



# CLIMATE CHANGE RESEARCH IN NORTH EAST UNIVERSITIES QUICK REFERENCE GUIDE

## BACKGROUND

This Quick Reference Guide was produced through the North East Improvement and Efficiency Partnership's Climate Change Best Practice Programme. Its aim is to provide greater visibility of climate change related research being undertaken within the universities in the North East England. By doing so, we hope to encourage improved knowledge transfer between the academic and local government community. The information should also prove useful to private and third sector organisations. The project was commissioned through the Institute of Local Governance and compiled by the Sustainable Cities Research Institute, School of the Built and Natural Environment, Northumbria University, with further input being provided by ClimateNE.

## INTRODUCTION

This Quick Reference Guide presents the results of a mapping project of research activity relating to climate change, undertaken in the five universities in the North East of England.

These are:

- Newcastle University;
- Northumbria University;
- Sunderland University;
- Durham University;
- Teesside University.

The research is presented in seven sections, relating to Local Authority policy areas:

- Planning and Built Environment
- Energy
- Housing and Buildings
- Transport and Highways
- Health and Social
- Environmental Services
- Business

## FEEDBACK

We would like to receive feedback on whether this report has encouraged opportunities for collaborations and improved knowledge transfer between the academic and local government community.

Please send this feedback to:

- Dr. Kate Theobald, Sustainable Cities Research Institute (SCRI), School of the Built and Natural Environment, Northumbria University  
[kate.theobald@northumbria.ac.uk](mailto:kate.theobald@northumbria.ac.uk)
- Sara Lilley, Sustainable Cities Research Institute (SCRI), School of the Built and Natural Environment, Northumbria University [sara2.lilley@northumbria.ac.uk](mailto:sara2.lilley@northumbria.ac.uk)

# **PLANNING AND BUILT ENVIRONMENT**

### **1. Transnational Climate Change Governance**

Led by the Department of Geography, Durham University, Transnational Climate Change Governance is an international research network sponsored by The Leverhulme Trust. Its aim is to examine the significance and implications of transnational arrangements for climate change governance by bringing together an interdisciplinary group of scholars with expertise in transnational relations, global governance and climate change. While both research and policy communities are increasingly interested in the potential of transnational climate change governance, we currently lack a systematic framework for considering their emergence and potential. Given the proliferation of these arrangements and the seemingly inexorable rise in greenhouse gas emissions, there is a pressing need to understand their influence, effectiveness and legitimacy. This research network will seek to contribute to this critical task by: - Developing the conceptual basis for understanding transnational climate change governance and the central issues of authority, legitimacy, representation and accountability. - Systematically mapping the nature and extent of transnational governance arrangements for climate change and developing a typology to evaluate the significance of this phenomenon. - Analysing and comparing case studies of transnational governance arrangements for climate change in order to understand their functions, effectiveness and limitations - Engaging with the wider research and policy community to consider the implications of transnational climate change governance for post-2012 climate policy, for the environment and for our understanding of global governance.

**Contact:** [Professor Harriet Bulkeley](#), Department of Geography, Durham University.

**Weblink:**

<http://www.geography.dur.ac.uk/Projects/Default.aspx?alias=www.geography.dur.ac.uk/projects/tccg>

### **2. Urban Transitions: climate change, global cities and the transformation of socio-technical systems**

Urban Transitions is a three year project examining the ways in which cities around the world are responding to climate change. Home to over half of the world's population, cities are significant sources of the greenhouse gases that lead to climate change and are also vulnerable to the impacts of a changing climate. This project analyses how cities are addressing climate change through their energy and housing systems, and the social and technical factors that are shaping the possibilities for urban transitions in the face of a changing climate.

**Contact:** [Professor Harriet Bulkeley](#), Department of Geography, Durham University

**Weblink:**

<http://www.geography.dur.ac.uk/Projects/Default.aspx?alias=www.geography.dur.ac.uk/projects/urbantransitions>

### **3. Local Level Resilience and Climate Change (2010 -2011)**

This research project examines the local governance of climate change, and investigates the concept of 'resilience' as a tool with which to identify policy solutions to the problems posed by climate change. Furthermore the research seeks to provide useful insights into how the challenges facing local authorities in the UK can be reformulated and reinterpreted. The project will aim to identify policy solutions to the problems posed by climate change framed by the following questions:

- How might we best build resilient local government in relation to climate change?
- What role can communities play within this process?

**Contact:** [Professor Keith Shaw](#) and [Louise Maythorne](#), School of Arts and Social Sciences, Northumbria University.

**Weblink:**

<http://www.northumbria.ac.uk/sd/academic/sass/about/socscience/solscre/Locloevclichange>

#### **4. Resilient Futures (2010-2013)**

What will the UK's critical infrastructure look like in 2030? In 2050? How resilient will it be? Decisions taken now by policy makers, NGOs, industrialists, and user communities will influence the answers to these questions. How can this decision making be best informed by considerations of infrastructural resilience? This project will consider future developments in the UK's energy and transport infrastructure and the resilience of these systems to natural and malicious threats and hazards, delivering a) fresh perspectives on how the inter-relations amongst our critical infrastructure sectors impact on current and future UK resilience, b) a state-of-the-art integrated social science/engineering methodology that can be generalised to address different sectors and scenarios, and c) an interactive demonstrator simulation that operationalises the otherwise nebulous concept of resilience for a wide range of decision makers and stakeholders.

This research will combine social science (at Durham University) and engineering expertise (at Newcastle University) with other centres from around the UK to develop methods to understand infrastructure resilience from both a social and engineering perspective. Central to this will be the development of a new network model to analyse interactions between interdependencies between infrastructure systems.

**Contact:** [Dr. Richard Dawson](#), School of Civil Engineering and Geosciences, Newcastle University.

[Professor Jonathan Rigg](#), School of Geography, Durham University

**Weblink:** <http://www.ncl.ac.uk/ceser/projects/resilient-futures/>

#### **5. Resource Implications for adaptations to global change (2010-2015)**

As cities adapt in response to global pressures such as climate change it is crucial to understand the implications of these adaptations in terms of resource requirements to avoid confounding parallel sustainability initiatives. Whilst the vulnerability of the built environment to climate change impacts is to some extent understood, resource flows such as energy, waste and water within cities are currently poorly understood and are generally considered in terms of gross inputs and outputs to the urban area. To plan and design adaptations in urban areas requires a capacity to analyse the behaviour of whole cities over the timescale of decades to simulate the effectiveness of alternate management options and to monitor and modify the system performance. The capacity to adequately understand and model process change within the technological and natural systems that comprise cities

does not exist. To plan adaptations in urban areas required a capacity to analyse the behaviour of cities over timescales of decades to simulate and test the effectiveness of alternate management options and monitor and modify the system performance. This fellowship intends to develop a novel coupled systems simulation model of urban dynamics, climate impacts and resource flows through cities, this will be used to analyse the relationship between the spatial configuration of cities and their infrastructure system, resource consumption and vulnerability to climate change impacts. The work will be carried out in conjunction with key stakeholders in industry and local government with the aim of showing how long term planning strategies can be developed for re-engineering cities from their traditional' form into more sustainable configurations.

**Contact:** [Dr. Richard Dawson](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **6. ReVisions (2007-2011)**

The project aims to provide the knowledge for public agencies and companies to plan regional infrastructure for transport, water, waste and energy (ranging from large capital schemes to small scale decentralised services), in a more co-ordinated way so as to maximise economic competitiveness, reduce environmental and resource impacts and allow household to live more sustainably with an improved quality of life. It will devise and test alternative regional spatial strategies integrated across sectors and spatial scales to investigate to what extent infrastructure selection, investment, regulation and pricing can help achieve more sustainable ways of living. Regional policies affect the location of development and the density of housing and hence the demand for transport, energy, water and waste services has implications for infrastructure provision. The research will be based on case studies of the Greater South East regions (London, East and South East of England) and contrasted with a case study of a lower growth more polycentric region such as the North East of England. The research will be carried out in parallel parts of the world to compare and contrast regions of similar size to the Greater South East but at different stages of development. These case studies will include Beijing, Sao Paulo and possibly Los Angeles. The aim is to allow options to be compared within a multi-criteria assessment framework in full consultation with end users and stakeholders. This will identify the most robust options that perform well for different value judgement and different future scenarios.

**Contact:** [Dr Neil Thorpe](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **7. Sustainable Cities: Options for Responding to Climate Change Impacts and Outcomes (SCORCHIO)(2007-2010)**

Urban area and city areas are vulnerable to the effects of climate change; they are increasingly becoming unhealthy, dangerous and uncomfortable to work and live in. Projected urban growth rates mean that vulnerability will increase at the same time as climate change impacts become greater. Standard climate change research does not consider the effects of the urban landscape or the heat released by human activities in modelling scenarios. The aims of the project include:

- 1) Developing a climate simulator for urban areas which can be used for assessing the problems and the adaptation to reduce or avoid them taking into account both 'greenhouse warming' and other additional changes to the climate as well

as the addition effect of the urban landscape and heating due to buildings, road and traffic.

- 2) To model typical buildings and their surroundings in order to develop new readily usable heat and human comfort vulnerability index.
- 3) To estimate heat emissions from buildings together with a set of energy-related air pollutant and greenhouse gas end user emission budgets in order to understand the implications of different building adaption options.
- 4) To develop GIS based decision support tools for exploration of adaption options for urban planning and design.

**Contact:** [Dr Stuart Barr](#), School of Civil Engineering and Geosciences, Newcastle University

**Weblink:** <http://www.ceg.ncl.ac.uk/geomatics/research/projects/scorchio.htm>

### **8. Self Conserving Urban Environments (SECURE) (January 2011 - January 2015)**

In urban areas demands on infrastructure whether housing, energy, transport, freight distribution or waste disposal are increasing in line with population growth. Policy decisions made now will have profound implications for future pressure on resources. The study Self Conserving Urban Environments aims to develop a range of future regional urbanisation scenarios and explore their consequences for issues of resource demand and provision. The effect of policy decisions will be played out on two different spatial scales. Firstly there are those decisions which will concern individual households and their neighbourhoods; these include issues such as how people will move around, what kind of housing they will occupy, how their energy demands and waste production will be reduced and how their negative influences on the wider environment will be limited. Secondly, broad scale strategic decisions regarding regional planning will determine where growth in the UK is primarily accommodated. This will affect the kinds of transport and energy infrastructure that are required and their environmental impacts. The idea behind SECURE is that North East Region will be used a test bed for carrying out an evaluation of transitional scenarios leading up to 2050. SECURE will deliver policy formation and planning decisions for 2030 and 2050 with a focus on creating a Sustainable Urban Environment. It will utilise the findings of research conducted under SUE1 and SUE2. The study includes specific research objectives under 5 cross-cutting themes – Urbanisation, Ecosystems Services, Energy, Stakeholder Engagement and Integration (across themes and scales). It aims to deliver a step change in thinking by enabling integration of demand-resource-supply systems across scales to create a scientifically informed strategic planning and land use regime at a regional level and which is more sustainable.

**Contact:** [Professor Margaret Bell](#), School of Civil Engineering and Geosciences, Newcastle University.

### **9. Adaptation and Resilience in Cities: Analysis and Decision making using Integrated Assessment – ARCADIA (2009-2012).**

Urban areas are particularly vulnerable to climate change; threats come in the form of flooding, water scarcity and extremes of heat. This project hopes to identify how the urban economy might be disrupted by climate change, it will analyse changes in the economy through time and the interactions occurring between economic sectors to improve understanding of how the economy can be made more resilient. This economic model will then be combined with a spatial model of buildings and infrastructure in urban areas. As

well as identifying concentrations of vulnerability, this will enable the simulation of potential redesign of the built environment under different scenarios of climate and other drivers such as unemployment and changes to the transport system. The final task of the project will be to work with stakeholders to use the new understanding of the vulnerability of urban systems to analyse how adaption of urban areas can enhance resilience over a range of timescales. The objective will be to make practical proposals for 'adaption pathways' for cities over the 21<sup>st</sup> Century to respond to the challenges of flooding, water scarcity and extremes of heat.

The ARCADIA project aims to provide new tools to inform decision making for the urban environment and infrastructure. Specifically it will seek to inform: city and regional planners, engineering consultants, designers and consultants for new developments or regeneration programs and businesses interested in long term planning and change at the city scale. Whilst the emphasis of the ARCADIA project is on adaptation to climate change, it takes place alongside developments in research in the Tyndall Centre on mitigation of greenhouse gas emissions in urban areas so together these initiatives will provide insights into how adaption and mitigation can be combined in strategies to achieve urban sustainability.

**Contact:** [Dr. Richard Dawson](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **10. Earth Systems Engineering: Sustainable systems for adapting to global change (2008-2013)**

Research on Earth Systems Engineering is structured around 5 topics:

- Developing detailed scenarios of future climate change
- Combining field monitoring data with satellite data sets to provide inputs to the computer models of technological, natural and human systems that are being modelled
- Attempting to deal with the uncertainty of that pervades complex systems management problems
- Using the proceeding knowledge together to inform engineers and policy makers in the choice of management options, primarily through the development of visualisation and decision support tools.
- Research on major integrated case studies which currently encompass the assessment of whole cities and catchment and management. Within 5 years the goal is to produce a major regional scale demonstration.

Communicating the importance of sustainable systems engineering to current undergraduates, and the general public, maintaining and enhancing mutually beneficial relationships with industry and government stakeholders, securing strategic international partnerships is also an important aspect of the project.

**Contact:** [Professor Chris Kilsby](#), School of Civil Engineering and Geosciences, Newcastle University.

**Weblink:** [www.ncl.ac.uk/ceser](http://www.ncl.ac.uk/ceser)

### **11. PRIMUS (Policies and Research for an Integrated Management of Urban Sustainability) (May 2009 – April 2012)**

The Informed Cities initiative is funded by the 7th Framework Program of the European Union under the name PRIMUS – Policies and Research for an Integrated Management of Urban Sustainability.

Informed Cities initiative is a 3-year European project that aims to examine and enhance connectivity between research and policy-making for sustainable development, at (and for) the local level. This will be done through encouraging interaction and face-to-face discussions between researchers and policy-makers, as well as through explorative application of research-based tools for sustainable urban management by local governments across Europe.

**Contact:** [Dr Kate Theobald](#), School of the Built and Natural Environment, Northumbria University.

**Project website:** <http://informed-cities.iclei-europe.org/>

### **12. Severe Weather Events Risk and Vulnerability Estimator – SWERVE (2007-2011)**

Climate change is affecting weather events on a global scale; recent years have seen an increase in extreme weather events such as hurricanes, flooding, storms and heat waves. An understanding of how these events affect communities and what emergency and long term planning procedures may be implemented to improve their resilience is what SWERVE proposes to undertake. SWERVE will use information from global climate models and a technique called downscaling to produce relevant information on extreme weather at the local community level. This will allow estimations of how often different types of extreme weather events may happen now and in the future. It will allow the identification of ‘hotspots’ of risk where communities may be vulnerable to more than one type of extreme weather event (e.g. flooding in the winter and drought in the summer). Using additional modelling tools, locations at risk from these type of weather events will be identified down to the post code level. The aim is to develop a tool kit of use for local emergency services, town planners and local government. The pilot study will focus on the SE London Resilience Zone and will engage stakeholders from this region and across others in the UK in the development of the tool kit.

**Contact:** [Dr Hayley Fowler](#), School of Civil Engineering and Geosciences, Newcastle University.

**Weblink:** <http://www.ceg.ncl.ac.uk/water/research/projects/swerve.htm>

### **13. Tyndall Centre Cities Programme (2006-2010)**

The Tyndall Centre Cities Programme is developing a city-scale assessment system that simulates the evolution of climate impacts and emissions over the 21st century. This will aid urban policy-makers, planners, engineers and other stakeholders to compare alternative adaptation and mitigation strategies and to consider how can cities grow whilst reducing emissions and vulnerability to climate change. The research is focused upon London and has engaged a small group of key stakeholders including the Greater London Authority, Transport for London, Environment Agency and Thames Water.

Programme objectives:

- Develop and demonstrate a downscaling methodology for generating scenarios of urban economic indicators and spatial attributes that are consistent with variables in coupled global economic and climate simulations;
- Develop and demonstrate a city-scale greenhouse gas emissions accounting tool;
- Adapt and apply methods for city-scale climate impacts assessment;
- Evaluate, in city-scale assessments, strategies and technologies for reducing climate impacts and greenhouse gas emissions.

The context for analysis of urban change is provided by global climate and socio-economic scenarios. National climate and socio-economic variables are disaggregated to a city scale to drive a model of land use change and provide a common basis for emissions accounting and climate impacts analysis. This integration will enable urban climate adaptation and mitigation strategies to be evaluated in a consistent manner and will facilitate analysis of trade-offs, conflicts and synergies.

**Contact:** [Dr. Richard Dawson](#), School of Civil Engineering and Geosciences, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/ceser/demonstrations/cities/index.html>

#### **14. Newcastle-Gateshead Urban Lab (2010-ongoing)**

The vision for the NG Urban Lab is that it will support NG into a safe, productive, sustainable urban environment. This will be achieved by establishing a long term and transformative process that integrates monitoring data, simulation models and visualisations so they can be used by urban decision-makers and the wider community.

**Contact:** [Dr Stephanie Glendinning](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **15. VERITAS – Virtual and Augmented Environments and Realistic User Interactions To achieve Embedded Accessibility Designs (2011-2014)**

VERITAS is a large-scale integrated project founded by the European Commission (7th Framework Programme, ICT for Independent Living, Inclusion and Governance – Grant Agreement No: 247765). The VERITAS Consortium is composed of 34 Partners from 11 countries. Large Industries, SMEs, Universities, Research Centres, Non-Profit Organisations, Public Organizations and Healthcare Centres are all represented.

VERITAS aims to develop, validate and access an open framework for built-in accessibility support at all stages of ICT and non-ICT product development, including specification, design, development and testing. The goal is to ensure that future products and services are being systematically designed for all people including those with disabilities and functional limitations.

