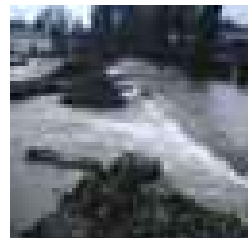
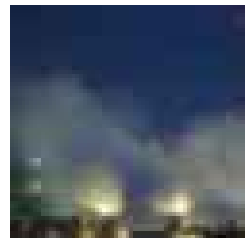


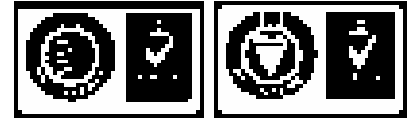
Climate change



Capability statement

Entec

Entec is one of the UK's largest environmental and engineering consultancies. Our technical and business skills are dedicated to delivering strategic, technical and engineering solutions which bring commercial benefit to customers at home and overseas. This know-how is based on over 60 years' consulting experience in the public and private sectors.



Certificate No. EMS 69090

Certificate No. FS13881

Entec operates a Quality Management System in accordance with the latest requirements of the international standard BS EN ISO 9001 and an Environmental Management System compliant with BS EN ISO 14001. Both are audited by BSI Management Systems.



Climate change

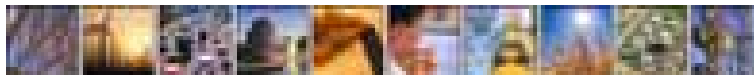
*Every day
seems to bring
a new shocking
headline about
climate change*

Climate change is happening and will continue to happen to some extent, depending on our emissions of greenhouse gases. However, we have a choice about the extent of the changes and how we adapt to these changes: some adaptation measures will help minimise the risks while others will help business and society take advantage of the opportunities presented by climate change.

There is a pressing need to substantially reduce our emissions of greenhouse gases.

We recognise however that climate change is not the only change that will affect us in the future. There will also be many other economic, social and environmental changes resulting from changes in population, industry and environment priorities.

Organisations need to decide how climate change could affect them and how they should respond.



Climate change

Handling complexity and uncertainty in adaptation

Climate change is a cross-boundary, cross-sectoral issue and Entec has delivered climate change advice at the national, regional and site-specific level. We have developed integrated teams of scientists, socio-economic, environmental and engineering experts to deliver solutions in the areas of climate change, mitigation, impact assessment and adaptation. We concentrate on both the impacts and opportunities afforded by climate change through an appreciation of the legal, commercial, social, economic, engineering and environmental challenges climate change will present.

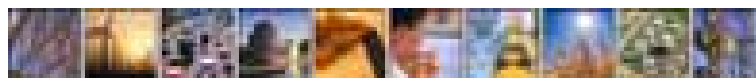
The assessment of climate change and its impacts is however still subject to uncertainties and information gaps and there is a need to appreciate the level of uncertainty and how it affects decision making. We believe that our flexibility and broad skill base are essential to addressing the technical complexities and uncertainties involved in this subject, and our expertise in stakeholder engagement can ensure the effective and essential communication of risk and choices to decision makers and individuals affected by climate change.

The Entec approach is to assemble specific project teams comprising in-house specialists from a range of sectors and from its academic and research partners to help clients understand the potential impacts and opportunities afforded by climate change. We can therefore provide a comprehensive matrix of support to address the range of projects, strategies, policies and plans that could be affected by climate change. Our key strengths are in developing strategies and technical advice for long term planning and cost minimisation.

