

CLIMATE CHANGE IN A RURAL CONTEXT

A BACKGROUND BRIEFING PAPER
Prepared for the Herefordshire Partnership

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Overview

The issue of global climate change is considered by many to represent the single most important sustainability challenge facing the world today. A growing number of rural sector organisations and groups such as the National Farmers Union (NFU) and Country Land and Business Association (CLA) can be found increasingly voicing concern at the implications of climate change for agriculture and the wider countryside. The CLA's seminal 2001 document, 'Climate Change and the Rural Economy' for instance, makes no less than 102 policy recommendations towards tackling the likely problems posed by the UK's changing climate. This briefing paper aims to give a broad overview of the causes of climate change, exploring some of the evidence and opinion on the extent to which changes are occurring and reviewing some of the national and international policies in place to address the issue. The paper also briefly speculates on possible impacts of climate change for the West Midlands region and discusses some of the solutions and opportunities that agriculture and the rural sector may offer.

Causes of Global Climate Change

Climate has and always will vary for natural reasons. For instance, the natural phenomena of North Atlantic Oscillation and El Nino/Southern Oscillation lead to variations within the earth's climatic systems. However there is increasing evidence to show that humankind is now having a discernible impact on global climate. The Intergovernmental panel on climate change (IPCC), made up of over 2500 of the world's leading scientists, has recently concluded that most of the warming observed over the last 50 years is likely due to increasing concentrations of greenhouse gases (GHGs) caused by human activities.¹

The process of climate change regulation is commonly likened to that of a greenhouse. Short-wave solar radiation from the sun passes through the atmosphere. About one third of this incoming solar radiation is reflected back into space while the rest is absorbed by the earth. This energy is then redistributed by the atmosphere and ocean and re-radiated out to space at longer wavelengths. Naturally occurring greenhouse gasses in the atmosphere trap a proportion of the outgoing radiation, reabsorbing the energy and effectively acting as a blanket by keeping a proportion of the heat in - the so-called 'greenhouse effect'. This natural process regulates the earth's temperature providing the conditions necessary to support life. However, increasing amounts of GHGs in the atmosphere over the last 200 years have trapped more energy in the lower atmosphere and enhanced this natural greenhouse effect thereby altering the global climate.

The principal anthropogenic GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Carbon dioxide is the most abundant of these gasses. Anthropogenic emissions of CO₂ result from the combustion of fossil fuels and destruction of forests. At present for example, about 6.5 billion tonnes of carbon is

¹ Climate Change Scenarios for the United Kingdom. The UKCIP02 Briefing Report. April 2002.
<http://www.ukcip.org.uk/>

emitted globally into the atmosphere each year.¹ Power generation in the UK emitted an estimated 150 million tonnes of CO₂ in 1999.² Most of the anthropogenic emissions of Methane and Nitrous oxide come from agriculture, industrial processes, power stations and road transport. For example, 40% of methane emissions in 1998 in the UK were from agriculture, the main source being animal digestive processes and animal wastes. Agriculture was estimated to cause around 70% of UK N₂O emissions in 2000 mostly through fertiliser use.³ Methane has a global warming potential 21 times greater than carbon dioxide and nitrous oxide has a global warming potential 310 times greater. Over the next 100 years it is thought that CO₂ will be responsible for 63% of future warming, methane 24%, nitrous oxide 10% and other gases 3%.¹⁵

Consensus on the extent of Climate Change

There is a general acknowledgement that climate – both global and local – is changing and an increasing number of observations indicate that the world has warmed. Global temperature has risen about 0.6°C over the last 100 years and 1998 was the single warmest year in the 142-year global instrument record. In the UK the temperature of central England has risen by almost 1°C over the last century and the decade of 1990s was the warmest in central England since records began in the 1660s.¹

The extent to which such change is solely due to human activities however is still not universally accepted. There is nothing new in the fact climate is changing. If one looks back over several millennia, climate has ranged between ice ages and subtropical conditions. Similarly while experts would agree that the global climate is changing, the extent at which these changes are occurring remains uncertain. Precise predictions of future climate change are impossible. However, climatologists have been able to use complex models to match historical records and arrive at possible future scenarios. The recent IPCC third assessment report projects and accepts an increase in the mean global temperature between 1.5°C and 6°C by 2100, depending on the extent of greenhouse gases emissions. It indicates a current rate of change of about 0.2°C to 0.3°C per decade⁴. Projected climate change scenarios for Europe have been presented in the “Assessment of the potential effects and adaptation for climate change in Europe“ (ACACIA). These scenarios predict a warming of annual temperatures over Europe at a rate of between 0.1°C and 0.4°C per decade with colder winters becoming rarer and hot summers becoming much more frequent. Average sea level rises of between 12 and 68 centimetres in Europe are estimated⁵.