VERITAS will introduce accessibility support tools at all the stages of iterative planning and development and for five new applications areas, i.e. automotive, smart living spaces, workplace design, infotainment and personal healthcare and wellbeing.

**Contact:** [Professor Phil Blythe](#), Professor of Intelligent Transport Systems, Newcastle University.

**Website:** <http://veritas-project.eu/>

## **16. Using observational evidence and process understanding to improve predictions of extreme rainfall change (2011-2014)**

Climate change is one of the most important challenges facing societies in the coming century but there are important gaps in our understanding of how climate change might affect local and regional scale hydrology. In particular, we do not know how European rainfall patterns might change. Observations of rainfall suggest that there have been increases in northern and central Europe, especially in winter, and also increases in rainfall intensity. These changes are consistent with atmospheric physics which indicate that warmer air can hold more moisture. We use climate models to examine how climate might change in the future and these suggest more frequent and intense heavy rainfall even in regions experiencing lower rainfall totals. This may cause an increase in the risk of flooding of the sort witnessed over the last decade across the UK and Europe.

Although climate model ability to simulate observed processes has improved in recent years, there are still biases in their outputs due to uncertainties in the levels of future greenhouse gas emissions, due to the large-scale resolution of climate models compared to many natural processes and due to natural variations in the climate. There is also a lack of climate model simulations on the small scale needed to model some of the heaviest rainfall events, in particular summer storms.

This research advances the study of extreme climate events by looking at the causes of climate model biases in the simulation of extreme rainfall, particularly with regards to heavy summer storms. We will first identify the historical characteristics of heavy rainfall using observed storms and, after we have identified the atmospheric causes for these events, we will try to provide physically-based explanations for any detected trends. Climate models represent physical processes in different ways and this can have an important influence on the simulation of heavy rainfall. We will assess which of these affect the simulation of heavy rainfall by comparing different model simulations with observations. Weather forecasting and climate models will also be run at a 1.5km resolution to see if such models are able to tell us more about how heavy rainfall events such as thunderstorms might change in the future.

This research will provide new estimates of future changes to heavy rainfall and examine the atmospheric mechanisms responsible for such changes. This information will tell us which aspects of heavy rainfall and relevant processes are simulated well by models and which projections for the future we should use in informing any adaptation to climate change. Those that are not will be identified and this research will provide guidance on improvements that are needed in the next generation of climate models as well as weather forecasting models. As we use many different climate models, we can also produce estimates of how uncertain we are about future changes in extreme rainfall and flood risk. The summer 2007 floods cost the UK over £3 billion and the UK Government has announced increased annual budgets for flood risk management that will reach £800 million by 2010

but when and should this investment be prioritised. The Pitt Review in 2008 suggested that more information is needed for "urgent and fundamental changes in the way the country is adapting to the likelihood of more frequent and intense periods of heavy rainfall". We need to know how heavy rainfall and flood risks may change in the future, particularly for surface water flooding which is very poorly understood. The information provided by this research is vital for agencies responsible for future flood risk planning and management such as the Environment Agency, DEFRA and the Emergency Services and crucial for updating the climate change allowances used in flood risk management.

**Contact:** Dr Hayley Fowler and [Dr Steve Blenkinsop](#), School of Civil Engineering and Geosciences, Newcastle University.

**Website:** <http://www.ceg.ncl.ac.uk/water/research/projects/observational.htm>

### **17. Local Carbon Framework Beacon co-production and evaluation**

DECC's Low Carbon Framework Beacon programme represents an important opportunity to pilot a range of place based approaches developed through co-production between local authorities and communities in order to inform with the aim of learning from local initiatives about approaches to reducing carbon. Rob Wilson with colleagues from Newcastle University Business School and the Centre for Knowledge, Innovation, Technology and Enterprise (KITE) are working with Northumberland Council one of the national Beacon sites to support the maximisation of learning, develop the processes and evaluate the effects.

**Contact:** [Rob Wilson](#), Business School, Newcastle University.

### **18. Coincidence Probabilistic Weather Data for a Sustainable Built Environment - COPSE**

COPSE is a collaborative project involving Manchester, Bath, Sheffield, Northumbria and Napier universities. The overall aim is to develop and evaluate tools and procedures for extracting future weather data from the UKCIP's 2009 Projections for use in the design and modelling of the built environment. Funding is from 4 linked EPSRC grants. Northumbria's contribution is to evaluate new statistical tools for extracting Test Reference Years and Design Reference Years from the Projections and to use these new data to evaluate future energy and comfort signatures for a range of building types.'

**Contact:** [Professor Chris Underwood](#), School of the Built and Natural Environment, Northumbria University.

**Weblink:** <http://www.copse.manchester.ac.uk/Design/aboutproject.htm>

### **19. Sustainable Urban Metabolism for Europe – SUME (2008-2011)**

The School of Architecture, Planning and Landscape at Newcastle University is a core partner in a major research project funded by the European Commission Seventh Framework Programme, focusing on Sustainable Urban Metabolism for Europe. The project involves a multi-disciplinary team of researchers from eight European institutions and the Chinese Academy of Science. It aims to explore the potential for transforming the existing urban built environment in order to significantly reduce the use of resources, energy and waste, and help in climate change mitigation. The project draws on the concept of metabolism which implies closing the loop between inputs into and outputs from urban

systems. The built environment uses and generates a substantial amount of energy and resource flows with major implications for climate change mitigation. Drawing on 'trend' and 'desirable' scenarios for four case study cities of Newcastle, Vienna, Stockholm and Porto, researchers aim to specify the types of urban forms and built environment structures which leads to a reduction of resource and energy consumptions in urban areas. An important part of the project, which is led by Newcastle University team, is the critical issue of governance and the role of regulatory frameworks, institutional structures, and planning strategies in fostering more sustainable urban developments. Particular emphasis is put on the appropriate mix of regulation and incentives in guiding individuals' behaviour while acknowledging the structures and institutions which can affect that behaviour. Policy tools and instruments that influence relevant flows and patterns of resource consumption are also examined. The main research challenge is to link the urban metabolism approach to urban development concepts in a way that place future cities into more sustainable development paths.

**Contact:** [Professor Simin Davoudi](#), School of Architecture, Planning and Landscape, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/guru/research/project/2816>

## **20. Climate Change and Territorial Effects on Regions and Local Economies - ESPON Climate (2009-2001)**

This is a pan-European research project funded the EU ESPON Programme in which School of Architecture, Planning and Landscape is a core partner. The project draws on climate change vulnerability assessment as a basis for identifying regional typologies of climate change exposure, sensitivity, impact and vulnerability. It draws on a widely-used analytical framework which acknowledges that the rising anthropogenic greenhouse gas emissions along with natural climate variability contribute to global warming and thus to *climate change*. However, the resulting climate changes differ between regions, i.e. each region has a different *exposure* to climate change. In addition, each region has distinct physical, environmental, social, cultural and economic characteristics which lead to different *sensitivities* to climate change. Together, exposure and sensitivity determine the possible *impact* that climatic changes may have on a region. However, the capability of a region to adjust to changes also differs. Factoring in a region's *adaptive capacity* can increase or decrease the impact of climate change and thus leads to a region's overall *vulnerability* to climate change. Based on this framework, detailed statistical analysis, complemented by in-depth case studies, were undertaken to examine the vulnerability of each NUTS 3 region in Europe. The research provides an innovative analytical framework, a series of indicators for each components of the framework, and assessment of the data availability. It provides a comparative analysis of the vulnerability of different European regions to climate change. The analyses are presented on a series of European-wide maps.

**Contact:** [Professor Simin Davoudi](#), School of Architecture, Planning and Landscape, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/guru/research/project/2956>

## **21. Sustainable Urban Metabolism for Europe – SUME (2008-2011)**

The School of Architecture, Planning and Landscape at Newcastle University is a core partner in a major research project funded by the European Commission Seventh Framework Programme, focusing on Sustainable Urban Metabolism for Europe. The project involves a multi-disciplinary team of researchers from eight European institutions and the Chinese Academy of Science. It aims to explore the potential for transforming the existing urban built environment in order to significantly reduce the use of resources, energy and waste, and help in climate change mitigation. The project draws on the concept of metabolism which implies closing the loop between inputs into and outputs from urban systems. The built environment uses and generates a substantial amount of energy and resource flows with major implications for climate change mitigation. Drawing on ‘trend’ and ‘desirable’ scenarios for four case study cities of Newcastle, Vienna, Stockholm and Porto, researchers aim to specify the types of urban forms and built environment structures which leads to a reduction of resource and energy consumptions in urban areas. An important part of the project, which is led by Newcastle University team, is the critical issue of governance and the role of regulatory frameworks, institutional structures, and planning strategies in fostering more sustainable urban developments. Particular emphasis is put on the appropriate mix of regulation and incentives in guiding individuals’ behavior while acknowledging the structures and institutions which can affect that behavior. Policy tools and instruments that influence relevant flows and patterns of resource consumption are also examined. The main research challenge is to link the urban metabolism approach to urban development concepts in a way that place future cities into more sustainable development paths.

**Contact:** [Professor Simin Davoudi](#), School of Architecture, Planning and Landscape, Newcastle University

**Weblink:** <http://www.ncl.ac.uk/guru/research/project/2816>

## **22. Climate Change and Territorial Effects on Regions and Local Economies - ESPON Climate (2009-2001)**

This is a pan-European research project funded the EU ESPON Programme in which School of Architecture, Planning and Landscape is a core partner. The project draws on climate change vulnerability assessment as a basis for identifying regional typologies of climate change exposure, sensitivity, impact and vulnerability. It draws on a widely-used analytical framework which acknowledges that the rising anthropogenic greenhouse gas emissions along with natural climate variability contribute to global warming and thus to *climate change*. However, the resulting climate changes differ between regions, i.e. each region has a different *exposure* to climate change. In addition, each region has distinct physical, environmental, social, cultural and economic characteristics which lead to different *sensitivities* to climate change. Together, exposure and sensitivity determine the possible *impact* that climatic changes may have on a region. However, the capability of a region to adjust to changes also differs. Factoring in a region’s *adaptive capacity* can increase or decrease the impact of climate change and thus leads to a region’s overall *vulnerability* to climate change. Based on this framework, detailed statistical analysis, complemented by in-depth case studies, were undertaken to examine the vulnerability of each NUTS 3 region in

Europe. The research provides an innovative analytical framework, a series of indicators for each components of the framework, and assessment of the data availability. It provides a comparative analysis of the vulnerability of different European regions to climate change. The analyses are presented on a series of European-wide maps.

**Contact:** [Professor Simin Davoudi](#), School of Architecture, Planning and Landscape, Newcastle University

**Weblink:** <http://www.ncl.ac.uk/guru/research/project/2956>

### **23. emBRACE: Building Resilience Amongst Communities in Europe EU/FP7 - Collaborative Project**

Within a context of interdisciplinary, socially inclusive and collaborative disasters research, the emBRACE project aims to improve the pan-European framing of the resilience concept. The project will develop a conceptual and methodological approach to clarify how the resilience capacity of a society confronted with natural hazards and disasters can be characterized, defined and measured. On the basis of a systematic evaluation of the widest literature base, the project will first elaborate an initial conceptual framework. Existing quantitative datasets will then be interrogated to identify variables that provide indications of resilience, which are framework consistent. The framework and data will then be 'tested' and ground truthed by means of six carefully-chosen European case studies. These case studies are characterised by their exposure to different hazards and their situation within different governance settings and socio-demographic-economic contexts. Therefore, as a result of emBRACE, resilience will be effectively contextualised through the application and evaluation of newly-developed indicators and models, and will subsequently contribute to the reformulation and adaption of the conceptual framework.

The project emBRACE will considerably advance the methodologies for evaluating, modeling and assessing the resilience of different actors at different levels. The emBRACE project is designed to be methodologically rich and to draw on partner expertise across the research methods spectrum. It plans to apply these methods across scales from the very local to the European. Indicators to measure resilience will be recommended based on practical experience and grounded theories. To maximize the benefit of existing information and new ideas on resilience, various stakeholders and experts will be incorporated into different knowledge-sharing groups. There will be an ongoing engagement with some of these stakeholders alongside programmed consultations at various times during the development of the framework and model, case study work, and also the reshaping of concepts, guidelines and database requirements focused on disasters and societal resilience. A key difference in the emBRACE proposal is the seeking out of those people and groups not normally included in such fora; not as *subjects* of research but as *partners* in the research and *experts* in their own right (e.g. through Peer-To-Peer Learning Exchanges with grassroots groups).

**Keywords:** Resilience, Disasters, Disaster footprints, Interdisciplinary, Integration, Human impacts, Knowledge-sharing groups, Peer-To-Peer Learning Exchanges.

**Contact:** [Dr Maureen Fordham](#), School of the Built and Natural environment,  
Northumbria University.

**Weblink:** <http://embrace-eu.org/index.htm>

# ENERGY

#### **24. Supergen Wind Energy Technologies Consortium (March 2010-March 2014)**

The SUPERGEN Wind Energy Technologies Consortium (SUPERGEN Wind) is a UK wind energy research consortium, which was established by the EPSRC on 23 March 2006 as part of the Sustainable Power Generation and Supply (SUPERGEN) programme. The SUPERGEN Wind Consortium is led by Strathclyde and Durham Universities and consists of 7 research groups with expertise in wind turbine technology, aerodynamics, hydrodynamics, materials, electrical machinery & control, and reliability & condition monitoring. The Consortium has the active support of 17 industrial partners, including wind farm operators, manufacturers and consultants.

**Contact:** [Professor Peter Tavner](#), School of Engineering and Computing Sciences, Durham University

#### **25. Boulby Geoscience (April 1st 2009-2011)**

The project is designed to create a facility and will detail the opportunities for the development of a deep geoscience facility at Boulby which is the only potash mine in the UK placing North East England at the heart of the development of new energy and environmental technologies; demonstrate the viability of the Boulby mine site for underground geoscience research; develop detailed plans for the implementation of the detailed design phase including the establishment of the range of facilities required; advance underground science in terms of rock mechanics geophysical processes and hydrogeology and the coupling between subsurface and surface processes; raise awareness regionally, nationally and internationally of the potential offered by Boulby facility; provide science led engagement between the NE geoscience community and local business and government; attract inward investment in terms of research and development; create science led employment through the establishment of at least two science led spin out company; offer training and development opportunities to local SMEs and major employers.

**Contact:** [Professor Dave Petley](#), Department of Geography, Durham University.

#### **26. InCluESEV – Interdisciplinary Cluster on Energy Systems, Equity and Vulnerability**

This interdisciplinary research cluster has a core membership of 30 academics from across 13 disciplines including geography, sociology, engineering, design, earth sciences, politics, economics, planning, physics and anthropology.

Academic involvement is focused at King's College London, Durham, Lancaster and Birmingham Universities with others from Cardiff, Edinburgh, Reading, Brunel, Surrey, Manchester, Oxford, CEH, BGS, Newcastle and Macaulay Institute. This brings together leading expertise and research activity from across a diversity of energy, climate change and environment funding programmes, including EPSRC, ESRC, cross research council, EU and the private sector.

Four non-academic members are each centrally involved with issues of energy and equity - National Energy Action, Eaga and Warm Zones are key actors in providing solutions that address fuel poverty in the UK, whilst the Building and Social Housing Foundation promotes sustainable housing for vulnerable communities in the UK and internationally.

InCluESEV will focus on the uneven production and experience of energy vulnerabilities, and examine the likely consequences of emerging low carbon energy systems for the changing nature and distribution of equity across time and space. The specific objectives of the cluster are:

- to foster interdisciplinary dialogue and new collaborations on equity, vulnerability and low carbon energy systems
- to develop improved understanding and new thinking on how equity and justice factor within energy systems and
- within evolving patterns of access to energy resources and services
- to develop interconnections between, and enhancements of, existing energy and climate change research
- initiatives through a specific focus on equity, vulnerability and resilience
- develop the evidence base through the synthesis of existing knowledge and new evidence and insights
- to establish the science challenges in this domain, build capacity to address them and develop future funding proposals
- To engage stakeholders in research and to formulate and disseminate policy relevant outputs.

**Contact:** [Professor Harriet Bulkeley](#), Department of Geography, Durham University.

**Weblink:** <http://sites.google.com/site/inclusev/>

## **27. PV21 – Photovoltaic materials for the 21<sup>st</sup> Century**

Northumbria's Photovoltaic's Applications Centre is investigating how to introduce cheaper materials to the production of thin-film photovoltaic cells to reduce their thickness and help bring down their manufacturing costs. This is part of the UK Supergen programme for advance thin PV materials and device concepts. The project will:

- Focus on thin film PV and routes to reducing cost and improving sustainability;
- Extension of fundamental understanding of the factors controlling thin film PV performance;
- Evolution and up scaling of technology platforms to incorporate new ideas and processes;
- Development and integration of advanced approaches to light harvesting and management;
- Identification/development of emerging/new materials to address concerns about materials sustainability;
- Consideration of economic factors influencing progress towards large scale deployment of low cost PV;
- Integration of 'Plus' projects in selected areas to enhance progress;
- Expansion and refinement of training activities.

**Contact:** Dr. Ian Forbes, Northumbria's, Photovoltaic's Applications Centre, School of Computing, Engineering and Information Sciences (CEIS), Northumbria University.

**Weblink** <http://www.pv21.org/index.html>

## **28. PERFORMANCE - A Science base on PV performance for increased market transparency and customer confidence**

The PERFORMANCE project aims to provide the PV community with tools to measure the quality of products – devices, systems and services – to ensure their usefulness and reliability, and to deliver data to predict the useful lifetime of the products. The project will develop reliable test & calibration procedures for standard and for innovative types of PV modules, it will harmonise measurement and evaluation techniques for PV systems. PERFORMANCE will cover all relevant aspects from cell to system level and from instantaneous device characterisation and system measurements to life-time performance prediction and assessment. From the demands of market players, eight topics have been identified and were transformed into a consistent set of sub-projects:

1. Traceable performance measurement of PV devices
2. Energy delivery of photovoltaic devices
3. PV system performance evaluation
4. Modelling and analysis
5. Service life assessment of PV modules
6. PV as a building product
7. Industry interaction and dissemination
8. Standardisation processes

Following this work programme, PERFORMANCE will produce a coherent framework of measurement and modelling methodologies to create the transparency needed for the European market and industry. Intense involvement of all European companies along the value chain will be organised systematically through feedback loops. These include project workshops, seminars and the involvement of an Industry Advisory Board. Project results will be fed directly into standardisation processes on CENELEC and IEC level.

