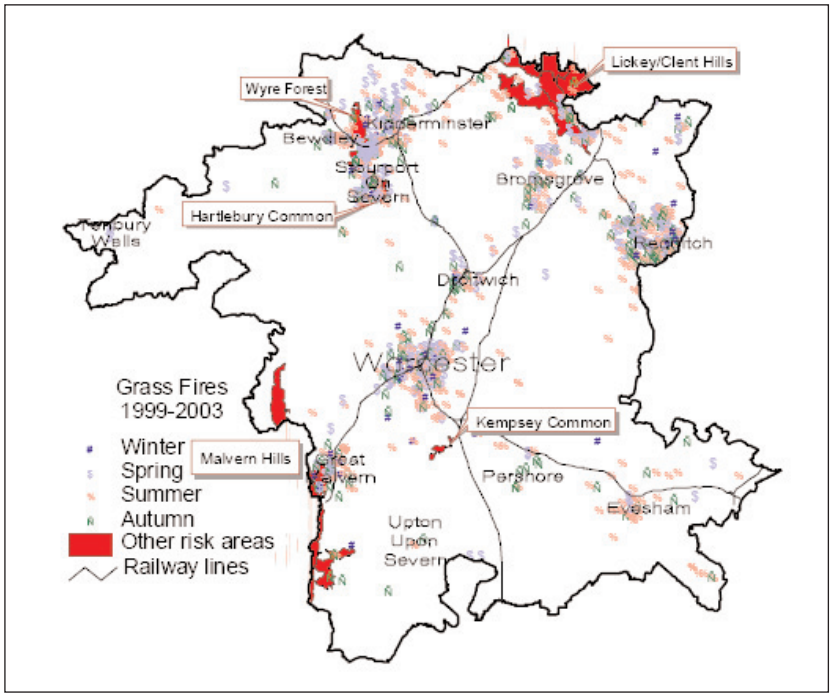
- Subsidence - as a result of the shrinking and heaving of clay soils.
- Flood - from increased winter rainfall and periods of sudden intense rainfall.
- Fires - as a result of periods of prolonged dryness and extremes of temperature.

Map of increased risk of subsidence in Worcestershire



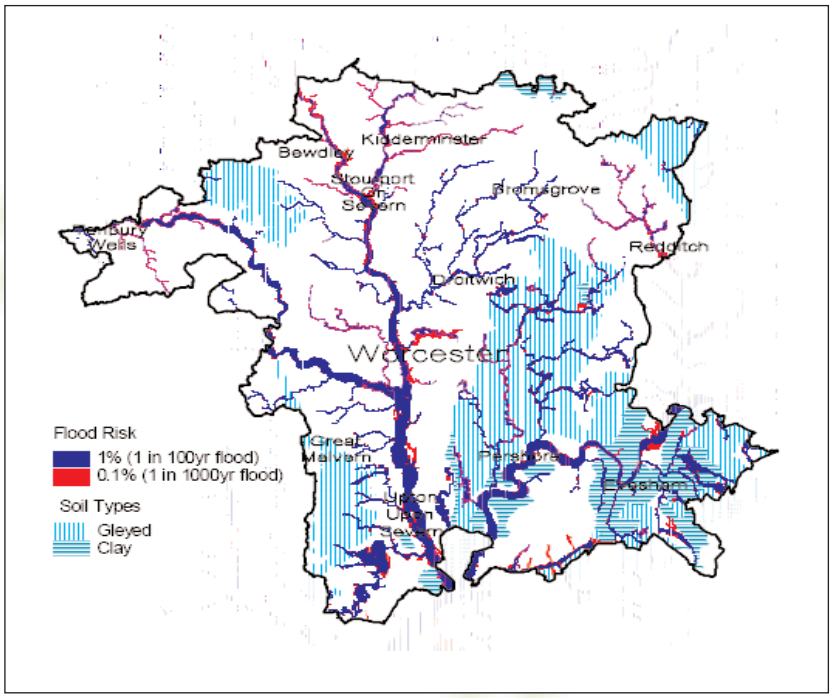
Source - Worcestershire Climate Change Impacts Study

Map of areas at risk from outdoor fires in Worcestershire



Source - Worcestershire Climate Change Impacts Study

Map of areas at risk of flooding in Worcestershire



Source - Worcestershire Climate Change Impacts Study

Appendix 6 - Future Climate Modelling

To enable mitigation and adaptation to the future effects of climate change an understanding is required of the likely future impacts at the regional, County and district levels. Both the Worcestershire Climate Change Impact Study (2004) and the Potential Impacts of Climate Change in the West Midlands (2004) draw upon climate information provided by UKCIP02.

The UK Climate Impacts Programme (UKCIP) is responsible for coordinating climate change impact projects. The programme provides climate change scenarios for the UK and has produced climate scenarios for the West Midlands which have been developed jointly by the UK Meteorological Office's Hadley Centre and the Tyndall Centre for Climate Prediction.

The UKCIP(02) presents a set of four scenarios for future climate change for the UK and provide a starting point for assessing climate change vulnerability, impacts and adaptation in the UK. The scenarios describe four alternative climates for the UK labelled, respectively, Low emissions, Medium-Low Emissions, Medium-High Emissions and High Emissions. By the 2080's the UKCIP02 scenarios suggest that global carbon dioxide concentrations may be between 525 parts per million (Low emissions scenario) and 810 parts per million (High emissions). The global atmospheric carbon dioxide concentration in 2002 was about 370 parts per million.