Improving knowledge

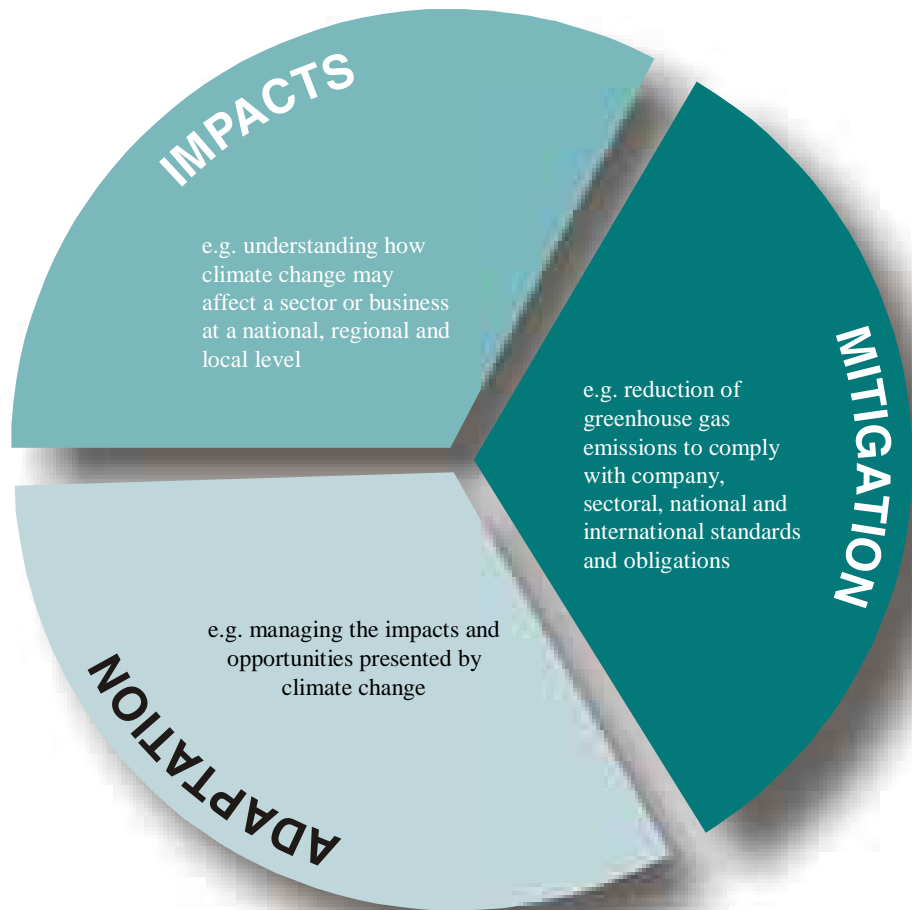
Entec is committed to investing in and developing its staff in updating skills and application of the climate change scenarios and key toolkits which are available through the United Kingdom Climate Impacts Programme (UKCIP) and through the application of experience and knowledge developed from other project work. Our staff undergo training and actively contribute to the UKCIP user forums and the regional climate groups across the UK, and we implement an in-house training and awareness initiative to ensure clients receive the most up-to-date advice.

Entec's approach



Entec's services

The diagram on this page illustrates the breadth of service Entec can provide in relation to climate change in the following 3 areas:



Mitigation services

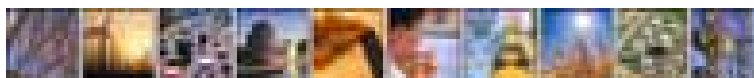
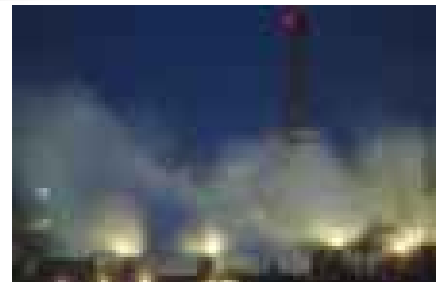
Climate change mitigation is about reducing greenhouse gases. The UK Climate Change Programme has the objective to achieve a 20% CO₂ reduction by 2010 and a 12.5% GHG reduction by 2008-2012.

Entec's mitigation experience has included modelling the impact of UK policies on industrial CO₂ emissions for Defra to help with development of policy and work for the Sustainable Development Commission in reviewing the technologies and techniques available for carbon emissions reduction.

We have also contributed to the development of the EU Emissions Trading Scheme (ETS), and work with individual companies to help them reduce their emissions.