**Contact:** [Professor Nicola Pearsall](#), Northumbria Photovoltaic's Applications Centre (NPAC), School of Computing, Engineering and Information Science, Northumbria University.

**Weblink:** <http://www.pv-performance.org/performance>

## **29. Geothermal heat pumps (Ongoing)**

Research on geothermal heat pumps involves the development of design methods for use by practitioners to select and evaluate the carbon impact of heat pumps with alternative methods of ground coupling and involves an extensive collaborative partnership with hydrogeologists at Newcastle University, including the formation of a spin-out company. The work at Northumbria University in this area is particularly focused on finding the best fit between the different methods of ground coupling and the demands placed on them by alternative methods of servicing heating and cooling.

**Contact:** [Professor Chris Underwood](#), School of Built and Natural Environment, Northumbria University.

### **30. Carbon Routemap: a routemap to a low carbon economy for Newcastle (2008-2009)**

The Carbon Routemap is a project that has been established in order to implement a long term strategy to reduce greenhouse gas emissions in Newcastle. It provides an interface between civic action and academia that aims to provide practical and pragmatic carbon reduction plans. The routemap will integrate plans to reduce emissions across all public, commercial, industrial, transport and domestic sectors. The project will strengthen and build upon existing partnerships, between the University, the Council, the Local Strategic Partnership (LSP), Carbon Neutral Newcastle (CNN), and Newcastle Science City.

The first phase of the project is to evaluate current emissions, next routemaps and scenarios for a low-carbon economy will be developed for the city, and finally communication and implementation of the chosen programme will begin. This will take place over 3 years. The project will drive the way climate change strategy is developed by the Council, and will help ensure reduction targets are met in sectors such as housing or recycling. The project will engage with the public, community groups and NGOs and hopefully effect behaviour changes. Businesses will be encouraged to understand their contribution to the cities emissions and to participate in formulating the solution also. Routemap will work with Regional Development Agencies to promote job creation in carbon reduction sectors.

**Contact:** [Professor Thomas Wagner](#), School of Civil Engineering and Geosciences, Newcastle University.

### **31. Measurement, Modelling, Mapping and Management: an evidence-based methodology for understanding and shrinking the urban carbon footprint - 4M (2008-2012)**

One way to represent carbon emissions from different sources is to calculate a carbon footprint; this can be done for an individual, household, a city (or a country). There are however some problems in doing this. The 4M project intends to address some of these challenges. The project will:

- Measure the carbon released by traffic and the burning of fossil fuels in homes, places of work and the rate at which green plants and trees capture carbon and lock it in the soil.
- Model the effects on the carbon budget of road layouts, traffic volumes and speeds, the way we use energy in our homes and places of work and the way we look after green spaces
- Map the sources and sinks of carbon for the whole city and compare this with social and economic well being of its 270,000 inhabitants.
- Conduct Management studies which will investigate how to shrink the city's Carbon footprint through: changing the road network, and/or the provision of better public transport; alterations to the main green spaces and the treatment of waste; the use of renewable and low energy systems to provide power and light; and the operation of a Tradable Energy Quota Scheme (TEQ).

This study will be one of the first to explore the likely impact of such schemes on the lifestyles and well being of city dwellers. The overall aim behind the collection of this data is to understand better the social and spatial aspect of both carbon emissions and the effects and costs of policies to reduce these emissions. The model hopes to deliver information on how

the carbon budget of cities varies with built form and social composition and to assess the relative impacts of measures designed to improve urban sustainability in respect to buildings, transport and the role of sequestration. The 4M methodology will provide decision support in trade-off management.

**Contact:** [Professor Margaret Bell](#), School of Civil Engineering and Geosciences, Newcastle University.

### **32. CO<sub>2</sub> Injection Simulation**

The project seeks to develop and introduce a simulation framework to assess depleted hydrocarbon reservoirs and manage risk for carbon capture and storage. Functionality and usability of different black oil and compositional simulators will be evaluated for their use at commercial projects. A special focus of the project will be increasing the understanding of how to properly model the pressure build-up associated with CO<sub>2</sub> injection in very low pressure environments.

**Contact:** [Professor Jon Gluyas](#), Director of the Centre for Research into Earth Energy Systems (CeREES) Department of Earth Sciences, Durham University

### **33. Intelligent energy and maintenance project**

The aim of this project is to investigate the role of artificial intelligence (AI) techniques in the management of energy consumption and maintenance, by building on previous projects which have looked at energy, condition monitoring and maintenance, and the application of AI techniques to such problems. Aims include:

- exploit existing expertise by developing a new research direction, building on previous work in the intelligent systems group on topics such as reinforcement learning, and work in the Institute for Automotive and Manufacturing Advanced Practice (AMAP) on maintenance practices and the link between these and energy efficiency
- develop future reach-out opportunities based on the needs of local industry in terms of maintenance strategy development, and research projects based on forthcoming national and European calls
- acquisition of a repository of energy and maintenance data gathered at a local SME, to bootstrap teaching programmes and student projects.

**Contact:** [Dr David Baglee](#), Department of Computing, Engineering and Technology, Sunderland University.

### **34. The Crown Estates project**

The rate of CO<sub>2</sub> injection into saline formations is limited to avoid excess pressure build up causing fracturing of the rock. Using the multiphase flow simulator, ECLIPSE, we are investigating the effects of heterogeneous geology on pressure in the formation. Results from ECLIPSE have been compared to TOUGH2 and analytical solutions, to understand the effects of gridding on reported well pressures. Stochastic simulation using Petrel software has provided the heterogeneous geology, in lieu of a detailed data set.

**Contact:** [Dr Kate Thatcher](#), Department of Earth Sciences, Durham University

### **35. Continental Shelf for CO<sub>2</sub> Storage using 3D Seismic and Borehole Data**

The PhD, funded by an NERC Case Award, involves evaluating three potential CO<sub>2</sub> storage sites within the Southern North Sea, East Irish Sea and the Wessex basins. Triassic reservoirs are the primary focus. The objectives of the PhD are to identify locations and extents of structural traps using well-calibrated 2D and 3D seismic data to identify and map structural and stratigraphic heterogeneities. Reservoir engineering techniques are used to analyse production and pressure data to model the behaviour of the depleted oil and gas fields during production and to project the likely behaviour of the same reservoirs during and after CO<sub>2</sub> injection. Estimates of the likely sealing capacity of fault-bounded compartments are investigated using Badley Geoscience Ltd's Traptester 6 software. The likelihood of leakage through reactivated faults during CO<sub>2</sub> injection is also risked here. The results of the project will be an important step towards realising the UK's CCS potential. Involves Badley Geoscience Ltd and IHS Global Energy.

**Contact:** [Amy Clarke](#), Department of Earth Sciences, Durham University

### **36. Science Central Borehole Project- Geothermal energy**

Newcastle Institute of Research on Sustainability (NIReS) has obtained major funding from the UK Government's Deep Geothermal Challenge Fund to support the first step in the development of the Science Central site as a sustainability flagship: the drilling of a two-kilometre borehole to explore for deep geothermal resources which could provide much of the fully-renewable energy supply for the development.

If successful, this exploration borehole will take the risk out of detailed design to incorporate deep geothermal into the overall energy plan for Science Central and adjoining districts, including Eldon Square, the UK's largest city centre indoor shopping mall. As the Ninety Fathom Fault extends laterally over distances in excess of 100km, quantification of the resource on this site would also provide a model for further such developments elsewhere in the North of England.

Professor Paul Younger is keeping a blog of developments on the borehole as things progress: to view the blog, click on the link below.

**Contact:** [Professor Paul Younger](#), Director of NIReS, Newcastle University.

**Blog:** [http://blogs.journallive.co.uk/journalblogcentral/professor\\_paul\\_younger.html](http://blogs.journallive.co.uk/journalblogcentral/professor_paul_younger.html)

### **37. Biomass, Remediation, Regeneration (BioReGen): Reusing brownfield sites for renewable energy crops (1st December 2005 – 30th April 2010)**

The BioReGen project sought to tackle the problem of contaminated brownfield sites, previously developed for industrial use and very often such sites lying vacant in a derelict state awaiting redevelopment.

The project explored the potential of using such sites to grow crops specifically for use as fuel, experimenting with four types of plant: willow trees, the current favourite for biomass power stations; and the miscanthus, reed canary and switch grasses.

The project revealed that reed canary grass grow well in poor soil and contaminated sites, and that this in turn allows grass to be grown without taking away land which would otherwise be used in food production. Having reached maturity after two years, reed canary grass can be harvested and baled up before being turned into bricks and pellets. These burn well, and are an excellent fuel for biomass power stations and, on a smaller scale, boilers in buildings like schools.

Test burnings have shown that reed canary grass does not pick up contamination from the soil, and can help to 'green up' sites to result in improved soil quality and biodiversity.

**Contact:** [Dr Richard Lord](#), School of Science and Engineering, Technology Futures Institute, Teesside University.

**Website:** <http://www.bioregen.eu/>

### **38. Nzomics Biocatalysis**

Nzomics develops novel enzymes for clients in the pharmaceutical, chemical, biofuel and food sectors. Using an enzyme alternative for a chemical process is cost-effective, efficient and environmentally sound. Our research and development focus is to develop novel intellectual property for our client using state-of-the-art chemistry, molecular biology and biotechnology.

**Contact:** [Dr Justin Perry](#), Nzomics, School of Life Sciences, Northumbria University

**Website:** <http://www.nzomics.com/>

### **39. EnergyScape and Ecosystem Services (1st July 2010 – 30th April 2011)**

This project seeks to develop a common framework to bring together diverse groups such as energy developers, farmers, land use planners and conservationists to address the scientific evidence for the deployment of land-based renewable energy. The overall aim of the project is to determine, through a pilot study, how an understanding of ecosystem services and the EnergyScape could help guide the deployment of land-based renewables (LBR).

The project also seeks to develop a new set of scientific methods to address specific questions for a specified area:

- What are the effects on ecosystem services of changing, for example from wheat production to miscanthus production?
- How do we maximise energy returns from combinations of and interactions between land-based renewable across different spatial and temporal scales?
- How do we identify the best combination and locations of land-based renewables over different spatial scales to maximise the delivery of both sustainable energy and ecosystem services?

The integration of spatial and temporal information will result in the identification of both complementary and antagonistic relationships between land-based renewables, ecosystem services and energy supply.

The approach could provide an innovative method of assessing the environmental impact of interventions, providing an alternative structure for describing the benefits and costs of a specific intervention.

**Contact:** [Dr Richard Lord](#), School of Science and Engineering, Technology Futures Institute, Teesside University

**Weblink:** <http://www.nerc.ac.uk/research/programmes/landbased/>

#### **40. Engineering the Soil Carbon Sink: a novel approach to carbon emission abatement (2007-2009)**

The aim of this project is to assess the feasibility of designing soil systems that maximise the uptake of atmospheric CO<sub>2</sub>, using plant growth to form soil carbonates and enhance soil carbon contents. The process occurs as follows: plants, crops and trees naturally absorb atmospheric carbon dioxide (CO<sub>2</sub>) during photosynthesis and then pump surplus carbon through their roots into the earth around them, in most soils much of this carbon escapes back to the atmosphere or enters groundwater. But in soils containing calcium-bearing silicates (natural or man-made), it is believed that the carbon which oozes out of a plant's roots may react with this available calcium to form the mineral calcium carbonate. This carbon then remains in the soil, close to the plant's roots, in the form of a coating on pebbles or as grains. The initial phase of the project will be to try to detect calcium carbonate in natural soils that have developed on top of calcium-rich rocks or been exposed to concrete dust (which contains man-made calcium silicates). Next a study of artificial soils made at the University from a mixture of compost and calcium-rich rock would be carried out and finally plants would be grown in these purpose made soils containing a high level of calcium silicates and the amount of accumulation of calcium carbonate there monitored. The long term aim is to develop a computer model which can predict how much calcium carbonate will form in specific types of soil, and how quickly.

If it is demonstrated that carbon can be fixed in soils as a consequence of plant growth it may encourage the growing of more plants, crops etc in places where calcium-rich soils already exist. The project also opens up the prospect that bespoke soils could be designed (i.e. with added calcium silicates, or specific plants) which optimise the carbon-capture process. Such soils could theoretically play a valuable role in carbon abatement all over the globe.

**Contact:** [Professor David Manning](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **41. Beyond NIMBYism: a multidisciplinary investigation of public engagement with renewable energy technologies (March 2006 - May 2009)**

This was a multidisciplinary project funded by the ESRC, involving research partners from five UK universities with expertise in environmental psychology (University of Manchester), human/critical geography (Lancaster University), environmental sociology (University of Surrey), environmental governance, policy and planning (Northumbria University), and renewable energy technologies (University of Strathclyde). The project aimed to deepen understanding of the factors underlying public support and opposition to renewable energy

technologies, taking a critical look at the commonly held 'NIMBY' (not in my back yard) concept and how it is used to describe and explain public opposition. It focused first on how 'the public' and public engagement are conceived by actors in the renewable energy industry (through a series of interviews), and second on how local residents perceive and respond to specific technology projects and the engagement activities undertaken by developers and other stakeholders (through case studies of ten projects at various stages in the planning process, across four sectors - onshore wind, offshore wind, biomass and marine).

**Contact:** [Dr Kate Theobald](#) and [Dr Judith Parks](#), Sustainable Cities Research Institute (SCRI) School of the Built and Natural Environment, Northumbria University.

#### **42. Area-based urban energy optimisation systems: retrofitting a city (Feb2011-Sep2011)**

The proposed research will develop a new approach for urban carbon and energy management. The proposed research will focus on a specific area of the city (e.g. South Heaton), down to the level of Lower Level Survey Output Area (LLSOA) or even individual buildings, to better understand how low carbon retrofitting interventions at building level for a designated area might be achieved in practice. For example, if combined heat and power systems are to be used within a district energy system, where should the heat source be located and how might the pipes be routed? The achievement of this level of assessment resolution is of international significance in the field.

**Contact:** [Dr. Carlos Calderon](#), School of Architecture, Planning and Landscape, Newcastle University.

#### **43. Materials for Next Generation CO<sub>2</sub> Pipeline Transport Systems (MATTRAN) (October 2009-January 2013)**

MATTRAN is a multi-consortium project sponsored by EPSRC with the aim of providing the tools and information necessary for pipeline engineers to select appropriate materials and operating conditions for pipelines carrying anthropogenic supercritical CO<sub>2</sub> in order to control corrosion, stress corrosion cracking and fracture propagation.

The MATTRAN project brings together a consortium of scientists, mathematicians and engineers working from the molecular scale of the CO<sub>2</sub> in the pipeline to the macro-scale of fracture propagation and pipeline failure to produce the data required in a systematic and co-ordinated manner that will ensure that the required results are generated efficiently and quickly disseminated to the industry.

**Contact:** [Professor Martin Downie](#), School of Marine Science and Technology, Newcastle University.

**Website:** <http://research.ncl.ac.uk/mattran/>

#### **44. Carbon Trust Algae Biofuels Challenge (2010-present)**

Newcastle University hosts two projects as part of an £8m Carbon Trust project to develop sustainable, cost-effective biofuel from algae. The long term goal of the Carbon Trust is to produce 70 billion litres of algae biofuel a year by 2030. This will be the equivalent to six per cent of road transport diesel and a saving of over 160 million tonnes of CO<sub>2</sub> every year.

Contact: [Dr Gary Caldwell](#), School of Marine Science and Technology, Newcastle University.

Website: <http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/algae-biofuels-challenge/pages/algae-biofuels-challenge.aspx>

#### **45. Biogas production from the anaerobic digestion of seaweed (2009-present)**

The availability and cost of energy derived from fossil fuels threatens to be a major socioeconomic bottleneck. The need for energy security necessitates the exploration and development of diverse energy portfolios. Energy from biomass (bioenergy) will be crucial in delivering future sources of liquid and gaseous fuels. From a marine perspective methane production by anaerobic digestion of macroalgae is the most promising near-to-market algal bioenergy option. This work is funded by Scottish Enterprise and the EPSRC.

Contact: [Dr Gary Caldwell](#), School of Marine Science and Technology, Newcastle University.

#### **46. Low-cost microalgae harvesting technologies (2009-present)**

Approximately one third of the cost of mass production of microalgae biomass for fuel is attributable to harvesting and dewatering of the algae. This project, funded by the EPSRC, is developing scalable low-cost, low-energy harvesting systems that can be seamlessly integrated into open pond production systems worldwide.

Contact: [Dr Gary Caldwell](#), School of Marine Science and Technology, Newcastle University.

#### **47. RESNET: Resilient Electricity Networks for Great Britain**

The resilience of GB's electricity energy network is being challenged on three fronts: (i) policies aimed at reducing greenhouse gas emissions through decarbonising energy supply will alter substantially the existing supply mix; (ii) decarbonising of the 'energy' system will likely involve considerable shift of previously non-electric energy demand onto the electricity network with accompanying changes in how much electricity is needed and when it is needed; and (iii) the expected mean changes in climate will alter the electricity demand and performance of electricity infrastructure, and increased severity and frequency of extreme weather events will impact on the electrical network and distribution systems.

To address these multiple challenges, the RESNET project (Resilient Electricity Networks for Great Britain) will develop and demonstrate a comprehensive systems-level approach to analysing the resilience of the existing and proposed electricity networks. It will develop, test and refine tools for evaluating adaptation measures designed to enhance

the resilience of the network including societal and technical adaptation. Newcastle will develop a new climate downscaling method for analysing changing wind conditions.