The UK Climate Impacts Programme (UKCIP) was established by the UK government with the aim of helping organisations assess their vulnerability to climate change and prepare adaptation strategies. The revised UKCIP climate change scenarios published in April 2002 offers four different emission scenarios based on the four alternative descriptions of how the world may develop in years to come: Low Emissions, Medium-Low Emissions, Medium-High Emissions and High Emissions.

² DTI Wind Energy Factsheet. August 2002. www.dti.gov.uk

³ Climate Change & Agriculture in the United Kingdom. DEFRA/MAFF. 2000

⁴ Climate Change 2001, Third Report of the Intergovernmental Panel on Climate Change. 2001

⁵ Assesment of Potential Effects and Adaptations for Climate Change in Europe (ACACIA) report – Jackson Environment Institute – www.jei.uea.ac.uk/projects/acacia_report.htm

These scenarios give some indication of the how the climate of the UK is likely to evolve in the future.

UKCIP02 Climate Change Scenarios: Key Results

- **UK climate will become warmer:** By the 2080s annual temperature across the UK may rise between 2°C for the Low Emissions scenario and by 3.5°C for the High Emissions Scenario
- **Hot summers will become more frequent; very cold winters will become rare:** A very hot August, such as experienced in 1995 when temperatures over central England averaged 3.4°C above normal, may occur one year in five by the 2050s for the Medium-High Emissions scenarios. Even for the low emissions scenario, by the 2080s about two summers in three may be as hot or hotter than the summer of 1995
- **Winters will become wetter; summers may become drier everywhere:** Relative changes will be greatest for the High Emissions Scenario with summer precipitation decreasing by 50% or more by the 2080s and winter precipitation increasing by up to 30%.
- **Snowfall amounts will decrease throughout the UK:** Reductions in average snowfall over Scotland might be between 60% and 90% by the 2080s for the high emissions scenario.
- **Heavy winter precipitation will become more frequent:** Winter daily precipitation intensities experienced every 2 years on average will become may become between 5% (Low Emissions) and 20% (High Emissions) heavier
- **Relative sea level will continue to rise around most of the UK's Shoreline**
- **Extreme sea levels will be experienced more frequently**

Source: Climate Change Scenarios for the United Kingdom. The UKCIP02 Briefing Report. April 2002

While we can say with certainty that global climate change is very real, we can only speculate about the extent to which it is taking place and confine predictions depending on how the continuing development of society may unfold. Despite the uncertainty with regard to the magnitude, timing and regional patterns of climate change one can be sure that the implications are severe.

The Climate Change Policy Framework

Global climate change has been described by many, including the UK Prime Minister, as the biggest public policy challenge we face. International government concern over the implications of global warming led to the creation of the Intergovernmental Panel on Climate Change (IPCC). The IPCC was set up by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) in 1988 to examine and report on the issue of global warming. The IPCC remains the most widely recognised authority on the subject of global climate change. By 1990, a series of international conferences issued urgent calls for a global treaty to address the problem. This resulted in the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) at the 1992 Rio Earth Summit. The ultimate objective of the convention is the “stabilization of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system.” The Kyoto Protocol to the convention was agreed in 1997 but still remains to be ratified by several countries, most notably the world’s biggest greenhouse gas producer, the United States. At EU level, the European target is has agreed an overall 8% reduction

of the 1990 level of greenhouse gas emissions by 2008-2012. The European Climate Change Programme was published in 2000 to assist EU member states to meet their own Kyoto targets.

