Why study climate change?
In January 2015, the Met Office published figures showing that 2014 had tied with 2010 as the hottest year globally since records began in 1850, and that the last ten years have been the warmest decade on record. This provided more evidence that the Earth is warming. The warming is leading to changes in the climate across the world, which poses profound challenges for ecosystems and human societies.

Natural scientists are systematically collecting climate data from across the globe and studying climatic phenomena to provide a picture of the changes taking place. For their part, social scientists provide information about how societies can manage the risks that these climatic changes are creating, now and in the future.

Overwhelming scientific evidence of the risks of climate change
Bob Ward is the policy and communications director at the ESRC Centre for Climate Change Economics and Policy (CCCEP) at the London School of Economics and Political Science (LSE), and the Grantham Research Institute on Climate Change and the Environment. He talks about the important role research plays in informing the debate about climate change and the urgent need for concerted worldwide action.

‘There’s mounting evidence all around the world that the Earth is warming and the climate is changing in response to rising levels of greenhouse gases in the atmosphere. Carbon dioxide (CO2) levels are close to 400 parts per million - 40 per cent higher than they were before the Industrial Revolution and probably higher than they’ve been for millions of years. The polar ice sheets and glaciers are shrinking, global sea levels are rising at an accelerating pace, and the risks of heatwaves and heavy rainfall are increasing in many parts of the world, including the UK, which recently experienced its hottest year on record.’

He goes on to give a warning to people, especially leaders in society, who remain unconvinced about the need for urgent action against climate change.

‘No politician can afford to ignore this overwhelming scientific evidence or claim that global warming is a hoax. Climate change is happening, and as the Intergovernmental Panel on Climate Change, national scientific academies and scientific organisations across the world have all concluded, human activities, particularly the burning of fossil fuels and deforestation, are primarily responsible. Decision-makers urgently need to work out how best to manage the risks that climate change is creating.’

Stern Review on the economics of climate change
With such warnings in mind, what actions are being taken? Influential reports based on rigorous research are being written that are helping to guide the international community on what action to take. One report that has been playing a leading role in the global response to climate change is the Stern Review.

In 2006, the UK Government published ‘The Stern
Review on the Economics of Climate Change’, a report about the effect of climate change on the world economy. The author of the report was Nicholas Stern, an expert in economics and development, and the chair of the CCCEP at the University of Leeds and LSE.

The review concludes that the costs of inaction on climate change far outweigh the costs of acting to reduce greenhouse gas emissions. It argues that climate change is ‘the greatest and widest-ranging market failure ever seen’ because the prices paid for products and services that produce greenhouse gases do not reflect the costs they create through climate change impacts. It talks about the risks of economic damage if we continue to carry on as we have always done and fail to take timely measures.

Stern warns that the costs of ignoring climate change could be the equivalent of reducing global Gross Domestic Product (GDP) by 20 per cent. To avoid this risk, Stern said that the world should spend one per cent of global GDP a year to reduce the greenhouse gas emission that are driving climate change. But, in 2008, he revised this to two per cent because the risks of serious climate impacts had been underestimated.

The review does not just give a warning about inaction; it makes suggestions about addressing climate change, such as:

- putting a ‘price on carbon’ to take account of the damage greenhouse gases cause
- switching to low-carbon sources of energy
- making vulnerable communities more resilient to the impacts of extreme weather.

Although many measures will require significant investments, eventually, they will be less expensive than dealing with the environmental consequences if no action is taken. The review’s main conclusion is that strong, early action on climate change is needed to minimise a detrimental worldwide economic impact.

Climate change moves into the economic mainstream

Professor Andy Gouldson, deputy director of the ESRC Centre for Climate Change Economics and Policy, says, ‘There’s a simple economic logic to say that it’s much better to do something about climate change than to ignore it and leave it for another time. The Stern Review helped move the climate change agenda from people who make up a “sustainability and environment community” and put it more into mainstream economic decision-making.’