Contact: [Dr Richard Dawson](#), [Dr Sean Wilkinson](#) and [Professor Chris Kilsby](#), School of Civil Engineering and Geosciences, Newcastle University.

#### **48. Bioenergy Research Durham**

There are a range of projects concerning the production, use and impacts of biofuels ongoing at Durham University:

- BioAlgaeSorb (EU FP 7, 2011-2013) will look at waste stream remediation by microalgae and the processing of the biomass into useful chemicals and fuels. Dr Chris Greenwell's group is involved in the conversion of the biomass.
- Mineral catalysed deoxygenating reactions of biomass (KiOR Inc, 2008-2011) is looking at the use of oxide catalysts to convert biooils through to fuel products (Dr Greenwell).
- Biofuels, Science & Society is a theme funded by the Institute of Advanced Studies and brings together Law, Psychology, Chemistry, Biology, Earth Sciences, Durham Business School, Anthropology and Geography to address wide ranging technical and social issues concerning biofuels. A summer internship is investigating attitudes to GM in the biofuels area (leader – Dr Greenwell, Prof Lindsey).
- Biofuels as socio-technical systems (2010-2013). A Durham Energy Institute PhD studentship to investigate how and why some biofuels fail as technologies while others succeed.
- Crop improvement for better yields. Prof Keith Lindsey (Biology) and Prof Toni Slabas both work on synthetic biology methods for improving oil yields, and changing carbohydrate structure for improved energy crops.
- Microalgae biofuels (2010-2015, BBSRC Link Project). Prof Toni Slabas is modifying photosynthetic microorganisms to yield improved oil for biofuels.
- Biogas from wastes and fuel crops. Prof Mike Theodorou is an expert in anaerobic digestion technologies and is co-funded by Durham University and the Centre for Process innovation.
- Sustaining the macroalgae supply chain (2010-2012). This project is looking at methods for sustaining supplies of macroalgae for bioenergy and bioproducts (Dr Greenwell, Prof Theodorou).
- Microalgae as biomass source for fuels, chemicals and remediation (2011-2014). A PhD studentship starting in 2011 (Dr Greenwell, Prof Theodorou, Dr Dyer).

**Contact:** [Dr Chris Greenwell](#), Department of Chemistry, Durham University

# HOUSING AND BUILDINGS

#### **49. iCAT Carbon Assessment Tool**

Development of the Interoperable Carbon Assessment Toolkit or 'iCAT' for embodied carbon calculations, which will enhance the design and life cycle management of zero carbon and low impact buildings.

AEC3 UK is leading the project team, including: the School of the Built and Natural Environment, University of Northumbria, BSRIA, Faithful and Gould, RIBA Enterprises, Autodesk, and the University of Bath.

Focusing on the early, feasibility and pre-design stages, iCAT will enable designers, cost consultants and their clients to minimise life cycle carbon and economic costs through improved decision-making.

iCAT will be available as an interoperable online tool, using data from the University of Bath's Inventory of Carbon and Energy (ICE) database, along with other carbon embodiment and building modelling data from mainstream design and analysis tools.

**Contact:** Professor Steve Lockley, School of the Built and Natural Environment, Northumbria University.

#### **50. Intelligent Use of Buildings' Energy Information (IntUBE) (2008-09-04 until 2011 -09-04)**

With over 80 % of the European buildings standing in 2020 being already built, the main aim of the IntUBE project is to develop and make use of information and communications technologies to improve the energy efficiency of existing buildings in compliance with the EU's aims of improving energy efficiency.

IntUBE will develop tools for measuring and analysing building energy profiles based on user comfort needs. These will offer efficient solutions for better use and management of energy use within buildings over their lifecycles. Intelligent Building Management Systems will be developed to enable real-time monitoring of energy use and optimisation. Neighbourhood Management Systems will be developed to support efficient energy distribution across groups of buildings. These will support timely and optimal energy transfers from building to building based on user needs and requirements. New Business Models to make best use of the developed Management Systems will be created. The results of IntUBE are expected to enhance not only the comfort levels of buildings users, but also reduce overall energy costs through better energy efficiency. These results will be demonstrated in at least three pilot cases: social housing in Spain, office buildings in Finland and a third case defined during the project.

The results of IntUBE are expected to enhance not only the comfort levels, but to also reduce overall energy costs through better energy efficiency.

The IntUBE consortium spans key research partners from Northern to Southern Europe including SMEs committed to exploiting the results of the project.

**Contact:** [Dr Tracie Crosby](#), Technology Futures Institute, Teesside University

**Website:** <http://www.intube.eu>

### **51. Newcastle Eco neighbourhood project (2007-ongoing)**

The aim of the study is for Northumbria and Newcastle Universities to work with key stakeholder organisations in the Centre West area (local authority, YHN, Groundwork, Bridging Newcastle Gateshead, NEA, EST) in identifying the opportunities for and barriers to developing eco-neighbourhoods (or more specifically low-carbon neighbourhoods), focusing on the Arthurs Hill and Rye Hill areas. Workshops and meetings have been held with interested groups/individuals, to discuss reducing energy consumption, focusing on housing, with advice given from the Energy Saving Trust. The project steering group meet regularly to discuss project progress and funding opportunities; members include bridging Newcastle Gateshead, National Energy Action, Energy Saving Trust, Newcastle City Council, Arts and Social Sciences Northumbria University, and Groundwork.

**Contact:** [Dr Kate Theobald](#), Sustainable Cities Research Institute (SCRI) School of the Built and Natural Environment, Northumbria University.

### **52. Lincolnshire Art Gallery and Observatory (November 2010 – November 2011)**

This is a project to design a portable wildlife observatory and gallery using innovative construction techniques, allowing the £600,000 building to be assembled at an exposed site where it can withstand adverse weather conditions. The building is easily dismantled and relocated further inland if location becomes threatened by rises in sea level and coastal erosion. The aim is for the building to generate its own power from renewable energy derived from the site. It will also serve as a research project and teaching aid for architecture students. Paul Jones was responsible for designing the building and Zaid Alwan, will advise on sustainability, in order to achieve a BRE Environmental Assessment Method (BREEAM) outstanding rating for the building. The University is working with Newcastle based Surface Light Space Architects, and it is envisaged they will construct the building. The building will be open in autumn 2011.

**Contact:** [Paul Jones](#), School of the Built and Natural Environment, Northumbria University.

### **53. Retrofit for the Future (March 2010-April 2011)**

Retrofit of an end terraced house (owned by Isos Housing Group) built in the 1990s, to reduce energy consumption. Retrofit includes:

- Fitting high quality wall, roof and floor insulation – Vacuum Insulation Panels;
- Increased air tightness of the building;
- Innovative heating systems new to UK market;
- Renewable energy technologies including a air source heat pump used with a combi-boiler and solar thermal panels (manufactured in Washington) to heat water and photovoltaic panels (manufactured in Consett) to generate electricity;
- highly efficient kitchen appliances;
- UK manufactured mechanical ventilation system;
- Reflector blinds

The project aims to test out which measures are effective in cutting carbon emissions (by at least 80%) and saving money. The most efficient technologies will become part of best practice model for similar houses across UK to be upgraded. Monitoring will be carried out using and 'Envirologic' system. Isos Housing group manage the project, Envirohome have undertaken the retrofit and Northumbria University will undertake monitoring of how the tenant and her daughter adapt to the retrofitted house, comparing behaviour pre and post retrofit.

**Contact:** [Dr Kate Theobald](#) and [Sara Lilley](#), Sustainable Cities Research Institute (SCRI) School of the Built and Natural Environment, Northumbria University.

**Project blog:** <http://www.envirohomes.co.uk/blogs/isos-retrofit-for-the-future-.html>

#### **54. The Green Pyramid Rating System (April 2009-March 2010).**

Sustainable Cities Research Institute (SCRI) is working with the Housing and Building National Research Centre in Cairo to develop and validate a Green Code which will be used to rate sustainable buildings. A Green Pyramid Rating System has been developed to measure the sustainability of buildings using a range of indicators such as carbon, indoor air quality, heat loss and materials. Furthermore a routemap has been developed to assist architects and other consultants with sustainable design in Egypt. This, 'Sustainable Design Process Model' has been based on work already undertaken by Devereux Architects.

**Contact:** [Professor Dave Greenwood](#), Associate Dean (Research) in the School of the Built and Natural Environment, Director of Sustainable Cities Research Institute (SCRI), Northumbria University.

#### **55. Retrofit Reality project**

The project aims to learn lessons for the housing sector and establish what the situation is for landlords, customers, and product suppliers, in the challenge to meet the future retrofit programme. 139 of the properties Gentoo own and manage were selected for the study and energy efficient products were fitted to all or some of the homes: solar thermal panels, A-rated condensing combination boilers, energy efficient showers and double glazing. In addition another 40 homes were chosen to act as a control group for the behavioural study, which forms part of the whole project.

Retrofit Reality is being pioneered by Gentoo Green, the sustainability arm of the group, working together with Gentoo Construction and Gentoo Sunderland to implement the study. The research is being carried out with financial support from the Tenant Services Authority and the Low Carbon Buildings Programme. Gentoo are also working in partnership with Sara Walker and Kate Theobald, Northumbria University and are funding two PhD students for a period of three years to assist with the technical and behavioural aspects of the project.

**Contact:** [Dr Kate Theobald](#) and [Dr Sara Walker](#), School of the Built and Natural Environment, Northumbria University.

**Weblink:** <http://www.gentoosunderland.com>

#### **56. Evacuation modelling for extreme weather events**

Effective management of extreme events requires successful operation of complex, interacting human and technological systems. A dynamic agent-based model of flooding and evacuation processes has been developed to provide new insights which can be used for policy analysis and other practical applications. The model integrates remotely sensed information on topography, buildings and road networks with empirical survey data to fit characteristics of specific communities. The multiagent simulation has been coupled with a hydrodynamic model to estimate the vulnerability of individuals to flooding under different storm surge conditions, defence breach scenarios, flood warning times and evacuation strategies. A case study in the coastal town of Towyn in the United Kingdom has demonstrated the capacity of the model to analyse the risks of flooding to people, support flood emergency planning and appraise the benefits of flood incident management measures.

Contact: [Dr Richard Dawson](#), School of Civil Engineering and Geosciences, Newcastle University.

Weblink:

[www.staff.ncl.ac.uk/richard.dawson/FloodEventABMDemo/FloodEventABMDemo.html](http://www.staff.ncl.ac.uk/richard.dawson/FloodEventABMDemo/FloodEventABMDemo.html)

### **57. Quality Homes for Older People - Sustainable Energy Systems (2008 – 2011)**

This project focuses on a Knowledge Transfer Project designed to assist a local authority, North Tyneside Council, in the procurement of new and refurbished sheltered housing schemes. One of the key challenges for the local authority is how to build sustainable social housing which can reduce the vulnerability of user groups at risk from multiple environmental shocks such as climate change, resource depletion and disruption of energy supply. The procurement forms part of the authorities PFI housing project which at a total cost of £312 million over 30 years, is aimed at refurbishing and rebuilding all sheltered housing in the borough.

The KTPs aim is to develop strategies to reduce overall energy use and greenhouse gas emissions whilst maximising the potential for renewable energy in line with targets set out by central government and the local authority's policies. The project also aims to meet the Social Care targets of the authority by reducing the number of elderly people vulnerable to fuel poverty and extreme weather events such as heat waves and increasingly cold winters. One of the key outputs of the project is a Sustainability Evaluation Tool which can be used to improve the sustainability local authority of social housing.

**Contact:** Alex Hope, School of Built and Natural Environment, Northumbria University.

# **TRANSPORT AND HIGHWAYS**

### **58. High Value Low Carbon (ongoing)**

Founded by Matteo Conti and Stuart English, the High Value Low Carbon design unit at Northumbria School of Design is part of a consortium of vehicle manufacturers and their suppliers. To date they have worked with companies such as Nissan, Petec, Sanko Gosei, Labone, Thomas Swan and Bayer on a variety of projects. Depending on the project, as well as working with our dedicated HVLC team, our partners can collaborate with our undergraduate and postgraduate students and/or work with our Centre for Design Research to develop their concepts. This project aims to envisage new functional and experiential value made possible by the commercial development of electric vehicle platforms. In particular:

- To develop high quality interior design concepts for future electric vehicles.
- To demonstrate how printable electronic technology can provide added value concepts in vehicle design.
- To explore the integration of hi-tech on-board info-entertainment equipment such as: screens, Internet enabled computer, mobile phones, cameras, etc.
- To provide a high level of security through the on-board Internet connection.
- To envisage additional user benefits made possible by battery technology.
- To pilot collaborative arrangements prior to the commencement of a substantial LCV project
- To provide a conceptual focus for an ongoing collaborative project involving technology companies and suppliers to the automotive industry.

Current projects include:

- Avid CUE-V Exterior Design – Styling Project;
- ZET – Electric Motor-home - Developing the Next Generation Motor Home;
- Electric Vehicle Wireless Charging Concept;
- Electric Vehicle Intelligence – Advanced sat-nav systems which would also alert drivers when their battery power is running low;
- A Portable Electric Battery Carrier;
- Internet Access and in-car entertainment systems.

**Contact:** Stuart English, HVLC – Lead Design Manager, Centre for Design Research, School of Design, Northumbria University.

**Project website:** <http://www.highvaluelowcarbon.com/>

### **59. Smart grids and Electric Vehicle (EV) Infrastructure regional impact study (January – July 2011)**

Northumbria University will undertake a study of Electric Vehicle (EV) charging points and their interaction with the grid, which will help with planning future deployment. Resolving any potential problems requires taking appropriate measures from the early stages of deployment, which may include adequate design of the charging posts, active network control and smart grid solutions.

Electric power networks have evolved over the years where power flows from the high voltage side (where large centrally-controlled generators are connected) to the low voltage (LV) side of the network, where medium and small size loads are connected. The after

diversity minimum and maximum demands (daily, weekly and annually) of these loads are largely predictable and therefore, transformer tap changers, protection and network control have been set (centrally) to meet these demands. The increase in installed micro-generation and expected widespread deployment of electric vehicles (EVs) will alter the power flow in the grid; and this will have significant effect on the way power networks are operated and controlled.

Currently, micro-generation and proposed EV charging posts amount to only a small proportion of the total network capacity, hence their impact on the network performance is normally insignificant. However, the establishment of a local EV infrastructure, including 1300 charging points, in the north east is expected to enable large scale utilisation of EVs. Such deployment, particularly when it involves fast charging points or several charging posts in a small “electrical” area, can impact the distribution network. The impact would be more severe when considering the deployment of EVs in conjunction with the expected increase in number of micro-generators, heat-pumps, etc.

**Contact:** [Dr. Sara Walker](#), School of the Built and Natural Environment, Northumbria University. [Dr. Ghanim Putrus](#), School of Computing, Engineering and Information Sciences, Northumbria University.

#### **60. Electric Vehicle Accelerated Development in the North East - EVADENE (2009-2011)**

This project responds to this challenge and, initially centring on Newcastle-Upon-Tyne, will place 59+ varied electric vehicles on the road in the region. They will be supplied to taxi companies, Newcastle City Council Captured Fleet, Newcastle City Council employees, Newcastle resident’s car club and others. There will be 8 models and 7 manufacturers involved in the project, and the potential of £1billion sales revenue. Vehicles will be in operation at least 2 years under various ownership models.

Two projects are to be run in parallel, one funded by TSB will undertake vehicle related R&D whilst the second, funded by One North East will design and install monitoring and charging infrastructure (including integrated renewable generation and energy storage). The second project will also create an operating organisation to manage both projects, provide technical support, vehicle aftercare, investment, vehicle ownership options and long term promotional activity. It will also lead further expansion to accommodate several thousand vehicles and quickly link up with other networks. The combination of two parallel projects will increase national understanding of LCV and their implications and the infrastructure will provide a long term trialling and demonstration area. This will act as a market independent mechanism for accelerated regional and national deployment that will in turn lead to capacity growth and carbon savings.

Other project partners include: Smiths Electric Vehicles, (SEV) AVID, Nissan, Liberty Electric Vehicles (LEV), Think, Newcastle University, NEDL, Newcastle City Council, Tegrel/Romag, ONE North East/North East Science and Industry Council and Elektromotive.

**Contact:** [Professor Phil Blythe](#), School of Civil Engineering and Geoscience, Newcastle University.

### **61. Foot-LITE (2007-2010)**

The aim of the Foot-LITE project is to design a revolutionary in-vehicle information system to encourage safer and greener driving and long term behavioural changes. By means of innovative driver/vehicle interface systems and services, the Foot-LITE project aims to educate drivers by highlighting the impacts of particular driving styles in real time and by advocating behaviours which:

- Are safer
- Reduce congestion
- Enhance sustainability
- Help reduce traffic pollution emissions
- Reduce other social and environmental impacts

**Contact:** [Professor Phil Blythe](#) and [Dr Neil Thorpe](#), School of Civil Engineering and Geoscience, Newcastle University.

### **62. Thermal management of electric vehicle powertrains**

This is an external project funded by an EPSRC Case Award, in collaboration with HILTech, UK. The research has the overall aim of improving electric vehicle design and performance through improved thermal management of the powertrain components. It is concerned with novel approaches, and is anticipated to greatly add to the science and engineering base in this area. The objectives are to:

- Develop mathematical models to predict the heat flows around the system
- Test the mathematical predictions on prototype vehicles under practical, test track running conditions
- Propose new integrated design layouts which optimise the heat management throughout the system components, and which improve the cabin comfort through heating and air conditioning
- Develop and test the most promising conversion technologies, and data collection thereof
- Investigate the potential for cost-effective heat recuperation systems for electric vehicle powertrains.

**Contact:** [Dr Ahmed Elmarakbi](#), Department of Computing, Engineering and Technology, Digital Innovation Research Beacon, Sunderland University.