Under Kyoto, the UK has a legally binding target, to reduce emissions by 12.5% by 2012. Additionally, the government set itself a more ambitious voluntary, domestic target of reducing emissions of carbon dioxide by 20% by 2010. In 2000, the UK Government unveiled the UK Climate Change Programme outlining the planned strategies to enable it to reach this national target. Amongst the measures was the Climate Change levy (CCL). This came into effect in April 2001 and puts a tax on the business use of electricity from fossil or nuclear fuel generation. As part of the utilities bill of 2000, The Renewables Obligation replaced the Non-Fossil Fuel Obligation (NFFO) and requires all electricity supply companies to supply a specified proportion of their electricity from renewable resources. This is intended to increase through a series of rising targets so that 10% of UK electricity is generated from renewable resources by 2010 with an ambition to see 20% derived from renewable resources by 2020. Most recently, the UK government's Energy White Paper, launched in early 2003 pledged a "low carbon economy" and a new ambitious target of a 60% cut in emissions of CO₂ by 2050⁶. This target is in line with the Royal Commission on Environmental Pollution's (RCEP) recommended minimum necessary needed to stabilise climate change.

However, after falling rapidly in the 1990s, UK CO₂ emissions have turned upwards in the last couple of years. The Sustainable Development Commission has voiced growing doubts over the target of achieving a 20% cut by 2010. Instead the commission predicts that CO₂ will actually decline by only 12.6% by 2010⁷. Atmospheric concentrations of many greenhouse gases reached their highest levels in 2001; global temperatures continue to rise with 2002, 2001 and 1998 being the hottest years on record⁸. While one can argue that programmes and policies are being put in place to reduce emissions, these figures indicate the scale of the problem and the magnitude of the challenge we face.

The Implications of climate change for the West Midlands rural economy

The West Midlands is one of the smallest regions in England. It covers 13,000 sq km and although comprises major urban areas such as the Birmingham/Coventry/Black Country urban core; a large part of the region is rural. The region has a population of around 5.3 million people, 20% of which live in rural areas⁹. The diverse countryside around these urban conurbations supports a variety of agriculture systems including arable, hill farming, market gardening and with livestock being predominant. Much of the landscape consists of rolling hills dissected by lowland river valleys. There is good evidence to suggest that the West Midlands Climate has changed in the last 100 years.

⁶ Government White Paper: Our Energy Future - Creating a Low Carbon Economy. February 2003. <http://www.dti.gov.uk/energy/whitepaper/>

⁷ Britain's CO₂ cut goal in "grave peril". Ends Daily 1383, 12.02.03

⁸ Analysis. Michael McCarthy. The Independent. 25.02.03

⁹ West Midlands ERDP. DEFRA 2002. www.defra.gov.uk/erdp/docs/wmchapter/

Evidence to suggest that the climate of the West Midlands is changing

- Annual mean temperatures over Central England have risen by some 0.6°C since 1901
- Annual precipitation totals across the region have increased by some 3-4% since the 1930's with the winters becoming wetter and the summers drier
- Intensity of rainfall events has tended to increase, especially in the winter months
- Duration of the frost-free period in Central England has increased by about 20 days per year since 1801

Source: Local Environment Agency Action Plan: West Midlands. Chapter Two: Climate Change
www.environment-agency.gov.uk/regions/midlands/

Detailed projected climate change scenarios for the region are still being developed. An established forecasting technique, the Regional Climate Model (RCM) predicts that annual temperatures in the midlands may increase by 3 to 3.5% between 2080 and 2100. These increases will show seasonality with larger increases in summer than winter¹⁰. The model also forecasts changes in annual precipitation of +7% in the West Midlands by 2100, with local variations ranging from +4% in west Shropshire to 12% in west Hereford and Worcestershire. Seasonal changes are more marked with average precipitation changes of +30% in winter and -28% in summer, relative to the period 1961-1990¹¹. Generally, the consensus of expert opinion would seem that within the West Midlands the trend will be towards milder, wetter winters and hotter, drier summers with these effects more pronounced in the south-east of the region than in the north-west¹².

This may have dramatic implications for the region, particularly for its important agriculture industry and the wider rural economy. About 73% of the land in the West Midlands is in agricultural use⁸. Agriculture produces 1.2% of regional Gross National Product (GNP), in some rural parishes providing 3% of employment and so is central to the economy of many rural communities¹³. Locally distinct produce such as Hereford cattle, Bulmers cider apples and Vale of Evesham horticulture are renowned regionally and nationally.