Professor Gouldson points out that even with the optimism that something could be done about climate change that the Stern Report generated; there still is no global agreement on what steps should be, and can be, taken. To help address this, researchers at CCCEP have been investigating what practical measures can be taken at a local level.

Making a business case for taking action on climate change

A convincing case for taking steps to reduce the effects of climate change stands a better chance of succeeding if decision makers can be convinced of the economic and social benefits. The CCCEP team have recognised this in their work. Professor Gouldson outlines the types of questions they have been seeking to answer.

‘In our work, we’ve been asking if there is a “hard-nosed” business case for making massive investments in low-carbon development. And, if there is a strong case for such an investment, is there a broader social and economic case that could improve public health, strengthen communities,
tackle fuel-poverty and create employment opportunities?’ he explains. ‘How do we achieve this, where are the economic opportunities - what do they look like and how can they be financed?’

**Looking ahead on climate change at community level**

Working from a fixed point that establishes where a city or town is, and where it is headed, on climate change, the CCCEP team looks at such things as:

- current local trends in energy use
- population and economic growth
- changes in transport behaviours.

The team then stretches out the trends to forecast what the situation might be in 30 years and calculates what contribution a community would make to carbon emissions if no action is taken and it carries on with ‘business as usual’.

‘Working from a baseline, we list all the things that could be done in: households; industry; commercial buildings; and transport systems, for example. In households this might be insulating lofts, fitting double glazing, turning down the thermostat or installing more efficient boilers. We list up to 50 things that can be done, not just in households, but in other places such as public buildings, factories and shopping centres, and up to 20 different things that could be done to transport systems, including replacing cars with the most efficient alternatives, park-and-ride schemes and cycle lanes.’

**Costs and benefits of acting on climate change**

From their studies, CCCEP researchers can determine what the cost and benefits would be of any proposed changes and calculate how many times the measures could be adopted throughout a city, such as Sheffield or Leeds. By adding up all the factors and instances of where they could be introduced, a picture can be built up of the costs and benefits and the likely reductions in carbon emissions. This enables a strong case to be presented to local decision makers outlining the economic case for improving a city’s energy efficiency and reducing its ‘carbon footprint’ over a period of time. An estimate of the possible increase in job opportunities related to the changes can also be made.

Many of the changes could pay for themselves within a few years. Energy bills for cities and towns could be cut, billions of pounds brought into local economies by exploiting cost-effective and low-carbon and energy-efficient options and many thousands of new permanent jobs could be created; all in all, a win-win situation.

**Your chance to find out more about ‘sustainable’ sources of energy**

By searching online, find out about some of the ways in which electrical energy can be generated without significant carbon emissions (eg wind, geothermal, solar and tidal installations).

**Key terms**

- **Carbon dioxide (CO2)**: emitted when fossil fuels are burnt. Too much CO2 in the atmosphere can contribute to dangerous climate change.

- **Carbon emissions**: release of CO2 into the atmosphere.

- **Climate change**: refers to general changes in climate
Environment - climate change

patterns, whether due to natural variability or as a result of human activity. It includes temperature, rainfall, winds, and other weather phenomena. Scientists overwhelmingly agree that current climate changes taking place are predominantly the result of human activities.

**Fossil fuels:** non-renewable sources of energy, such as coal, gas and oil.

**Fuel poverty:** households spending more than 10 per cent of their income on heating the home.

**Global warming:** rise in the measured global average temperature, with impacts that include, amongst other things, changes in weather patterns and rising sea levels.

**Greenhouse gas:** gases emitted into the atmosphere that result in rising global temperatures - known as the greenhouse effect.

**Gross Domestic Product (GDP):** measure of a country’s economic activity.

**Intergovernmental Panel on Climate Change:** an international scientific body set up by the United Nations in 1988.

**Low-carbon sources of energy:** energy sources with reduced CO2 emissions.