### **63. Zero emission transport (ZET).**

Funded by One North East, UK the ZET project provides a unique opportunity for local companies to showcase and develop technology in conjunction with the University of Sunderland. The emerging zero emission automotive sector is growing very quickly and the ZET project allows companies, along with universities, to:

- Learn from international exemplars
- Develop their own solutions to the problems surrounding this technology area
- Create innovative products for sale in this growing sector
- The project builds upon work carried out within the ECO2Trans project, and capitalises on the proposed National Low Carbon Vehicle R&D Centre planned for the Low Carbon Economic Area.

**Contact:** [Dr Ahmed Elmarakbi](#), Department of Computing, Engineering and Technology, Digital Innovation Research Beacon, Sunderland University.

#### **64. ICT for low-carbon vehicles: user experience and acceptance**

This is an external project. It aims to investigate user experience requirements and enhancements for electric vehicles, contributing to the user acceptability agenda, and identify and exploit the synergies between software and low carbon vehicles.

Among the issues the research team will look at are:

- Ergonomic, human factors, interfaces and operating systems of electric vehicles and associated infrastructure
- Innovative approaches to vehicle charging and charge monitoring
- Remote monitoring or control of electronic vehicles (i.e. from a mobile phone or home computer) with notification systems
- Useful ways to collect and utilise information such as usage rates, mileage covered, geographical spread, etc.

**Contact:** [Helen Middleton](#), Institute for Automotive and Manufacturing Advanced Practice (AMAP), Sunderland University

#### **65. Mobile Environmental Sensing System Across Grid Environments – MESSAGE (2009-2012)**

The impact of road traffic on local air quality is a major public policy concern. Recent research has sought to use a variety of vehicle-based, person-based and infrastructure-based sensor systems to collect data on key aspects of driver and traffic behaviour, emissions, pollutant concentrations and exposure. Existing technologies are becoming increasingly widespread, (e.g.: GPS vehicle based tracking, CANbus interfaces to onboard engine management system data) future developments will include the use of vehicles as platforms for outward facing environmental sensor systems, allowing vehicles to operate as mobile environmental probes, providing radically improved capability for the detection and monitoring of environmental pollutants and hazardous materials.

In addition UV sensing and nanotechnology based micro sensors for car parks are also being developed. These new technologies present new research challenges arising from the need to transmit, integrate, model and interpret vast quantities of highly diverse (spatially and temporarily varying) sensor data. The approach of this project is to combine and extend eScience, sensor positioning and modelling (data fusion, transport emissions, dispersion) technologies. By doing this the capability to model and predict a wide range of environmental pollutants and hazards (both transport related and otherwise) using a grid of pervasive roadside mounted sensors will be realised.

**Contact:** [Professor Phil Blythe](#) and [Professor Margaret Bell](#), School of Civil Engineering and Geoscience, Newcastle University.

**Weblink:** <http://research.cs.ncl.ac.uk/message/>

## **66. SAVE ME – Systems and Actions for VEHICLES and transportation hubs to support disaster Mitigation and Evacuation (2009-2012)**

Natural disasters (earthquake, floods, etc.), are becoming all the more frequent, and these disasters have obvious impacts to transport operations and means. Fires with the most serious consequences (involving injuries, fatalities or extensive infrastructure damage) have primarily been the result of tunnel accidents. Another great menace of our time is terrorism, and transportation infrastructures, hubs and stations are all targets of terrorist attacks.

SAVE ME aims to develop a system that detects natural (i.e. earthquake, fire, etc.) and man-made (i.e. terrorist attacks) disaster events in public transport terminals, vehicles and critical infrastructures (i.e. tunnels, and bridges) and support the quick and optimal mass evacuation guidance, to save the lives of the general public and the rescuers, giving particular emphasis to the most vulnerable travellers (i.e. children, elderly and disabled). All project developments are thoroughly and iteratively tested and optimised by lab tests as well as two in pilot sites, at a metro station in Newcastle and the Gotthard Strassentunnel (Switzerland).

Newcastle University are the co-ordinating partner for the SAVE ME consortium which is made up of 11 European partners, ranging from academic research institutes, infrastructure providers and emergency rescue organisations. Newcastle are also responsible for the Work Packages on Sensors and Localisation (Digital Institute) and Pilot Site Testing and Evaluation (TORG).

**Contact:** [Professor Phil Blythe](#), School of Civil Engineering and Geoscience, Newcastle University

**Weblink:** <http://www.save-me.eu/>

## **67. Niches+ - New and Innovative Concepts for Helping European Transport Sustainability – towards implementation**

The mission of NICHES+ is to promote innovative measures for making urban transport more efficient and sustainable, and to move them from their current ‘niche’ position to a mainstream urban transport application. To assist with uptake of niche concepts, NICHES+ has selected 7 ‘Champion Cities’: Glasgow, Daventry, Cork, Trondheim, Artois-Gohelle, Burgos and Warsaw.

NICHES+ aims to provide real help to these cities in order to implement urban transport innovations in the following thematic areas:

- accessibility to urban mobility options
- the use & efficiency of infrastructure & interchanges
- functionalities of traffic management centres
- automated & space efficient transport

The consortium and hand-picked international experts will get together to provide real added value and impact for the Champion Cities through:

- Networking opportunities: The NICHES+ Working Group meetings and further events to create a “NICHES community” of experts
- Publishing effective guidance for cities: Attractive brochures that include key information on how to successfully implement the selected urban transport innovations

Working with cities on the ground: NICHES+ will provide resources and support to the 7 Champion Cities, helping them to develop concrete implementation plans for NICHES+ concepts.

**Contact:** [Professor Phil Blythe](#), School of Civil Engineering and Geoscience, Newcastle University

**Weblink:** <http://www.save-me.eu/>

### **68. Remote asset inspection for transport corridor environments (2006-2009)**

The aim of this research is to improve the reliability, safety and profitability of transport networks through the identification of existing and potential slope stability hazards using integrated remote engineering surveying techniques. UK industry and government agencies have recently invested heavily in applying a number of remote sensing techniques to transport environments. The proposed research seeks to develop methods in which remotely sensed data can be utilised to perform intelligent analysis in transport corridor environments, namely by integrating high resolution airborne LiDAR, NIR digital imagery and terrestrial laser scanning.

**Contact:** [Professor Jon Mills](#), School of Civil Engineering and Geosciences, Newcastle University.

### **69. Electric vehicles**

In the UK transport is responsible for almost a third of the CO<sub>2</sub> emissions cars being one of the main polluters. Electric vehicles can significantly reduce this number when powered from clean energy. As well as reducing CO<sub>2</sub> electric vehicles will become more economical to run as fuel prices continue to grow. Further more electric vehicles promise to close gaps in intermodal chains. This year, electric vehicle sales are forecast to reach about 20,000 units worldwide, increasing to more than 500,000 units by 2015 and 1.3 million by 2020 which accounts for 1.8 per cent of the total number of passenger vehicles expected to be sold that year.

The North East is the spearhead in the manufacturing, development and research of electric vehicles. The first mass produced electric car, the Nissan Leaf, will be produced in Sunderland starting in 2013. The North East is also host to Smith Electric Vehicles, the world largest manufacturer of commercial electric vehicles. In addition the region includes Tier 1 and Tier 2 component suppliers for electric vehicles such as Avid, Sevcon , TPS and HiLTech and the Nissan battery plant. transportNewcastle supports all of these companies by providing innovative new ideas, class-leading solutions and highly skilled engineers. This makes the region unique in the UK and beyond.

transportNewcastle has more than twenty on-going projects on low-carbon vehicles with more than ten focussing on research in electric vehicles. For example the Switch EV project

is a TSB project that will see 49 electric vehicles on trial across the North East region from September 2010. transportNewcastle is also involved in the £7.8m fund to roll-out electric vehicle charging points across North East England allowing 1,300 charging points to be installed. Beside projects on the infrastructure and data collection of electric vehicles transportNewcastle is heavily involved in the research of components and systems such as energy storage, power electronics, machines and electric drives. For example, a step change in energy storage of batteries has been achieved recently in an EPSRC funded project giving electric vehicles 5 to 10 times the distance compared to today's range. Traction batteries can be replaced with fuel cells or supercapacitors. transportNewcastle is active in both areas. For example work on advanced high temperature fuel cell systems has just recently been completed and an international industrial consortium is funding research in a new device called Li-Ion capacitor allowing fast charging. transportNewcastle also provides a world leading service to the automotive industry for the research and development of advanced electrical traction drives and machines. It holds the £1m funded Centre for Advanced Electrical Drive serving customers like Toyota, Leyland Truck, Prodrive, Eaton and Ricardo to name a few. Work includes, for example, the design of a highly power dense power dc/dc converter using innovative circuit topologies and cutting edge cooling designs, high efficient electric motors using new materials, novel machine designs for high torque in-wheel motors and sophisticated control methods allowing down-sizing of drives and dc/dc converters.

**Contact:** [Dr Volker Pickert](#), School of Electrical, Electronic and Computer Engineering, Newcastle University.

## **70. Lightweight Vehicles**

With the rising economic and environmental pressures associated with the generation and consumption of energy, transport users and operators are increasingly considering the energy efficiency of their vehicles. One approach to reducing the energy consumption of a vehicle is to reduce its overall mass. Everything else being equal, a lighter vehicle will consume less energy in operation than a heavier one.

transportNewcastle is working with vehicle manufacturers to assist them with the design and manufacturing of lightweight structures. This includes the development of tools for the optimisation of vehicle components to ensure that they are fit-for-purpose without being over-designed. Other research areas include multifunctional components that perform the role of several (heavier) conventional components, and the application of lightweight materials such as advanced composites and sandwich structures.

A good example of transportNewcastle's work on lightweight vehicles is a train cab that was completed recently in collaboration with Bombardier Transportation. Conventional rail vehicle cab structures are typically based on welded steel assemblies, often with a thin non-structural fibreglass cover. They are therefore relatively heavy. Furthermore, current cab designs tend to be very complex, high part count assemblies with fragmented material usage. This is because they must meet a wide range of demands including structural loads, crashworthiness, missile protection, aerodynamics and insulation. Assembly costs are high, and there is little in the way of functional integration. By contrast, transportNewcastle's cab

is an innovative modular design based on advanced sandwich material technology. It provides all the required functionality within a single integrated package that is around 40% lighter than a conventional cab. Furthermore, the reduced mass and integrated nature of the cab's design yields savings in assembly and outfitting costs, as well as in-service reductions in energy consumption and operational costs.

**Contact:** [Dr Joe Carruthers](#), NewRail, Newcastle University

### **71. SUPERGEN III - Fuel Cells: Powering a Greener Future**

The SUPERGEN (Sustainable Power Generation and Supply) initiative is a program of research funded by the Engineering and Physical Sciences Research Council. The SUPERGEN initiative addresses the following key areas:

- The sustainable and efficient generation of electrical power from low carbon, zero-carbon or carbon neutral generation systems based on a life-cycle analysis.
- The distribution, control, monitoring, stability, supply and connection of electrical power or energy carrier. The evolution of alternative energy vectors, carriers, conversion technologies or generation systems

It aims to:

- Contribute to the UK's environmental emissions targets through a radical improvement in the sustainability of power generation and supply.
- Promote significant step change rather than incremental progress.
- Involve multidisciplinary partnerships working in major programmes of work rather than individual research groups working in isolation.

The following key tasks over the first four year lifetime of the consortium are:

- To produce a thick film Solid Oxide Fuel Cell with 'zero' leakage
- To significantly improve fuel cell durability by halving the present degradation rate
- To substantially improve the power density of existing fuel cells:
  1. HT-PEMFCs to match the performance of current low temperature PEMFCs,
  2. HT-SOFCs such that the performance at 750C matches present performance at 850C,
  3. IT-SOFCs such that the performance at 500C matches current performance at 550C.
- To enhance fuel flexibility to encompass both renewable and logistic fuels.
- To establish a dissemination, outreach and training program in fuel cell science and engineering.

**Contact:** [Professor Keith Scott](#), the School of Chemical Engineering and Advanced Materials, Newcastle University.

### **72. CleanER-D**

Clean European Rail Diesel (CleanER-D) aims to develop, improve and integrate emissions reduction technologies for diesel locomotives and rail vehicles.

The project was launched to tackle the technical challenges inherent in complying with the new emissions regulations. The quantitative target of the project is to achieve emission

levels within the limits established by the new European Directive 2004/26/EC, while evaluating the best possible innovative and hybrid solutions for a contribution to the reduction of CO2 emissions.

The project also anticipates that further regulation is likely and seeks to provide the sector with dynamic and innovative solutions for future applications. Keeping this in mind, the project will analyse hybrid technologies and their contribution to the reduction of energy consumption and CO2 emissions. In order to reach the goal of 'greening' diesel vehicles, the consortium's 26 partners from across Europe are putting forth a strong, collaborative effort. Newcastle University is the leader of the sub-project dedicated to the analysis of emerging technologies as well as major participant in the sustainability work and the research into on-board energy storage systems for hybridisation of railway traction as well as impact of alternative fuels. Newcastle University is the only academic institution sitting on the technical management and steering boards of this industry-led initiative.

**Contact:** [Roberto Palacin](#), NewRail, Newcastle University.

**Weblink:** [www.cleaner-d.eu](http://www.cleaner-d.eu)

### **73. Low Carbon Shipping – A systems approach**

We are endeavouring to reduce the carbon footprint of the entire maritime transport chain. The overall aim of the research project is to investigate holistically the complex relationships between shipping and emissions now and in the future, to 2050. The research project, 'Low Carbon Shipping – A systems approach' will help the shipping industry meet the recommended levels of emissions reduction required to avoid climate change. 90% of goods in the UK arrive by ship and there are estimates which suggest that shipping contributes 3.3% of man-made CO2 emissions. Scientists are concerned that by 2050 shipping's share of global emissions could rise significantly - potentially up to 20-30% and initiatives to prevent this rise are desperately needed. The identification of the best strategies for reducing the carbon emissions of the shipping sector requires a holistic understanding of how it functions technically, operationally and economically. Studies on individual topics will be integrated through a global model of shipping which will then be run under a range of foreseeable future scenarios (regulatory, fiscal, economic) to determine the likely costs and impact of a variety of methods to reduce shipping's CO2 emissions. This is a collaborative project, also involving researchers from UCL, Hull, Plymouth, and Strathclyde Universities, as well as many industry stakeholders.

**Contact:** [Professor John Mangan](#), School of Marine Science and Technology, Newcastle University.

**Weblink:** [www.lowcarbonshipping.co.uk](http://www.lowcarbonshipping.co.uk)

### **74. Switch EV (2009-2013)**

As part of the TSB's Ultra Low Carbon Vehicle demonstration project, the North east of England was awarded the SWITCH-EV project in 2009. Over the next three years electric vehicles from a number of suppliers will be demonstrated in the North East and evaluated by the Transport Operations Research Group at Newcastle University. The University has developed (in partnership with Comesys Europe) an in-vehicle data logger which records CAN-data from a vehicle's OBD and from the vehicle's battery management system. The

logger has been designed to take some external analogue and digital inputs. These inputs include GPS and time-stamp data as well as a number of analogue inputs from current-clamps which are attached to various electrical systems of the vehicle to measure current flow and battery drain. A built in GPRS data-link is used to transmit all the data (time and location stamped) to a server at Newcastle University, where the data from the vehicles is analysed and displayed on a GIS overlay.

**Contact:** [Professor Phil Blythe](#), School of Civil Engineering and Geoscience, Newcastle University

#### **75. Second generation 7.5t-127 diesel/electric hybrid truck**

The innovation of this project is related to the full-integration of the hybrid system into the vehicle architecture. By leveraging additional onboard generation capability existing mechanical components/systems can be deleted or downsized offsetting additional cost of hybrid system. This project will deliver a modular hybrid concept where the level of hybrid features can be tailored to meet requirements of specific markets segments.

**Contact:** [Dr Volker Pickert](#), School of Electrical, Electronic and Computer Engineering, Newcastle University.

#### **76. BE LOGIC (2008-2011)**

BE LOGIC is a collaborative project funded by the European Commission under FP7, which started on 1st September 2008 with duration of 30 months. The project aims to improve the quality and efficiency within and across different freight transport modes through benchmarking in logistics and co-modality. The benchmarking will be conducted in three areas of logistics: transport chain, terminals and policy. Such benchmarking is expected to strengthen the European SMEs through reconsidering their logistics performances in, among others, costs, reliability, service quality and environmental impact. The project will propose models for new logistics standards through examining existing standards and soliciting opinion from Delphi panel.

**Contact:** [Thomas Zunder](#), Research Manager, NewRail, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/newrail/research/project/2944>

#### **77. RETRACK (2007-2012)**

The EC has entered into a contract for the RETRACK consortium to research, develop and implement a rail freight corridor from Rotterdam to Constanza. In the RETRACK Consortium, new and upcoming European rail freight operators, experienced IT and training specialists and leading European research and development organisations have taken the initiative to design, develop and implement a new and innovative trans-European rail freight service concept, starting with the rail corridor Rotterdam to Constanza (Romania) and on to the Black Sea area and Turkey. The chosen trans-European corridor for RETRACK is an ambitious one, with a high potential for a modal shift of cargo from road to rail, creating an

effective and sustainable freight corridor between high growth areas in Western and Eastern Europe.

**Contact:** [Thomas Zunder](#), Research Manager, NewRail, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/newrail/research/project/1861>

## **78. SUPERGREEN**

The purpose of SUPERGREEN is to promote the development of European freight Logistics in an environmentally friendly manner. Environmental factors play an increasing role in all transport modes, and holistic approaches are needed to identify win-win solutions.