Entec's mitigation services include:

- Carbon management to reduce greenhouse gas emissions and deliver financial benefits
- Development of organisation objectives and measures
- Development of implementation plans to reduce greenhouse gas emissions
- Impact of climate change levy on specific sectors
- Emissions trading opportunities
- Development of monitoring and reporting systems for emissions
- Energy efficiency: industrial, commercial and domestic audits



Climate change

Impacts services

Entec's experience in climate change impacts include the delivery of three regional scoping studies (London, West and East Midlands) looking at the impacts of climate change in key sectors. At a more detailed level we have undertaken impact studies on water supply in the West Midlands and Wales for water companies and specific studies such as the impact of climate change on waste management for the Environment Agency.

Our approach to assessment of impacts includes the application of the UKCIP02 climate scenarios, the use of statistical downscaling to allow impacts to be assessed to a local level, the application of GIS and water resources planning and flood risk modelling techniques, and the application of UKCIP costing methodology to case studies in specific regions and sectors.

The effects of climate change can be substantial and Entec can provide comprehensive services relating to environmental, social and economic impacts that occur. Examples include:

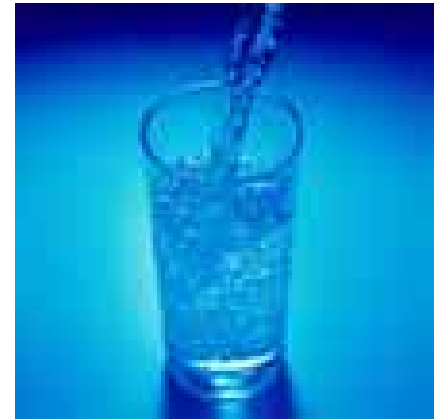
- Business – increased energy use in winter for heating and in summer for cooling
- Transport – increased flooding and potential risk of tarmac melting in summer
- Tourism – changes in domestic tourism and risks to coastal heritage sites
- Health – fewer deaths related to cold spells but potential increase due to hot spells
- Insurance - insurance cover and availability in subsidence and flood prone areas
- Poorest communities
- Flood defence - more frequent flooding leading to disruption
- Water supply - changing rainfall patterns could affect availability of water resources
- Agriculture - changing agriculture including impacts on crop production
- Wildlife - changing biodiversity with threats and opportunities for species

Adaptation services

Even if society substantially reduces its emissions of greenhouse gases over the coming decades, the climate system is projected to continue to change over the coming centuries. Adaptation strategies are needed at a national, regional and local level.

Entec's experience in adaptation has included advice on potential measures in a range of sectors including transport, water supply and sewerage, asset management, agriculture, land use, landscape and energy.

Our approach to adaptation includes the application of ODPM guidance on planning and climate change and the UKCIP guidance on risk, uncertainty and decision-making including the use of these techniques in strategic planning under the EU SEA Directive. A key component of adaptation is stakeholder involvement and Entec has specific skills in the development and implementation of stakeholder engagement. The stakeholder process is aimed at the identification of low or no regrets decisions that also recognise the potential benefits from climate change adaptation, such as the creating of wetland for flood storage. Our aim is to deliver flexible thinking and improved decision-making by combination of sound science, specific sector knowledge and stakeholder involvement from public, business and regulatory bodies.



Examples include:

- Flood risk management - use of agricultural land for flood water storage; use of sustainable drainage systems and extension of wetlands
- Water supply – promote water efficiency in current and new developments
- Agriculture – new crop varieties and more water tolerant crops
- Energy – use of natural ventilation and shading to cool buildings in summer

Case studies

The following pages demonstrate Entec's capabilities in the area of climate change, using case study examples.



London's Warming - The Impacts of Climate Change on London Greater London Authority on behalf of the London Climate Change Partnership

By the 2080s, London's summer extreme temperatures could be comparable with those of present-day New York. This was a finding of a study managed by Entec to identify the threats and opportunities to London presented by climate change. The study was the first for a major urban area and the first to use the UK Climate Impact Programme's (UKCIP) latest scenarios of climate change produced in 2002.

Stakeholder engagement has been pivotal to this study and has been successfully achieved through several workshops involving a broad range of stakeholders representing London's environmental, social and economic interests in relation to climate change. The study involved a review of existing information on the potential impacts of climate change on environmental, economic and social aspects of London as well as the utilisation of statistical methods to predict the local environmental impacts of the various UKCIP climate change scenarios.