Such climatic changes may lead to a lengthening of the growing season while hot summers with short periods of extreme temperatures may increase the risk of damage to crops. Temperature changes could affect the timing of maturity, crop uniformity and product quality of field vegetables. This could have considerable impact on important horticultural areas such as Evesham and the areas around Ledbury and Ross on Wye. Half the region's field-scale vegetables are cultivated in Worcestershire for

¹⁰ Environment Digest, Issue 23. July 2002

¹¹ *Local Environment Agency Action Plan: West Midlands. Chapter Two: Climate Change* www.environment-agency.gov.uk/regions/midlands/

¹² The Potential Impacts of Climate Change in the West Midlands: Pre-scoping Consultation Report. March 2001. West Midlands Climate Change Impacts Study (WMCCIS)

¹³ Environment Digest. January 2002

example. The region has 20% of England's fruit mostly spread across Worcestershire and Herefordshire¹⁴. Most current apple cultivars grown in the UK for instance have little trait for climatic tolerance². For the region's livestock, increased temperatures bring greater risk of heat stress and disease, especially for those in intensive housing. Decreased spring and summer rainfall with drier, hotter summers will increase scarcity of water whilst hotter conditions will simultaneously increase water demand. Less water will be available for the region's irrigated vegetable and horticultural produce as well as for livestock.

Increased winter rainfall in general, combined with more frequent occurrence of extreme weather events such as heavy rain spells will present a high flood risk. Many of the region's rivers have extensive flood plains, which regularly flood in most winters. In particular, the Wye and Severn would be vulnerable enhanced risk of flooding.

Beyond the important agriculture sector, climate change may have a wider effect on the region's biodiversity. Unique, species-rich habitats such as parts of the Peak District National Park in northeast Staffordshire and Areas of National Beauty (AONB) such as Cannock Chase and the Malvern Hills may be threatened. Species of regional importance such as Freshwater Mussels, Great Crested Newt and Twaite Shad for example are already identified as vulnerable¹¹. Pressures upon them may be further exacerbated with the changing climate.

Climatic changes may also bring positive effects. Such a climate could support a greater diversity of farming/horticulture enterprises. It has been suggested the region's agriculture may adapt to the new climatic conditions by growing common continental crops such as sunflowers and maize. A potential lengthening of the summer season and higher frequency of warmer drier days may increase the use of the countryside for recreation. This may positively stimulate the rural economy, particularly in the tourism sector, creating demand for services and providing revenue for local economies.

Options for Climate Change mitigation & adaptation in the rural sector

The rural sector, with agriculture at its heart, faces an immediate challenge from the threat of climate change. Land managers, rural businesses and all stakeholders who depend on the countryside for their livelihood will feel the impacts. Climate Change affects the rural sector; the rural sector contributes to climate change. The UK government's recently launched Strategy for Sustainable Food and Farming recognises the need to tackle agriculture's contribution to climate change. Agriculture was responsible for about 7.5% of UK greenhouse gas emissions in 1990 and going by current trends, in 2010 agricultural emissions are expected to level out at about 14% below the 1990 level.¹⁵

¹⁴ LEADER+. West Midlands Regional Annex.

31.08.2001. www.ruralnetworkwm.org.uk/specsec/leader/wm-reg2-demopot.htm

¹⁵ The Strategy for Sustainable Farming and Food: Facing the Future. DEFRA. 2002

Improvement of farm management practice may offer some scope for greenhouse gas reductions at the farm-level. Organic or lower input systems that use careful fertiliser management can help reduce emissions of nitrous oxide, reduced stocking densities of livestock and the development of methane reducing feedstock may lessen methane emissions.¹⁶ Use of lower emission fuels such as Liquid Propane Gas (LPG) and better use of information and communication technologies to reduce unnecessary transport within the agriculture and rural industries may help reduce CO₂ emissions in the short-term. More importantly the rural sector can offer considerable resources, which if utilised properly with support from joined-up policy thinking, have the potential to play a significant role in reducing greenhouse gases.

Carbon Sequestration

Agriculture is an accumulator of carbon, sequestering atmospheric CO₂ as organic matter in soils or woody biomass in the form of forests. Such soils and forests can act as sinks that lock up this carbon and so offset anthropogenic emissions. Soil carbon changes are dependent on land use change and soil management practices, i.e. ploughing releases carbon while non-tillage systems store carbon. Recent years have seen the growth in the adoption of conservation and zero-tillage systems. By maintaining a permanent or semi-permanent cover on the soil, erosion is reduced and soil organic matter and carbon content is improved. Such systems have an additional benefit of requiring less machinery passes and so saves on carbon emissions through reduced direct use of fossil fuels. It is calculated that by 2030, if better management practices are introduced the amount of carbon locked up in cropland soils, as organic matter from crop residues and manure, could rise by 50%.¹⁷ Whilst the greatest carbon dividend comes from conversion of arable land to agroforestry, conversion of arable land to grassland and improved crop and grazing management also offer scope to accumulate significant amounts of carbon. It has been calculated that the UK could sequester 6 x 10⁶ tonnes of carbon per year whilst maintaining current food production at a rate of 0.95 tonnes carbon per hectare per year.¹⁵