SUPERGREEN will evaluate a series of Green Corridors covering some respective regions and main transport routes throughout Europe. The adopted methodology involves the following steps:

- The selected corridors will be benchmarked based on parameters and KPIs covering all aspects related to transport operations and infrastructure. Based on the benchmarking exercise areas and conditions for improvements will be identified (i.e. bottlenecks);
- The next step will be to evaluate how green technologies may support improving the identified bottlenecks. Among the green technologies may be novel propulsion systems, alternative fuels, new cargo handling technologies, etc.
- The benchmarking is an iterative process which depends on "smarter" utilization of available information in the multi-modal chain (ICT-flows). An analysis will be made on how this information can be utilized to achieve greener logistics along the green corridors.
- Based on these iterative benchmarks and evaluations, new R&D within specific topics may be needed to improve the identified bottlenecks. Recommendations for future calls for R&D proposals will be made.
- Last but not least, the SUPERGREEN project will review and address the implications of alternative policy measures for green corridors, at both the Local and European Levels.

**Contact:** [Thomas Zunder](#), Research Manager, NewRail, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/newrail/research/project/3093>

## **79. BESTUFS II (2004-2006)**

BESTUFS II aims to increase the awareness of urban freight transport best practice for all those actors involved in its functioning and to stimulate innovative solutions that will enhance its sustainability, lower emissions and support sound modal choice in the urban area. Furthermore, it seeks to foster co-operation between domain experts, research institutions, urban transport operators and city administrations in order to encourage the identification and dissemination of City Logistic Solutions (CLS) that are considered best practice both within Europe and other parts of the world.

**Contact:** [Thomas Zunder](#), Research Manager, NewRail, Newcastle University.

**Weblink:** <http://www.ncl.ac.uk/newrail/research/project/1310>

**80. BESTFACT (2011-2015)**

BESTFACT, aka the Best Practice Factory, will develop a network of researchers and practitioners to identify, analyse and disseminate sustainable best practice in freight logistics in Europe through desktop research, workshops, focus groups etc.

**Contact:** [Thomas Zunder](#), Research Manager, NewRail, Newcastle University.

# HEALTH AND SOCIAL

### **81. Built Infrastructure for Older People's Care in Conditions of Climate Change (BIOPICCC) (January 2009-January 2012)**

The Engineering and Physical Sciences Research Council has awarded to Durham University and to Heriot-Watt University major grants totalling £713,000 for the BIOPICCC project, as part of a major research network funded by the Council on Adaptation and Resilience to a Changing Climate. The project will develop strategies to help ensure that the infrastructures and systems supporting the health and social care for older people (aged 65 and over) will be sufficiently resilient to withstand harmful impacts of climate change in the future, up to 2050.

We will map those parts of Britain which have large numbers of older people and are likely to be most affected by storms, floods and heatwaves. From these areas we will select a small number of case study areas where we will ask older people and their carers, including family and friends, and professional carers in health and social services about the services that are important to them. We will also discuss key parts of local systems for care of older people with other experts such as highway engineers, hospital estates staff, etc.

We'll be investigating our systems of care to see how they can stand up to the challenges created by climate change. We aim to build up a picture of what parts of the system are most likely to be disrupted by extreme weather and floods and what are the crucial things to aim to keep running effectively, and to assess different ways to plan and design services to withstand climate change effects.

The results from our project will be made widely available to other groups across Britain (see website for details) and in other countries who might want to make their own local assessments of how to adapt older people's care services to climate change.

**Contact:** [Professor Sarah Curtis](#), Department of Geography, Durham University

**Website:** <http://www.dur.ac.uk/geography/research/researchprojects/biopiccc/>

**Leaflet:** <http://www.dur.ac.uk/resources/geography/BIOPICCC/BIOPICCCflyerwebsite.pdf>

### **82. Air pollution and respiratory infections in the 1000 families cohort (2004-2009)**

In May and June 1947 all babies born in Newcastle upon Tyne were recruited into a prospective cohort study, the 'Thousand Families' study. This study was set up to investigate the extent to which infectious disease was undermining the health of infants in Newcastle, who had a high death rate in infancy and early childhood. The Thousand Families children were studied in detail until the age of 15 years, with the study team being notified of each child's illnesses, including all episodes of respiratory, alimentary and other infections by parents, GPs and hospital staff.

This cohort is therefore a valuable resource to aid in the identification and quantification of important risk factors for infectious respiratory diseases. The prospective nature of the study, and the fact exhaustive infections data are available from birth to age 15, as well as respiratory health data at age 50, provides a unique opportunity to assess the impact of early life experiences and infections on respiratory health in later life.

The original analysis of the Thousand Families study included an assessment of infectious disease incidence in infancy and childhood, and found that children from poorer families

were at greatest risk of severe respiratory infection in their first year of life, and that rates of severe respiratory infection were significantly higher among children living in over-crowded housing, children from lower social classes, and children with poor standards of maternal care. The original analysis also showed that children who had severe respiratory infection before the age of five were seven times more likely to develop chronic lung disease by age 15 years.

Our current work will utilise linear and logistic regression to provide a more in-depth analysis of the social and environmental determinants of respiratory infections in this cohort. The specific focus of this work is to investigate the impact of air pollution on respiratory infections in infancy and childhood, with future analyses potentially looking at the impacts of early life respiratory infections on respiratory health in later life.

**Contact:** [Dr Susan Hodgson](#), Institute of Health and Society, Newcastle University

### **83. A public health and safety risk assessment of allotment sites within Newcastle upon Tyne (2004-2009)**

During 1979 and 1998 Byker incinerator used waste derived fuel and coal, for district heating and power generation. Between 1994 and 1999 approximately 2,000 tons of ash from the Byker incineration was delivered to allotments throughout Newcastle for use on footpaths. Following publication of an investigation undertaken by Newcastle University into polychlorinated dibenzodioxins/polychlorinated dibenzofurans (PCDD/PCDF) and heavy metals in soil and egg samples from Newcastle allotments, the proposed series of staged site investigations was commissioned by Newcastle City Council. Such individual site specific risk assessments were agreed by Newcastle City Council as part of its action plan. For each allotment site where levels of PCDD/PCDF and/or heavy metals were shown to be elevated in the previous exploratory sampling programme, it is proposed that a staged investigation and risk assessment will be undertaken.

This project aims: to compile a staged site investigation and risk assessment report comprising the desk top study and intrusive investigation previously undertaken by Newcastle City Council for seven allotment sites in Newcastle; To undertake a desk top study, design and undertake an intrusive investigation and; compile a staged site investigation and risk assessment report for five allotment sites in Newcastle.

**Contact:** [Professor Tanja Pless-Mulloji](#), Newcastle Biomedicine, Newcastle University.

# **ENVIRONMENTAL SERVICES**

#### **84. Biological and engineering impacts of climate change on slopes - Bionics (2006-present)**

Climate change is likely to have a serious detrimental effect on huge parts of our infrastructure. There is as yet no strategy to facilitate the planning required to act upon it. BIONICS will enable the effects of climate change on infrastructure slopes to be deduced by establishing a unique facility consisting of a full-scale, instrumented soil embankment, planted with a variety of flora with controlled heating and rainfall at its surface. It aims to establish a database of high-quality embankment performance data to enable future research into the interaction of climate, vegetation and engineering on the behaviour of infrastructure earthworks. It is also to extend modelling capability to examine the long-term effects of climate change on serviceability limits of embankments and develop a methodology for identifying vulnerable parts of the transport infrastructure. It will establish a database of embankment performance data and develop the necessary skills to enable future research so that engineering solutions to the effects of climate change can be devised.

The specific objectives of the project are to:

- Build and monitor an embankment representative of UK infrastructure subjected to different climates
- Plant and monitor representative vegetation subjected to different climates
- Create a controlled climate
- Set up and run validated computer models under present and future climates to predict the embankment performance
- Develop a methodology to identify parts of the UK infrastructure that require further investigation
- Formulate a medium to long term research strategy, including some specific needs-based 'spin-off' projects.

**Contact:** [Dr Stephanie Glendinning](#), School of Civil Engineering and Geosciences, Newcastle University

**Weblink:** <http://research.ncl.ac.uk/bionics/index.htm>

#### **85. Integrated Management of European Wetlands (IMEW)**

The IMEW Project was a cross cultural endeavour which used a holistic, comparative and multi-disciplinary approach. It addressed important issues of biodiversity maintenance. Wetland inhabitants and international, national and local organisations were among the stakeholders involved in this collaborative project (see links). The purpose of the research was to solve actual or perceived conflicts within a sustainable development framework. This project made an important contribution to the EU research programme Human Dimensions of Environmental Change.

Primary data collection for the Integrated Management of European Wetlands took place between 2001 - 2004 in the following areas:

- Danube, Delta, Romania
- Kerkini Lake, Greece

- Nemunas Delta, Lithuania
- Saimaa Lakes, Finland

Cross-cultural synthesis of the data took place primarily at the University of Durham, England.

**Contact:** [Dr Sandra Bell](#), Department of Anthropology, part of the Anthropology in Development research group, Durham University.

**Website:** <http://www.dur.ac.uk/imew.ecproject/>

### **86. Waste of the World (Overall programme from 2006 to 2011; Projects 1 and 2 from 2007 to 2009; project 3 from 2007 to 2010)**

The Waste of the World project comprises six projects, the following three of which are based at Durham:

Project 1 examines how ships are broken-up, in different ways, under different regulatory regimes, and with what implications for the ways in which wastes are treated, generated and disposed of. It achieves this through two case studies of shipbreaking, in Hartlepool (England) and Chittagong (Bangladesh).

Project 2 provides an examination of the international trade in nuclear wastes from the 1950s to the present day, and an analysis of how used nuclear fuel is moved around the world and within one nuclear reprocessing plant.

Project 3 examines the ways in which materials and waste are generated in the processes of steel manufacture in different parts of the world (NE England, India and the US); how production processes have been altered to minimise waste; and strategies to revalorise waste.

**Contact:** [Professor Ray Hudson](#), Durham University.

**Website:** <http://www.thewasteoftheworld.org/>

### **87. Land and sea-level changes around Britain**

This project uses a wide range of field and analytical methods to reconstruct coastal environments over the last 18000 years and relate the sediments to sea level at the time of their formation. Field sites include East coast of England, Western Scotland.

**Contact:** [Dr Jim Innes](#) and [Professor Ian Shennan](#), Quaternary Environmental Change (QEC) research group, Department of Geography, Durham University

### **88. Landslide assessment and flood erosion risk from the North Yorkshire floods**

Assess the impact of the flood in terms of the sediment contribution from peat mass movements and shallow mineral landslides; and their link with channel erosion and sedimentation; Quantify the amount of sediment removed by detailed morphological survey; map the extent of valley flooding and compare to the Environment Agency flood

extent predictions and recent flood diffusion wave models; correlate erosion and sedimentation patterns with rainfall intensity measured by rainfall RADAR4.

**Contact:** [Dr Jeff Warburton](#), Department of Geography, Durham University.

### **89. ROBUST: regeneration of Brownfield Using Sustainable Technology**

ROBUST is a five year £1million project to engage with local communities to reclaim low-value brownfield sites to improve their local environment and quality of life.

**Contact:** [Professor Clare Bamba](#), Department of Geography, Durham University.

### **90. BICCO Net - the Biodiversity of Impacts of Climate Change Observation Network**

A considerable range of monitoring schemes exist that provide data of potential use for assessing the effects of climate change on UK biodiversity. However, there is no current centralised collation or reporting structure in place for the provision of this information to policy-makers. Key monitoring data sets, covering a range of terrestrial and coastal taxa and habitats, have been brought together under BICCO-Net. Using a combination of statistical analysis and qualitative assessment, those species, communities and habitats that are most likely to be impacted by climate change in the UK will be identified. Additionally, BICCO-Net is where the latest published information on the impacts of climate change on UK biodiversity is available through climate change publications.

The BICCO-Net project brings together a range of expertise to address these issues through a co-ordinated approach. Some of the most comprehensive biodiversity monitoring data sets in the UK have contributed to the BICCO-Net database, covering a wide range of taxa, including aphids, bats, birds, butterflies, common plants, larger mammals, moths and trees. BICCO-Net will thus provide a comprehensive and powerful tool for assessing climate change impacts.

Output from BICCO-Net will inform the development of adaptation strategies by enabling an adaptive management approach, refining techniques in the light of emerging evidence. The findings of the project will thus have a significant influence on climate change adaptation policy and future strategies for monitoring climate change impacts.

**Contact:** Institute of Ecosystem Science (IES), Durham University

**Website:** <http://bicco-net.org/>

### **91. What are the true limits for the anaerobic treatment of domestic wastewater (2009-2012)**

The need for carbon neutral or negative wastewater treatment technologies has prompted a re-examination of the use of anaerobic systems to treat domestic wastewater at ambient temperatures. Low temperatures are known to impede or stop the production of methane and/or the initial hydrolysis and fermentation that must take place in all systems as waste begins to breakdown. The true temperature limits of such systems are not currently known. Preliminary evidence from previously conducted arctic field work and literature suggests that adequate rates of methane production may be achievable as low as 5°C. The project hopes to determine the true limits of anaerobic digestion by comparing the performance reactors seeded with cold adapted and non cold adapted organisms at a variety of

temperatures. Whether there is a psychrophilic community (i.e. a methanogenic bacterial community capable of thriving at low temperature) will be determined by identifying, isolating and characterising representatives of the key functional groups in these communities. The putative cold adapted communities will be challenged, to gain insight into their robustness in warmer conditions. This would be done by feeding the reactors wastewater which mimicked the seasonal affect of temperature. The project also hopes to make preliminary estimates of the minimum size of anaerobic digesters treating domestic wastewater with or without low temperature adaption. If this project proves the ability of methanogenic (methane producing) bacteria to function in ambient temperatures it could be of strategic importance to the UK water industry and all temperate countries and a valuable piece of technology for the transition to a low carbon economy. However, even assuming the success of the project there remains much work to be done to make this technology a reality.

**Contact:** [Professor Tom Curtis](#), School of Civil Engineering and Geosciences, Newcastle University.

## **92. North Tyneside Waste Project (NTC project) (2008-2010)**

The project aims to improve the general efficiency of waste collection services provided by North Tyneside Council with a focus on biological municipal waste/compostable waste, this is in order to ensure compliance with targets for a reduction in biodegradable municipal solid waste going to landfill. The project will follow the 6 point plan presented below in order to achieve its objectives. It will:

- 1) Review current practices with respect to quality and quantity of material collected.
- 2) Suggest short term cost savings for the current MSW collection practice by rationalising the collection process (e.g. changes to frequency, source segregation routes vehicles etc)
- 3) Evaluate current status and future capability of NTC's composting systems. (Currently NTC uses windrow composting to treat mainly green waste) Future waste treatment may involve the construction of new Biodegradable Municipal Waste (BMW) treatment technologies, but which still utilise existing facilities as an integral part. Waste material flows would be quantified and characterised for their compostability.
- 4) Evaluate and justify possible BMW treatment options, it will also work to develop the investment strategy for the provision and ownership of the most appropriate treatment technology. This will be done via the production of a technical review document giving technology comparison and ranking of process options, tender specifications, process selection report, pilot trial methods statement.
- 5) Design the Pilot Trial of preferred BMW treatment process; including start up conditions and full scale operating conditions of desired plant.
- 6) Procurement of preferred BMW treatment process. This will lead to the Final Tender documents and formal Planning Application.

**Contact:** [Dr Paul Sallis](#), School of Civil Engineering and Geosciences, Newcastle University.

### **93. Proactive (2005-ongoing)**

A range of projects involving approaches to intervene in the environment to improve water quality, reduce flood risk and diffuse pollution, recycle waste and introduce renewable energy generation into farming. Mainly based in the north-east.

**Contact:** [Dr Paul Quinn](#), School of Civil Engineering and Geosciences, Newcastle University

**Weblink:** <http://research.ncl.ac.uk/ig/Proactive/Proact.html>

### **94. ARCTIC CLIMATE CHANGE 1750 TO 1850: new insights from old documents (ARCDOC) (March 2011-March 2014)**

Although not directly related to local activities and environmental decision-making, this project has wider implications that might filter down to local and regional level. This project will use contemporary ships' logbooks, documents and climate records from the period 1750 to 1850 to reconstruct Arctic climate and ice cover variations in this key period. It will provide a clearer picture of climate variations in the pre-anthropogenic period. This enables more confident predictions to be made of future changes. These are, of course, global and regional scale considerations, but the finding may well have implications at smaller and more local scales with respect such issues as climatic change and sea-level rise.

**Contact:** [Dr Dennis Wheeler](#), Faculty of Applied Science, Sunderland University.

### **95. Future Recyclates Planning for North East Local Authorities: Critical Appraisal (March – November 2010)**

The aim of this project was to review the current situation with kerbside collections of recyclate material by local authorities in the North East, and in particular to identify potential opportunities to utilise recyclate materials based on the composition of current and future markets.

This research was carried out as part of a series of ILG pathfinders. The research was initiated by the Waste and Environment Programme Board for the ILG in response to concerns about the adverse impacts that the recent global economic downturn have played on the market values of various recyclable commodities, which, in turn, have affected the validity of contracts that were in place. This piece of research therefore investigated ways to build future resilience for recycling activities. The study focused on kerbside recyclates collected by the 12 NE LAs, particularly paper, card, plastics, metals and glass. The following were taken as the key objectives of the research:

- To undertake a recycling audit involving the collection and validation of data to quantify the current and potential supply of recyclate materials from LAs in the NE;
- To undertake a feasibility study into the options for regional recycling, identifying current and underutilised capacity for recyclate reprocessing. Where regional solutions were absent, best practice from neighbouring regions was explored;
- Establish the effect that waste reduction strategies may have on the future supply of recyclates;
- Provide a critical assessment of current commodity markets (regional, national and global); and

- Provide recommendations for LAs to develop efficient and robust recycle policies for the future.

**Contact:** [Professor Eric Senior](#), Director of Clean Technologies & Environmental Man Centre - CLEMANCE, School of Science & Engineering, Technology Futures Institute, Teeside University

#### **96. DART Dynamic response of the forest–tundra ecotone to environmental change (April 1998 - December 2002)**

The overall objective of our research is to increase understanding of how the Fennoscandian forest–tundra ecotone may respond to the combination of climatic and land-use changes it is likely to experience during the next century. We have formulated hypotheses relating the potential response of the tree line to changes in snow cover, summer warmth and grazing pressure, as well as to seed dispersal. We also hypothesise that:

- the tree line has been relatively insensitive to past climate changes, such as the ‘Little Ice Age’;
- the impacts of climatic change may differ with latitude; and
- invasion of tundra by trees will result in changes in the soils that will potentially alter the exchanges of carbon dioxide and methane with the atmosphere, as well as affecting the quantity and quality of water reaching rivers and lakes.