The study found that:

- London may be particularly sensitive to increases in temperature in the future because of the 'urban heat island effect'*², and that this may have detrimental effects on air quality, summer electricity demand, and comfort in the city's buildings and transport network.
- London is exposed to far greater potential damage from flooding than any other urban area in the UK, due to the value of its assets and the fact that a significant proportion of London lies within the floodplain of the River Thames and its tributaries.
- London is one of the driest capital cities in the world, with available water resources per head of population similar to that of Israel. Climate change could reduce the amount of water available and increase demand in summer.



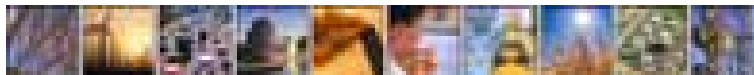
Identifying the threats and opportunities presented by climate change

- The inter-linking of international capital markets means that the wider financial service sector is likely to be impacted by both domestic and global extreme climate change events.
- Climate change could also present some important opportunities for London. For example, tourism and recreational industries could benefit considerably. It may also offer new opportunities for the financial sector.

Awareness of climate change issues amongst stakeholders involved in this study

was high and is accelerating. However, work needs to be done to further quantify the potential climate change impacts and adaptation options at the local level and to engage decision-makers effectively, whether householders, government or major corporations. This study has provided an excellent start to this process.

* The Urban Heat Island Effect is a term used to describe the fact that the temperature of London at its centre is several degrees higher than at its edges; this is because London is a fairly dense, urban settlement and heat emitted from buildings and the characteristics of the airflow contribute to this temperature profile.



Climate Change and Natural Forces: The Consequences for Landscape Character Countryside

To accompany the Guidance on landscape character assessment (LCA) published by the Countryside Agency and Scottish Natural Heritage in 2002, a series of topic papers are being developed to explain the policy context and applications of the technique. The production of the topic papers is being co-ordinated by Countryside.

Climate change could have significant effects on landscape, but little work has been done on assessing the potential impacts and developing appropriate tools and techniques to consider this issue.

Entec has undertaken a number of landscape assessment projects and has carried out several regional and sectoral climate change studies. We were commissioned by Countryside to prepare a paper on the potential impacts of climate change and natural forces on landscape character in order to start the process of exploring this topic.

The UK climate is changing and climate models indicate that further, perhaps more dramatic changes are possible. For example, higher temperatures, flooding, more intense rainfall etc. could all have marked effects on landscape character.

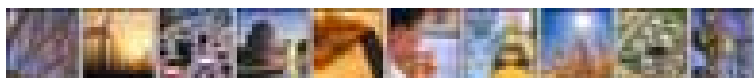
In many cases the precise likely impact of climate change on landscape character remains unclear, although we can expect many subtle changes to the fabric of the landscape both through impacts on landscape elements such as trees, hedges and water bodies and through broader changes in land use. These are likely to occur both over the short (such as through extreme events) and the longer term, and be both geographically specific and more widespread in their effects. It is possible that some of the characteristic features of valued landscapes could be compromised, and in some cases new landscapes created.

Using UK Climate Impacts Programme (UKCIP) climate change scenarios, the

study considered likely impacts in respect of natural heritage, land use and cultural heritage, with case studies used to illustrate how specific landscapes and their management are responding to the effects of climate change. To assist with the incorporation of these diverse considerations into LCA in a transparent and systematic way, a flowchart and matrix were developed which have the potential to allow likely climate change impacts to be considered within the preparation of landscape guidelines at regional and local levels.

It is hoped the publication of this paper, which is available on the web by following the links provided at: <http://www.cnetwork.org.uk/tp> will prompt further discussion and research on this topic.

Preparation of a topic paper on climate change to accompany national landscape character assessment guidance



Climate Change Agreement Monitoring and Reporting System Yule Catto

Industry recognises the significant environmental benefits and variable cost savings that are possible through improved energy efficiency management. In 2001, Climate Change Agreements (CCAs) were introduced by the Government to provide industrial operators with an 80% rebate on the Climate Change Levy (CCL) on fossil fuel use in return for meeting demanding energy efficiency and greenhouse gas (GHG) emission reduction targets. Yule Catto required a robust and auditable monitoring and reporting system so that it could manage its CCA over the period January 2002 to December 2010.