The Kyoto Protocol affirms that emissions from fossil-fuel use could be offset by removal of atmospheric CO₂ into carbon stocks in the terrestrial biosphere. Mechanisms are being developed that encourage the trading of sequestered carbon. Yet there is uncertainty on how to establish permanent or indefinite carbon sinks. If lands under conservation tillage are ploughed or deforestation of woodland plantations occur, all the gains in carbon are lost. Also how much carbon could be locked up in response to monetary incentives for carbon sequestration is unknown. Carbon banks, boards of trade and trading systems emerged during the year 2000. The early carbon trading systems set per-tonne credit values mostly in the US\$2 to US\$10 range.¹⁸ The price of sequestered carbon is still a contentious subject and greater research on the potential of soils and forest as carbon sinks together with improved knowledge of carbon accounting is needed. Still, if international markets for carbon properly develop and expand, there is the potential for sequestered carbon within soils

¹⁶ Climate Change and the Rural Economy. Country Land & Business Association. 2001
www.cla.org.uk/climatechange

¹⁷ World Agriculture 2030: Main findings, FAO

¹⁸ Agri culture. Jules Pretty. Earthscan. 2002

and forestry to offset atmospheric carbon emissions whilst providing landowners a new source of income from sustainable management techniques.

Biomass Potential

Biomass is a wide term and can encompass all plant and animal matter on the earth's surface. The rural sector offers considerable biomass resources such as trees, crops or animal wastes that could be used to supply renewable bio-energy. With 10% of set-aside and 80% of woodland undermanaged, groups such as the CLA believe that significant quantities of biomass could be produced in the UK.¹⁹ Combustion or gasification of herbaceous energy crops such as Miscanthus and short-rotation Coppice Willow or Poplar can be used to generate heat or electricity. Crop residues such as straw from cereals, which might otherwise be ploughed back into the soil or wood shavings and off cuts from the timber industry, can also be used for energy production. For example the UK has one of the world's largest straw burning power stations near Ely in Cambridgeshire. The station aims to consume around 200,000 tonnes of straw per year sourced from a 50 mile radius and generate sufficient electricity to supply around 65,000 homes.²⁰ At the local level a growing number of innovative rural sector alliances are developing local renewable energy industries. Rural Energy, a recently formed energy supply company, was set up by a group of East Midlands farmers and plans to supply woodchips and wood pellets produced on local farms for heating systems in houses, business premises, hotels, schools and council properties.²¹

Energy crops such as wheat, sugar or oilseed rape may also be processed into fuels such as ethanol or Biodiesel. These biofuels can be used pure or as an admixture, typically blended with conventional petrol at 5%.²² Such fuels are generally considered to reduce GHG emissions of around 50% compared with fossil fuels.²³ Particularly when grown in a low-input system, these resulting reduced emissions could help to offset emissions particularly in the UK transport sector which currently accounts for 22% of all GHG emissions.²⁰ The UK currently lags behind other countries such as Spain, Germany and Sweden who are developing progressive farmed fuel industries. Currently 10% of Brazil's fuel supply is met from biofuels.²¹ Though comparatively the much talked about UK energy crop and biofuel industry have failed to make much progress to date, research by the NFU and CLA suggest that the land potential for energy cropping could be between 25% and 35% by 2020.²⁴ Government has also demonstrated support in the form of DEFRA's energy crop grant and DTI/New Opportunity fund's Bio Energy capital grant schemes.¹⁴

Utilisation of Methane emissions from farm wastes as an energy source is sometimes proposed as a means of reducing greenhouse gas emissions. The digestion of organic wastes by bacteria under anaerobic conditions to produce biogas is commonly used in many countries. Many commentators have tended to view proposed plans for large