The UKCIP02 scenarios for the UK predict the following;

- Average Annual temperature rises of between 2° and 3.5°C by the 2080s.
- Decreases in Annual Average precipitation by 0 and 15 percent by the 2080s.

Whilst climate change models for Worcestershire using the UKCIP02 scenarios suggest;

- Air temperature increases between 2.5-4.1°c
- Greater rainfall intensity and more rain on heavy rainfall days.
- Soil Moisture is predicted to decrease by between 12% to 23% particularly in the summer months.

In November 2008 the UK 21st Century Climate Scenarios (UKCIP08) will be launched. UKCIP08 will utilise advances in climate science to enable users to assess, plan and adapt for climate change. The climate projections will be produced using three emissions scenarios Low, Medium and High and should enable an improved assessment of climate risk.

The regional climate model being used to downscale UKCIP08 will be based on a 25km grid (UKCIP02 previously at 50km grids) and will allow for improved spatial representation of data. Reports produced will give probabilistic projections of climate change and give information on future changes for land areas concentrating on changes in temperature and precipitation. An online collection of maps and graphs will illustrate the changes described and will illustrate the outputs that users will be able to generate using a dedicated web interface[26].

[26] http://www.ukcip.org.uk/scenarios/ukcip08/what_is_ukcip08.asp

Appendix 7 - Climate Change Indicators

Commitments at a national, regional and local level to reduce carbon emissions will require a monitoring framework to enable an accurate assessment of progress towards the targets set. PPS1, paragraph 34 notes the need for effective monitoring and review that should be closely linked at a regional and local level.

Phase 3 of the revision of the WMRSS will consider the need for further work on the development of carbon emission trajectories in line with the supplement to PPS1. To assess progress towards the trajectories introduced a series of indicators will be required that measure change and should assess progress against the objectives of the PPS.

These indicators can be agreed through local partnerships and may include a set of recommended indicators and aggregated from these a set of headline indicators. Suggested indicators may include:

- Annual average surface temperature
- Annual average rainfall broken into Summer rainfall and Winter rainfall.
- CO2 Emissions for County or District.
- Incidents of flooding to include peak and low flows.
- Installed capacity for energy production from renewable sources
- Projected capacity for renewables
- Domestic and sectoral consumption of energy
- Appearance of first leaves on trees.
- Appearance of first migrant species
- Installation of SUDS
- Planting of new woodland.
- Ground water levels.
- New homes built to Code for Sustainable Homes/Eco Homes.
- Retro fitting of homes for energy efficiency
- New Non Domestic buildings built to Breeam
- Growth in environmental business sector - New business start ups and inward investment from existing business.

Whilst some wider environmental, social or economic data required to form an appropriate baseline for climate change monitoring may already be available, there may also be an absence or gaps in information required. It will therefore be necessary to identify additional sources of information and to consult with stakeholders or representatives of other bodies that may already collate or be able to assist in gathering such information. The indicators outlined above are suggestive of those that may be considered and are by no means exhaustive and further indicators may be considered at a local scale.

Appendix 8 - What is Carbon Zero

The Code for Sustainable Homes was introduced in England in April 2007. Mandatory ratings against the Code will be introduced from May 2008. This means that while it remains voluntary to design and build a home to meet the standards set out in the Code, regulations mean that from May 2008 those selling new homes will be required to provide information to any prospective purchaser on the sustainability of the home. Where a home is designed and built to the Code and assessed against it, a Code certificate will be provided. Otherwise a statement of non-assessment (a nil-rated certificate) will be provided [27].

PPS1 Supplement - Planning and Climate Change paragraph 32 notes that when discussing requirements for sustainable buildings planning authorities should "specify the requirement in terms of achievement of nationally described sustainable buildings standards, for example in the case of housing by expecting identified housing proposals to be delivered at a specific level of the Code for Sustainable Homes".

The Draft Phase 2 Revision of the RSS Policy SR3 C that local authorities in their LDD's should work toward the achievement of zero carbon developments, by: "Ensuring that all new homes meet at least level 3 of the Code for Sustainable Homes and consider the potential for securing higher standards of energy efficiency for new homes at level 4 before 2013 and zero carbon level 6 before 2016".

However it is currently difficult to define what may be considered Zero Carbon. The current confusion falls in identifying the source of renewable energy for zero carbon developments. The Code for Sustainable Homes, devised by CLG, insists that any power taken from the grid must be replaced by zero carbon energy fed back into it. However the Treasury's definition of zero carbon (for which zero carbon homes will be exempt from stamp duty), excludes connection to the grid and green tariffs by requiring that heat and power "must be generated either in the home, on the development or through other local community schemes including district heat and power".

Care will be need be taken by those drafting policy relating to zero carbon homes to be aware of the differences in defining the term and they will need to have a clear understanding as to what they expect from a zero carbon development.

[27] The Code for Sustainable Homes - Setting the standard in sustainability for new homes.

এই দলিলটি বুঝতে আপনার সাহায্যের দরকার হলে দয়া করে এই নম্বরে ফোন করুন: 01905 25121

اگر آپ کو اس دستاویز سے متعلق مدد درکار ہو تو براہ مہربانی 01905 25121 پر فون کریں۔

如果你在明白這份文件方面需要幫助的話，請致電 01905 25121。

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Se con questo documento avete bisogno di aiuto pregasi telefonare a 01905 25121

Jeżeli potrzebujesz pomocy w zrozumieniu tego dokumentu, zadzwoń pod nr tel.: 01905 25121

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