The objectives for this work were therefore to:

- Gather information on energy use profiles and key performance indicators for the 10 chemicals manufacturing sites covered by the group's CCA;
- Determine the group's requirements in terms of monitoring and reporting of performance against the CCA targets, including forecasting of future performance; and,
- Develop a user-friendly software tool

to implement the CCA monitoring and reporting system across the group.

The project was fast-tracked over a 3 month period to allow Yule Catto to gain the full benefit of using the system before the end of the first CCA compliance period.

The tool was developed in Microsoft Excel, making use of advanced features to improve the user-interface. Specific energy use curves for production at each site were developed to allow forecasting of energy use.

The system automatically generates monthly progress reports for individual sites and for the group. A financial analysis of energy savings measures is also produced. The system allows site and group managers to identify problems and opportunities, including the potential for emission trading.

Entec successfully rolled-out the system across the group to ensure that the CCA reporting, auditing and verification requirements were met. This helped secure a £0.5 million/year CCL rebate.

Facts and Figures

Project

Development of a Climate Change Agreement Monitoring and Reporting Tool

Client

Yule Catto

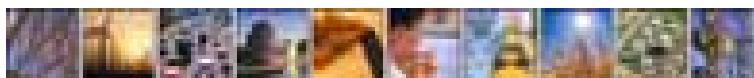
Entec Services

Key services associated with delivery of this project included:

- Determination of Yule Catto's energy use profile and key performance indicators for energy efficiency and greenhouse gas emissions.
- Review of the group's Climate Change Agreement (CCA) including requirements for reporting, auditing and verification.
- Development and roll-out of a user-friendly software tool to allow CCA monitoring, reporting and verification, including forecasting of future performance, financial analysis of savings and potential for emissions trading.



*Enabling management
of climate change
agreements for UK
chemicals business*



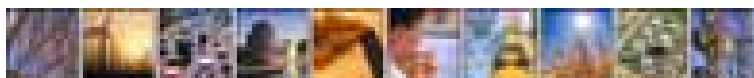
Assessment of the Effect of Climate Change Policies on Industrial Energy Use DEFRA

Entec was commissioned to carry out this project for the Global Atmosphere Division of DEFRA. The project used and developed an existing model to assess energy use, the uptake of energy saving technologies and the resulting profile of energy use and carbon dioxide emissions from nineteen industrial sectors (e.g. water sector, chemical industry, iron & steel industry) up to 2020. Entec teamed up with Cambridge Econometrics to deliver the project.

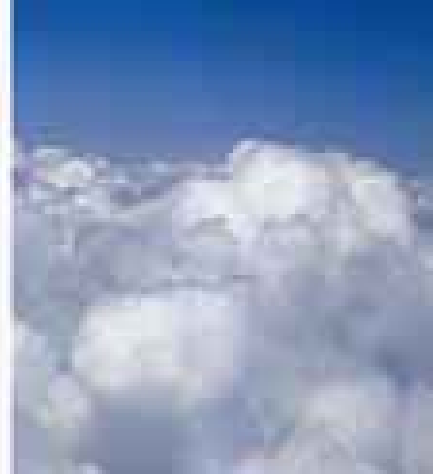
The effect of implementing all cost effective and all technically feasible energy efficient technologies within the sectors on energy demand and carbon dioxide emissions was investigated. In addition, the effect of the various climate change policies (i.e. emissions trading, climate change levy, negotiated agreements, the Carbon Trust and capital allowances for energy efficient technologies and combined heat and power) was modelled to establish their influence on energy use and carbon dioxide emissions. The effect of fuel price sensitivities was also examined together with the overall effect that the policies may have on industrial output.

The results of the work had a number of uses. Whilst primarily enabling the UK to meet its reporting obligations to the UN Framework Convention on Climate Change and the EU Monitoring Mechanism, the results of the work also enabled the UK to assess the anticipated impact of the Climate Change Programme.