We are carrying out a series of experiments at the three primary research sites shown on the map by red squares (1. Dovrefjell; 2. Abisko; 3. Iešjávri). Additional experiments are being performed at two secondary sites shown on the map by magenta dots (4. Vassijaure; 5. Seiland), and a series of complementary studies are being performed at two further secondary sites (6. Kevo; 7. Tärna-fjället). Our experiments and other studies are designed to test our hypotheses and to provide data that will be used to construct a computer model able to simulate tree line response to various combinations of climatic and land-use change.

**Contact:** [Professor Brian Huntley](#), Environmental Research Centre, University of Durham.

**Weblink:** <http://www.dur.ac.uk/DART/>

#### **97. River Tyne sediment management (2010-ongoing)**

Investigation of origins and options for long term management of metals-polluted water and sediments in the River Tyne.

**Contact:** [Dr Adam Jarvis](#), School of Civil Engineering and Geosciences, Newcastle University.

### **98. UKCIP Weather Generator (2008-2010)**

UKCIP provides pdfs of change factors of multiple weather variables derived from the MOHC multi-model perturbed physics ensemble. The WG provides the facility for realising ensembles of time series of rainfall, temperature and other variables from these change factors. The User Interface will allow users to select a time period and emissions scenario for any 5km grid square in the UK and generate series at daily or hourly resolution. Recent developments to the WG allow a better representation of urban areas.

**Contact:** [Professor Chris Kilsby](#) School of Civil Engineering and Geosciences, Newcastle University.

**Weblink:** <http://ukclimateprojections.defra.gov.uk/content/view/858/500/>

### **99. CityCAT (2010 – ongoing)**

A novel and unique software tool for modelling, analysis and visualisation of urban surface water flooding and flood alleviation measures has been developed and demonstrated. CityCat (City Catchment Analysis Tool) is based on an existing state-of-the-art 2-D hydrodynamic model developed at Newcastle University and for the first time provides such advanced software in a user friendly, interactive and visual environment. The project was funded by the Environment Agency's Local Levy (raised by the Northumbria Regional Flood Defence Committee). The specification for the tool is a combination of several conflicting demands currently not met by any existing software:

- Accuracy of representation of complex and dynamic surface flow for urban floods;
- Speed, ease of use and visualisation for rapid scoping studies;
- Capability for rapid introduction and testing of flood risk management interventions by personnel with limited modelling expertise;
- Rapid applicability to any UK city using standard GIS data sets.

The tool has been set up and simulations performed for a city-centre application in Newcastle upon Tyne. Two flood situations and interventions have been demonstrated:

1. Pluvial flood: generation and propagation of a flood arising from a design storm before and after introduction of “green roof” storage on buildings;
2. Surface flood propagation across the domain before and after introduction of flow barriers routing the flood away from a high risk area.

The next stage of the project is user testing after which there is clearly great potential for future development including further flood alleviation features, rainfall inputs from climate change scenarios and combination with sewer flow models.

**Contact:** [Professor Chris Kilsby](#) School of Civil Engineering and Geosciences, Newcastle University.

### **100. ECLISE: Enabling Climate Information Services for Europe (2011-2014)**

Climate and climate change has high impact on society. Better understanding and improved prediction skills of future weather and climate is vital to protect lives, goods and infrastructures. Different sectors of society and infrastructure are more or less designed to accommodate the current level of climate variability. The prospect of a changing climate necessitates adapting these designs. To prevent high costs, it is of paramount importance

that the most reliable and accurate climate information is used to underpin the development of new adaptation strategies.

In response to this need, climate scientists, in close cooperation with climate impact specialists, have started to generate and provide information on future climate projections, aimed at supporting adaptation policies. These efforts are often organized at a national level and, at present, differ considerably in the methods used and the level of user involvement. It has been recognized (WMO-WCC3, EU White paper on Adaptation) that coordination of climate services at an international level would greatly advance the benefits of climate science for adaptation policies. This effort must find a way to deal with the strong local nature of climate impacts and adaptation needs.

The central objective of ECLISE is to take the first step towards the realisation of a European Climate Service. ECLISE is a European effort in which researchers, in close cooperation with users, develop and demonstrate local climate services to support climate adaptation policies. It does so by providing climate services for several climate-vulnerable regions in Europe, organized at a sectorial level: coastal defence, cities, water resources and energy production. Furthermore, ECLISE will define, in conceptual terms, how a pan-European Climate Service could be developed in the future, based on experiences from the aforementioned local services and the involvement of a broader set of European decision makers and stakeholders.

**Contact:** [Dr Hayley Fowler](#), [Dr Sean Wilkinson](#), [Dr Steve Blenkinsop](#) and [Mr Aidan Burton](#), School of Civil Engineering and Geosciences, Newcastle University.

**Weblink:** <http://www.ceg.ncl.ac.uk/water/research/projects/eclise.htm>

#### **101. FORCE – Future of Reefs in a Changing Environment (Jan 2010 – May 2014)**

Within this large FP7-funded project, several work packages are exploring climate-change impacts on coral reefs in the wider Caribbean. The work at Newcastle is focused on analysing the ecological consequences of coral loss through climate-driven coral bleaching and other events including cyclones. Hard corals are important for the coral reef ecosystem in several ways, not least in providing much of the physical foundation of the ecosystem itself. Extensive field work in 10 locations around the Caribbean combined with existing data is allowing analysis of how coral-reef biodiversity (both fish and benthic cover) relates currently to reef habitat complexity at different scales (local, within-country and among country) and how these relationships may have changed at particular sites over time. One idea is to input to ecosystem models and advise how this fragile biodiverse ecosystem can be managed in future, in the face of climate change and other broad-scale environmental and social factors, including governance.

**Contact:** [Prof. Nicholas Polunin](#), School of Marine Science & Technology, Newcastle University.

**Weblink:** [www.force-project.eu](http://www.force-project.eu)

**102. The responses of marine invertebrates to anthropogenic CO<sub>2</sub>-induced ocean acidification (2009-present).**

The uptake of anthropogenic CO<sub>2</sub> by ocean surface waters is causing seawater pH to decrease. This process is termed ocean acidification. This project constitutes four PhD studentships focused on the responses of marine invertebrates to ocean acidification, both as a standalone environmental stressor and in combination to other anthropogenic contaminants. The four integrated studentships are as follows:

- Sensitivity and predicted population level effects of CO<sub>2</sub>-induced ocean acidification in harpacticoid copepods.
- Determining the impacts of ocean acidification on reproductive and developmental fitness of polychaete worms.
- Assessment of combined effects of ocean acidification and metal toxicity on selected marine invertebrates.
- How will ocean acidification affect the response of marine invertebrate sperm to endocrine disrupters?

**Contact:** [Dr Gary Caldwell](#), School of Marine Science and Technology, Newcastle University.

**103. Immediate geomorphological impact and fluvial system response to the Cumbria floods.**

Between November 18th - 20th 2009 Cumbria, NW England was hit by an exceptional precipitation event producing an unprecedented total of 372 mm of rainfall. Over the 24 h period between November 19th-20th alone, 313 mm of rain fell at Seathwaithe. This was equivalent to a month's precipitation and set a new UK record (Met. Office, 2009, previously 279 mm). The flood was the biggest event recorded in this region and had major consequences for population and infrastructure over a large area, as well as involving loss of human life. Due to its system-wide impact, the November 2009 flooding in Cumbria presents an unparalleled opportunity to gain insight into the controls on, and impact of, an extreme flood within upland, lowland parts of a large catchment. This project aims to examine the whole river corridor of the river Derwent from the headwaters, through Bassenthwaite Lake to the Lowland agricultural/urban catchment identifying key impacts and linkages. Quantifying erosion and sedimentation during extreme events is crucial so that effective hazard management can be undertaken in the short term and long-term spatially targeted management strategies devised. To achieve this, field-data must be collected in the immediate aftermath of the event to ensure essential features of the event are fully documented. Our main objectives are to produce a rapid, structured field inventory of the immediate geomorphic impact of rainfall and flooding on fluvial systems within the River Derwent river corridor along a headwater to coast transect; provide a rapid geomorphic assessment of the role of scour and sedimentation in the vicinity of bridges to discriminate factors influencing bridge collapse and so inform future design practice; identify areas of risk for remobilisation of flood-deposited sediments; delivery of hillslope sediments and hotspots of erosion in the River Derwent to identify zones at risk from future flood events and; work with project partners (EA and LDNPA) and local stakeholders in designating catchment zones that are 'at risk' from erosion and sedimentation.

**Contact:** [Dr Stuart Dunning](#), School of Built and Natural Environment, Northumbria University.

#### **104. Southern High Latitude Vegetation Response to Rapid Climate Change at the Cenozoic Greenhouse to Icehouse Transition.**

As a result of continuous burning of fossil fuel, the global environment is facing a crisis stemming from rapidly rising concentrations of carbon dioxide and other greenhouse gases in our atmosphere. Assuming greenhouse gas emissions at or above current rates, carbon dioxide will reach nearly triple the pre-industrial concentrations by the end of this century. This is expected to raise global mean temperatures to a level not seen for more than 32 million years. According to the latest assessment of the Intergovernmental Panel on Climate Change, the high latitudes will experience the largest temperature increases, resulting in a rapid melting of polar ice-sheets and global sea level rise. For a further understanding of potential changes that our world may undergo in the future, it is vital to study environmental changes during past warm periods and across major climatic thresholds. The proposed research project will reconstruct past vegetation of Antarctica and southern Australasia during the Eocene (ca 55-34 million years ago). The Eocene is a geological time period of exceptional warmth, with atmospheric CO<sub>2</sub> concentrations exceeding triple the pre-industrial levels. The project will reconstruct past vegetation by analysing pollen in sediments deposited during Eocene times. Vegetation provides detailed information on a number of important environmental parameters, such as annual temperature and precipitation, length of growing season, minimum and maximum temperatures, and soils. Of particular interest for this study are very short-lived time intervals during the early and late Eocene, during which carbon dioxide concentration and temperatures changed rapidly. For a full understanding of their climate forcings and mechanisms, the analysed sediments must have a high time resolution and unambiguous dating control, in order to relate them to respective past climate events. The marine cores 1171 and 1171, taken offshore Tasmania as part of the International Ocean Deep Drilling Programme Leg 189, as well as Eocene rock outcrops at Cape Foulwind in New Zealand, have been chosen for the proposed study, as they provide an unprecedented opportunity to produce high resolution pollen records for Antarctica and adjacent sub-polar regions. The data will be interpreted in a global context and related to Arctic palaeoenvironmental reconstructions by integrating them into the global GIS database TEVIS (Tertiary Environment and Vegetation Information System). The TEVIS dataset will be compared with a number of simulations using the cutting edge Hadley Centre climate model (used within the climate assessment reports of the Intergovernmental Panel of Climate Change IPCC). By combining regional high-resolution pollen analyses with global data-model comparison, this proposed study will foster a deeper understanding of how the terrestrial environments and polar ice sheets responded, and might respond in the future, to rapid changes in temperatures and atmospheric CO<sub>2</sub> concentration. By indicating weakness and strength, the data-model comparison will also contribute to the improvement of climate models that we rely upon for simulating future climate change.

**Contact:** [Dr Ulrich Salzmann](#), School of the Built and Natural Environment, Northumbria University.

# **BUSINESS**

**105. Climate change - impact of weather and other seasonal factors on stock returns.**

Climate change - impact of weather and other seasonal factors on stock returns (more information to add when this is received).

**Contact:** [Professor David Barr](#), Durham University Business School.

**106. Investigating the Practicalities, Benefits and unintended effects of localising food production (2007-2009)**

DEFRA funded project investigating the benefits and practicalities of local food production. The notion behind the rising demand of local food, is that production is less environmentally damaging than larger scale, more centralised production, due to shorter transport routes – lower ‘food’ miles. The project involved case studies of 30 food supply chains, from ‘local’ to larger scale examples.

**Contact:** [Professor David Oglethorpe](#), Logistics and Supply Chain Management group, Newcastle Business School, Northumbria University.

**Case study document:** [www.newcastlebusinessschool.co.uk/documents/CaseStudy10.pdf](http://www.newcastlebusinessschool.co.uk/documents/CaseStudy10.pdf)

**107. Mapping supply chain carbon footprint**

Logistics and Supply Chain Management experts at Newcastle Business School, Northumbria University have partnered with industry for a project that will identify the total carbon footprint of pig and poultry products from the production of feed right through to the retailer's store shelf.

**Contact:** [Professor David Oglethorpe](#), Northumbria University Business School

**Case study document:**

<http://www.newcastlebusinessschool.co.uk/documents/CaseStudy9.pdf>

**108. Reverse Logistics and Waste Routing**

An increasing interest is being taken into how vehicle efficiency can be improved by combining product out and waste in vehicle routing, especially in the food sector where there is significant pressure to reduce food waste.

**Contact:** [Dr Gu Pang](#), Newcastle Business School, Northumbria University.

**109. Disseminating ideas with the power of tale (November 2010-August 2012)**

Storytelling in managerial practice is of contemporary interest to organisational scholars, managers and management consultants. The underlying assumption is that storytelling is an effective means of communication. The role and purpose of spontaneous organisational stories has been researched, but the dynamics of purposive managerial storytelling, its implications on the firm and its limits in daily practice are largely unknown. Recent claims of the power and effectiveness of purposive storytelling in managerial practice may therefore be inflated.

This research investigates the use of storytelling in managerial practice as well as its effectiveness and appropriateness in a comparative case study design. The focus is on the use of stories in two UK service organisations, one of which uses storytelling explicitly and one of which does not, in order to establish whether and how coal-face practice differs. The main data collection method of this qualitative, interpretive and inductive study is in-depth interviewing to investigate managerial motives and techniques as well as employee perceptions and reactions. This research will provide a framework for understanding the use of managerial storytelling and will further the current knowledge base by revealing the dynamics and limits of storytelling in managerial practice.

**Contact:** [Dr Stefanie Reissner](#), Newcastle University Business School.

**Website:** [www.managerial-storytelling.com](http://www.managerial-storytelling.com)

**RESEARCH CENTRES  
UNDERTAKING CLIMATE  
CHANGE RESEARCH IN NORTH  
EAST UNIVERSITIES**

# DURHAM UNIVERSITY

## 1. Centre for Research into Earth Energy Systems (CeREES)

CeREES research is focussed in the following areas:

- Petroleum Geoscience
- Clean Coal
- Carbon Capture and Storage
- Geothermal

CeREES is one of the only research centres in the UK to have expertise in all areas of Geo-Energy. When the centre began it was focused on Petroleum Geoscience, but has now expanded to include Oil and Gas, Unconventionals, Coal, Carbon Capture & Storage and Geothermal Energy. Primary energy supply and security issues are at the heart of research within CeREES, tackling the problems that will allow clean sustainable energy supply to be delivered for our planet today and for generations to come.

**Contact:** [Professor Jon Gluyas](#), Professor in CCS and Geo-Energy, Director of CeREES in the Department of Earth Sciences.

**Weblink:** <http://www.dur.ac.uk/cerees/>

## 2. Durham Energy Institute

Durham Energy Institute is a leading UK energy research institute. Based-upon success at winning research funding it is one of the UK's leading university research communities in at least five energy disciplines: offshore wind, photovoltaic's, carbon capture and storage, electricity transmission and smart grids. They have strong capabilities in technologies for fusion energy and biofuels. The Institute link societal research to these technology areas.

The Durham Energy Institute draws upon its existing considerable knowledge base, skills and expertise to:-

- promote technical scientific excellence in energy science.
- solve technological-social problems associated with energy provision, demand and use.

DEI aspire to initiate the behavioural step change required for society to realise a low carbon future; in the process establishing DEI as an internationally leading institution which is recognised worldwide as a centre for integrating energy science with society.

**Weblink:** <http://www.dur.ac.uk/dei/>

## 3. Institute of Ecosystem Science

### Department of Biological and Biomedical Sciences

The Institute of Ecosystem Science (IES) at Durham University carries out a comprehensive research programme that provides insights into ecosystem patterns, processes and functioning in a changing world that help inform society about issues of global importance and assist mitigation of the adverse affects of anthropogenic environmental changes. The studies carried out especially address issues relating to: climate change impacts; biodiversity

conservation; ecosystem health and the provision of ecosystem services; and the health of the human population. IES is a leading international authority in the modelling of the geographical distributions of plants and animals, particularly with respect to climate change.

Much recent IES research is tied to the role of climate and habitat in determining species distributions. A major emphasis is examining the effects of environmental change, particularly global climate change, on ecosystems and the mechanisms by which environmental change acts upon species. In addition, how environmental change impacts upon factors such as biodiversity and causes range shifts in both native and invasive species is a key research component.

**Contact:** [Dr. Bob Baxter](#) Institute of Ecosystem Science, Department of Biological and Biomedical Sciences, University of Durham, UK

#### **4. International Landslide Centre**

Established in March 2003 to undertake fundamental research into landslide problems worldwide; provide direct assistance to communities affected by landslide disasters; assist in the development of capability to cope with and mitigate against landslides in less developed countries.

**Contact:** [Professor Dave Petley](#), Director, International Landslide Centre, Department of Geography.

**Weblink:** <http://www.landslidecentre.org/index.html>

#### **5. Institute of Hazard, Risk and Resilience**

##### **Department of Geography**

The Institute of Hazard, Risk and Resilience is harnessing the capacity of researchers from across Durham University to make a difference to how we live with emerging hazards and risks. Making a difference means moving beyond what we already do, to challenge the core assumptions, scientific, economic and social, about how we live with hazard and risk. This can only be done through critical engagements that bring together researchers from across the Natural and Social Sciences, Engineering, Health and Humanities.