¹⁹ Farmers Guardian. 22.11.2002

²⁰ DTI New Review. www.dti.gov.uk/NewReview/nr40/html/straw-fired.html

²¹ Farmers Weekly. 22.11.2002

²² Bioethanol Briefing Sheet. British Sugar. www.britishsugar.co.uk

²³ Country Land & Business Association Campaigns Information Pack. www.cla.org.uk/campaigns

²⁴ Energy Review: The Role of Biofuels. British Biogen. 2002. www.britishbiogen.co.uk

scale development in the UK as uneconomical. However the recent construction of a biogas power station in Holsworthy, Devon may point the way for future similar developments. The complex plans to process 120,000 tonnes of livestock manure each year collected from a cooperative of local farmers generating 2000 kilowatts of electricity for the national grid and also providing a district heating scheme for local public buildings. Once methane has been extracted in digesters, the remaining liquid by-product can be used as fertiliser. It is estimated that there is potential for 100 similar plants in the UK.²⁵

Wind Energy

With 40% of Europe's total wind resource the UK is one of the windiest countries in Europe.²⁶ Wind power is becoming the fastest growing energy source worldwide with the European market estimated to be expanding at an average of 30% per annum². According to the European Wind Energy Association (EWEA), wind energy capacity broke the 20,000 megawatt mark in 2002 and now accounts for three-quarters of global wind energy.²⁷ In January 2003 a landmark was passed when the UK's 1000th turbine was switched on. The country's total wind capacity now stands at 1003 turbines generating 555.8MW of clean green power, equivalent to 1.46TWh, or the annual electricity needs of just under four hundred thousand households each year.²⁸ The rural sector offers an abundance of suitable sites that can be utilised for this purpose. Already landowners are exploiting these resources in a range of ways from installing their own turbines, hosting wind farms on their land, developing joint-ventures with industry or neighbouring farmers and developing shared ownership projects with local communities. For example, the UK's 1000th turbine in Moel Maelegen, North Wales was developed as a local ownership project with three hill farmers in cooperation with an energy development company.²⁶ Energy generated from wind power developments can be used to supply a farm's own electricity needs or be exported to the national grid. In addition to offering an alternative, renewable form of carbon-free energy, wind power can offer farmers a means of an additional source of revenue or allow for savings in energy bills to help improve suffering livelihoods. Major UK bodies within the agriculture industry are increasingly indicating their strong support for wind energy. With further government support for reform of the planning process and amendments to electricity trading arrangements, wind energy sourced from the rural sector has the potential to make significant contributions towards government targets for renewable-derived energy production.

Summary

Evidence supports the claim that climate change is occurring and this is likely to have an important impact on the rural sector. While policies and strategies are being put in place to deal with the challenge, more research is needed to forecast the effects of climate change on the rural sector, particularly at the local level where agriculture

²⁵ Dung-power station set to fire on all cylinders. Paul Brown. The Guardian 18.05.02

²⁶ Farmers weekly. 13.12.02

²⁷ Environment Daily. 1329. 14.11.02

²⁸ BWEA Press Release. 24.03.03 www.bwea.com

systems and rural economies may show diverse regional variation. With the correct political incentive and infrastructure, a model of multi-functional agriculture within a sustainable rural sector can make an important contribution to climate change mitigation, whilst enabling farmers to derive viable livelihoods from sustainable land management strategies.

APPENDIX 1

LIST OF RELEVANT ORGANISATION CONTACTS

Climate Change Research Institutes

UK Climate Change Impacts Programme (UKCIP)

Union House
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Oxford
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<http://www.eci.ox.ac.uk/index.html>
<http://www.changingclimate.org/>

Hadley Centre for Climate Prediction and Research

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Fax: 0845 300 1300
Email: e-mailing_hadley@metoffice.com
<http://www.metoffice.gov.uk/research/hadleycentre/>

The Intergovernmental Panel on Climate Change (IPCC)
<http://www.ipcc.ch/>

Rural Sector Organisations

Country Land and Business Association (CLA)

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SW1X 8PQ
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E-mail: mail@cla.org.uk
<http://www.cla.org.uk/climatechange/>

National Farmers Union (NFU)

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Fax: 020 7331 7313
E-mail: nfu@nfuonline.com
<http://www.nfu.org.uk/>

The Countryside Agency

John Dower House
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West Midlands Region

Midlands Environmental Business Company (MEBC)

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Renewable Energy

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European Biomass Association (AEBIOM)

www.ecop.ucl.ac.be/aebiom/