*Helping enable the UK
to meet international
climate change
obligations*



The Impact of Climate Change on Northumbrian Water (Scoping Study) Northumbrian Water



Following the extreme weather patterns arising across the UK in 2003, including the hottest day ever recorded in Britain on 10 August 2003, Northumbrian Water required an assessment of the risks that these and other climate related factors could pose to its operations, particularly in terms of its ability to supply services to customer (and regulator) expectations and in its returns to shareholders.

Northumbrian Water commissioned a scoping study from Entec with the following objectives:

- Identification of potential short term risks and their significance.
- Review of possible risk management options and recommendations for action.
- Analysis of medium to long term impacts of climate change on Northumbrian Water operations and its wider group businesses.

The scoping study involved consultation across the business in order to identify operational experiences and responses to

help in the preparation of an initial high level risk assessment which could be used to form the basis of more detailed investigations.

The key potential impacts of climate change included:

- excessive heat on demand, operations (overheating infrastructure, etc), water quality (algae etc);
- changing rainfall patterns on headroom and security of supply; and
- flood risk.

The project included a presentation of the following key recommendations to the Northumbrian Water Business Conference including Senior Management in Autumn 2003:

- To design and modify processes and facilities to withstand climate impacts, where appropriate.
- To incorporate consideration of climate change impacts in investment planning (short, medium and long term).

- To increase access to climate change information.
- To carry out condition surveys for buildings, structures, network, processes and facilities and incorporate climate change impacts in assessments and action plans.
- To assess need for climate change related maintenance.
- To develop and operationalise climate change indicators.
- To quantify costs.
- To engage with customers and regulators on climate change and uncertainty.

*Business
recommendations
on how to react to
climate change*



Managing Flood Risks in the Government's Growth Areas Association of British Insurers



Guiding safe and sustainable development in the UK

The flood probability risk information used in the creation of this report is: Based upon information supplied by the Ordnance Survey © Licence 100026380 [2004]; Based on information supplied by the Centre for Ecology and Hydrology © NERC; Based on information supplied by UK Hydrographic Office © Crown Copyright © Environment Agency copyright and/or database right 2005. All rights reserved.

In August 2004, Entec was commissioned by the Association of British Insurers (ABI) to undertake a study to evaluate the current and future flood risk exposure within the government's housing growth areas of Ashford, South Midlands, M11 Corridor and Thames Gateway. The resulting technical report, Making Communities Sustainable (www.abi.org.uk/housing), published on the 1st February 2005, highlighted that around one-third of the new developments across the growth areas are located in the floodplain. A large number of these are located on the Thames floodplain. In addition, it is estimated that these new homes could increase annual costs of flooding in these areas by 74%, adding £55 million to the annual flood bill unless effective steps are taken to manage the risk. Up to 10,000 new properties could potentially be located in areas at significant risk of flooding without proper planning.

Another important conclusion of the study was that a strong planning policy, fully implemented by local authorities and developers, could reduce flood risks to negligible levels in Ashford, the M11 corridor and the South Midlands, and by half in Thames Gateway. Further reductions in losses could be achieved by a combination of effective urban design; flood resilient measures and, in some locations, enhancements to flood defences. These measures were all most effective targeted at the most susceptible flood risk locations.

From these observations, a number of key recommendations for local authorities, government and developers were proposed. These included:

- local authorities and developers should use appropriate flood risk assessments to examine options for reducing flood risk associated with proposed developments;
 - flood defence spending should be targeted towards vulnerable sites; and
 - more use should be made of flood-resilient measures for properties built in the floodplain, including raising living space and services above flood levels.
- the government should strengthen planning guidance to ensure that new developments are built on the lowest-risk sites first;



Climate change

Sample client list

Anglesey Aluminium
AstraZeneca
Carbon Trust
Countryside Agency
Croda
Defra
Department for Trade and Industry
East Midlands Development Agency
East Midlands Sustainable Development Round Table
Environment Agency
Greater London Authority
Kronospan
Leicestershire County Council
Northumbrian Water
Severn Trent Water
Sustainability West Midlands
Sustainable Development Commission
UKWIR
Welsh Water Dwr Cymru
Yorkshire Water
Yule Catto



Climate change

Entec

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