Our activities are housed in a purpose-built building with a dedicated staff, generously funded by private benefactions and University investments, as well as from industry, government, NGOs and research councils.

The core objectives guiding the Institute are the following:

- Establishing academic leadership in fundamental understanding of hazard and risk.
- Developing new concepts and approaches to hazard and risk through interdisciplinary research and novel collaborations.
- Undertaking research that supports social and environmental resilience, especially in less developed countries.
- Developing anticipatory models of risk governance capable of interacting with policy and innovation processes in real-time.
- Supporting and training the next generation of hazard and risk researchers.

- Informing policymakers, industry and non-governmental organisations at regional, national and international levels.

**Weblink:** <http://www.dur.ac.uk/ihr/>

## **6. Wolfson Research Institute**

The Wolfson Research Institute conducts research on human health and well-being. The Institute brings together researchers from across almost all of Durham University's academic departments, along with their national and international networks. It seeks to improve health and the quality of people's lives by informing policy and practice.

The Institute has a particular commitment to the health and well-being of people living in the North East of England. There are strong relationships with the National Health Service and local government, and a flourishing programme of collaborative research. International health is a key interest. This includes studies of immigrant populations in the UK as well as work that identifies risks, and seeks improvements, to the health of populations in other countries, especially the developing world

**Contact:** [linda.crowe@durham.ac.uk](mailto:linda.crowe@durham.ac.uk)

**Weblink:** <http://www.dur.ac.uk/wolfson.institute/>

# NEWCASTLE UNIVERSITY

## **1. Centre for Earth Systems Engineering Research (CESER)**

### **School of Civil Engineering and Geosciences**

CESER undertakes cutting edge research in the fields of Earth Systems Science, Engineering and Management. CESER's mission is a highly inter-disciplinary endeavour and, embracing academic input from across Newcastle University. The centre collaborates widely in the UK and internationally. CESER is motivated by the recognition that management of the physical infrastructure systems that sustain society must in future be based upon analysis, at an unprecedented range of spatial and temporal scales, of interacting technological, human and natural systems. To realise this vision requires the new generation of techniques, tools and system-scale applications that we are advancing.

Building upon a unique capacity for analysis of long term change and climate impacts in water and infrastructure systems, CESER is dedicated to understanding and modelling of processes of change within coupled technological, human and natural systems. We use our knowledge to inform the sustainable management of these complex systems, through development of data acquisition, simulation, decision analysis and visualisation tools and techniques to underpin the sustainable management of infrastructure systems.

**Weblink:** <http://www.ncl.ac.uk/ceser/>

## **2. Centre for Renewable Energy from Land (CREEL)**

CREEL, based at Newcastle University, aims to promote and research existing and emerging bioenergy technologies, helping translate them into viable commercial applications for business, the community and the public sector. Technologies researched into include gasification, anaerobic digestion and biofuel production.

**Weblink:** [www.ncl.ac.uk/afrd/creel](http://www.ncl.ac.uk/afrd/creel)

## **3. Centre for Knowledge, Innovation, Technology and Enterprise (KITE)**

The Centre for Knowledge, Innovation, Technology and Enterprise (KITE) brings together Newcastle University's extensive research capabilities on:

- innovation management and policy,
- enterprise,
- the social, economic, managerial, organisational and cultural aspects of information and communications technologies and their social consequences, and studies of the role of universities in society.

KITE's activities are mainly in the Newcastle University Business School, with links to other schools and institutes across the University. With the designation of Newcastle as a Science City, KITE is undertaking research on the evolving international environment for place-based innovation policy, as well as developing links with the main science and technology streams of the Newcastle Science City project.

**Weblink:** <http://www.ncl.ac.uk/kite/>

#### **4. Centre for Urban & Regional Development Studies (CURDS)**

Based within Newcastle Universities School of Geography, Politics and sociology, it is a research group which specialises in the uneven geographical impact of globalisation on social, economic, technological and cultural processes.

**Weblink:** [www.ncl.ac.uk/curds/](http://www.ncl.ac.uk/curds/)

#### **5. marineNewcastle Research Network**

marineNewcastle is the networking environment provided by Newcastle University for everyone across the University involved in marine research. Its aim is to provide a platform for interdisciplinary research and promote marine research that takes place at Newcastle University.

marineNewcastle's focus is on four topics:

- Environmental Systems
- Governance, Management and Planning
- Ocean and Coastal Resources
- Technology

marineNewcastle involves staff from all faculties at Newcastle University and is part of the Newcastle Institute for Research on Sustainability which the University is seeking to establish as Europe's leading centre of expertise in the principles and practice of sustainability.

**Weblink:** <http://www.ncl.ac.uk/marinewcastle/>

**Contact:** [marinewcastle@ncl.ac.uk](mailto:marinewcastle@ncl.ac.uk)

#### **6. New Rail**

NewRail is a dedicated railway research centre with a vast range of expertise in diverse areas of the rail industry. The aim of our research centre is to develop and maintain the highest international standards of excellence in rail-related research.

NewRail has a wide experience in applied research for railways focusing on the development and strategic implementation of innovative technologies, with links to the major international players in industry as well as institutions and end users.

Based at Newcastle University the core expertise of NewRail is focused on four main research priorities:

- Rail Freight and Logistics Group
- Rail Infrastructure Group
- Rail Systems Group
- Rail Vehicles Group

Our extensive research results are publicised by our dissemination team through the medium of conferences, exhibitions and specialised events.

**Weblink:** [www.newrail.org](http://www.newrail.org)

**Contact:** [newrail@ncl.ac.uk](mailto:newrail@ncl.ac.uk)

## 7. Newcastle Institute for Research on Sustainability (NIReS)

NIReS is Newcastle's hub for sustainability research addressing social, economic and environmental issues. The Newcastle Institute for Research on Sustainability aims to bring people together from throughout Newcastle University and the wider community to develop sustainable responses to the great challenges of our age: ensuring that everyone has access to a fair share of the world's resources in perpetuity.

The focus of this Institute is on delivering solutions to major challenges in areas including:

- urban living
- low-carbon energy and transport
- food security
- water management
- clean manufacturing

While we must continue to play our part in the identification and understanding these challenges, our primary focus is on addressing them.

**Weblink:** [www.ncl.ac.uk/sustainability](http://www.ncl.ac.uk/sustainability)  
**Contact:** [sustainability@newcastle.ac.uk](mailto:sustainability@newcastle.ac.uk)

## 8. Sir Joseph Swan Centre for Energy Research (Swan)

The Sir Joseph Swan Centre is an interdisciplinary research centre within Newcastle University. It provides the focus for energy related research across the University and incorporates researchers from 11 academic schools specialising in:

- natural science;
- social science;
- engineering.

The researchers involved with the Centre already have extensive industrial collaborations and the close integration of the research team enhances the industrial offering.

The Centre provides the vehicle for inter-institution collaboration and bridges academia, other centres such as NaREC and CPI, the regional development agency and industry.

**Weblink:** [www.ncl.ac.uk/energy/](http://www.ncl.ac.uk/energy/)

## 9. *transport*Newcastle

*transport*Newcastle is a research network which brings together a wide range of transport technology related activities within Newcastle University.

We are focused on following four topics:

- Greener
- Safe and Secure
- Seamless and Inclusive
- Intelligent

*transport*Newcastle enables the University to combine its strengths to address transport issues regionally, nationally and internationally in a more coordinated way. Our vision is 'To be Europe's leading transport technology research University'

**Weblink:** [www.ncl.ac.uk/transport](http://www.ncl.ac.uk/transport)

**Contact:** [transport.newcastle@ncl.ac.uk](mailto:transport.newcastle@ncl.ac.uk)

#### **10. Tyndall Centre for Climate Change Research**

This brings together scientists, economists, engineers and social scientists who are working together to develop sustainable responses to climate change. The research conducted is trans-disciplinary and involves dialogue outside academia with business leaders, policy advisors, the media and the public. The institute is a partnership between 6 different research institutes including Newcastle University.

**Weblink:** [www.tyndall.ac.uk/index.shtml](http://www.tyndall.ac.uk/index.shtml)

# NORTHUMBRIA UNIVERSITY

## 1. Centre for Design Research (CfDR)

### School of Design.

Centre for Design Research (CfDR) is a research organisation within Northumbria University, working at a local, national and international level providing knowledge and expertise in the field of design. CfDR provide a research-led professional design practice service to industry, commerce and the public sector in the fields of industrial design, interaction design, conceptual design research, innovation management, medical product design, medical design research, new media and interface design, design learning. High Value Low Carbon is an example of a project undertaken by CfDR.

**Contact:** [Professor Robert Young](#), Director, CfDR, School of Design.

**Weblink:** <http://www.cfdr.co.uk>

## 2. Departments of Biomedical Science and of Chemical and Forensic Sciences and the Biomolecular and Biomedical Sciences Research Centre

The Biomolecular and Biomedical Research Centre (BioReC) has 62 affiliated staff (including seven professors and three readers) spread over three departments: Biomedical Sciences, Chemical and Forensic Sciences, and Biology, Food and Nutritional Sciences. The research centre is housed in Northumbria City Campus, Ellison Building, and consists of newly refurbished (SRIF-funded) laboratories and scientific equipment. It is a multi-disciplinary group that provides support for teaching, research and consultancy activities, e.g. in immunology, health, microbiology, food, genomics, proteomics and chemistry.

## 3. Disaster and Development Centre (DDC)

### School of the Built and Natural Environment.

Disaster and Development Centre (DDC) develops through research, teaching and learning the knowledge and skills to address hazards, disasters and complex emergencies from the perspective of different development debates and experience. This field of inquiry and associated expertise, by necessity non-disciplinary, is guided by the needs of civil society and institutions in addressing vulnerability and disaster response.

The DDC explores the association of sustainable development with improved human security through risk management, resilience, emergency response systems, and longer-term recovery strategies both locally and in an international context. DDC activities include a programme of postgraduate studies in disaster management and sustainable development, academic links spanning four continents, collaboration with the UK emergency services, internationally funded research projects, and consultancy.

**Weblink:**

<http://www.northumbria.ac.uk/sd/academic/sobe/enterprise/ddc/?view=Standard>

**Contact:** [sz.ddc@northumbria.ac.uk](mailto:sz.ddc@northumbria.ac.uk)

## 4. Northumbria Photovoltaic's Applications Centre (NPAC)

### School of Computing, Engineering and Information Sciences (CEIS).

Northumbria Photovoltaic's Applications Centre (NPAC) research activities include work in the development of solar cells, techno-economic studies of photovoltaic module production and use, building integrated photovoltaic systems, performance monitoring and assessment, environmental assessment of energy technologies, social and policy issues. One of the historical highlights, in 1995, was the installation of the UK's first building integrated PV system, rated at 39.5 kWp, on the façade of Northumberland Building on the main University campus. The work of the group can be divided into three main categories:

- Cell Technology Development
- PV System Design and Development
- Education and Promotion New

**Weblink:** <http://www.northumbria.ac.uk/sd/academic/ceis/re/esg/npacn/?view=Standard>

## **5. Nzomics Biocatalysis**

### **School of Life Sciences.**

Nzomics develops novel enzymes for clients in the pharmaceutical, chemical, biofuel and food sectors. Using an enzyme alternative for a chemical process is cost-effective, efficient and environmentally sound. Our research and development focus is to develop novel intellectual property for our client using state-of-the-art chemistry, molecular biology and biotechnology.

Nzomics has expertise in producing patent-free enzymes for a range of chemistries and we whole-heartedly believe that biocatalysis has a major part in the future for chemical manufacturing at all scales and for all sectors. We have worked with a range of clients from multinationals to SMEs and fresh start-up companies, and interfaced with clients with a range of experience and background expertise.

Nzomics can provide a range of tailor-made services to suit your company's requirements. We offer the following services:

- Enzyme discovery and synthesis
- Custom enzyme library synthesis
- Analysis and characterization of enzymes
- Proteomic evaluation of microbial systems

**Contact:** [Dr Justin Perry](#), School of Life Sciences.

**Weblink:** [www.nzomics.com](http://www.nzomics.com)

## **6. Power and Wind Energy Research (PaWER) Group**

### **School of Computing Engineering and Information Sciences.**

The Power and Wind Energy Research (PaWER) group is active in research and development in the areas of grid integration of renewable energy sources and electric vehicles (smart grids), wind energy conversion systems (new machine technologies and control systems), electric machines and drive systems. Main research activities include power electronic applications in power systems (FACTS and custom power technology), power quality monitoring, distributed generation, active control of power distribution networks (smart

grids), variable-speed electric drives, modelling of ac machines and control of doubly-fed generators for wind power applications.

Staff experience covers theoretical and experimental work together with the development and use of software for system design and analysis. The group has established good track record in providing consultancy for industry and collaborating with national and international organisations. Projects conducted by the group are supported by industry and reputable organisations, including EPSRC, European Commission, DTI, NEDL/CE Electric, Reyrolle/Siemens, NGC, Econnect/Senergy, NaREC and ONE.

Currently, the group is leading several projects including, “Performance Comparison of Conventional and Emerging Doubly-Fed Generator Topologies for Grid Connected Wind Power Applications” funded by EPSRC, “Electric Vehicle Infrastructure – Smart Grids and EV Infrastructure Regional Impact” funded by ONE and “Development of Training Modules in the Renewable Energy Field” funded by Feedback Group. Other projects conducted by the group include development of an intelligent power quality analysis system and advanced design concepts to maximize energy capture of small-scale wind turbines in addition to smart controllers for dynamic energy management of combined heat & power (CHP) and electrical vehicles battery charging systems.

The group has successfully completed several projects, including “Sensorless Direct Torque Control of Brushless Doubly-Fed Reluctance Machines” (funded by EPSRC), “Embedded Controller for Active Management of LV Distribution Networks” (funded by DTI), “Hybrid Fault Current Limiting and Interrupting Device” (funded by NEDL) in addition to “The Road Map to the Machinery Directive” (European funding).

The group benefits from a well developed research laboratory which includes modern machines, renewable energy systems (domestic scale wind turbines and PV systems) together with appropriate power conditioning, measurement and analysis equipment. The laboratory has advanced test and power quality monitoring equipment that allows computer controlled tests and measurements. The new laboratory provides real data (at fast sampling rate), test facilities and a platform for teaching and research in the area of new and renewable energy.

Members of the group are actively involved with professional bodies, including the IET, IMechE and IEEE.

**Weblink:** <http://www.northumbria.ac.uk/sd/academic/ceis/re/esg/pcrn/?view=Standard>

**Contact:** [Dr Ghanim Putrus](#) School of Computing Engineering and Information Sciences.

## **7. Sustainable Cities Research Institute (SCRI)**

### **School of the Built and Natural Environment.**

The Sustainable Cities Research Institute (SCRI) is a research and consultancy Institute based within the School of the Built Environment, Northumbria University. SCRI is committed to developing effective, integrated and interdisciplinary approaches to urban sustainability and urban regeneration through high quality research, publication and the public dissemination of knowledge. It promotes the principles of sustainable development by working closely with local, regional, national and international organisations through the development of innovative approaches in research and policy implementation. SCRI operates as an

interdisciplinary, cross-school Institute and as such is able to draw upon expertise from across the University. The Institute has considerable research experience in the fields of environmental policy, urban regeneration and urban sustainability, including work for the European Commission in developing the Urban Thematic Strategy.

**Weblink:** <http://sustainable-cities.org.uk>

**Contact:** [Professor David Greenwood](#), Director, SCRI, Associate Dean of Research, School of the Built and Natural Environment.

## 8. Visualisation Centre

### School of the Built and Natural Environment

The Built Environment Visualisation Centre (BEVC) was set up to promote the effective use of three-dimensional (3D) computer modeling and Virtual Reality (VR) technologies throughout all disciplines in the School of the Built and Natural Environment across teaching, learning, research and enterprise activities.

BEVC is an initiative within Northumbria University to utilize emerging computer technologies such as VR and 3D modeling applications to support built environment teaching, learning research and consultancy activities. It has interdisciplinary and experienced personnel who participates in international VR research and consultancy projects. By providing training and access to the Virtual Environment facility and expertise it raises awareness of visualisation technologies within the School of the Built Environment and beyond.

BEVC work on four main research themes:

- Education / Pedagogy
- 3D modelling, VR and BIM applications
- Technical solutions with 3D modelling, VR and BIM
- Business solutions for 3D modelling, VR and BIM.

**Weblink:**

<http://www.northumbria.ac.uk/sd/academic/sobe/enterprise/bevc/?view=Standard>

**Contact:** [Margaret Horne](#), School of the Built and Natural Environment

# SUNDERLAND UNIVERSITY

## 1. Digital Innovation Research Beacon

The Digital Innovation Research Beacon integrates research activities in the areas of computing, information systems, engineering, automotive technology and low carbon technology. The beacon has two strands of research:

- **Computing**- Interaction design evaluation, Intelligent systems. Internet technologies.
- **Engineering and low carbon technologies** - Digital engineering technologies, Low carbon vehicles, Advanced maintenance, Human factors, Logistics.

The Faculty of Applied Sciences has a long-standing and well-established research reputation, founded on innovation in science and engineering. This research is applied to a range of collaborative projects within the region, nationally and internationally.

**Weblink:** <http://www.sunderland.ac.uk/beacon-di/>

# TEESSIDE UNIVERSITY

## 1. Clean Environment Management Centre (CLEMANCE)

Carries out environmental research mainly technical but includes working with public authorities. Expertise includes:

- anaerobic digestion
- bioremediation
- biochar
- cleaner production
- ecological control analysis
- energy efficiency
- environmental reviews
- environmental supply chain management
- gas biofiltration
- GIS
- industrial and domestic waste water treatment
- industrial symbiosis
- landfill biotechnology
- legislation
- life cycle assessment (LCA)
- recycling
- restoration and reclamation
- soil and sediment contamination
- stakeholder management
- waste minimisation
- water purification sludge exploitation

**Weblink:** [www.tees.ac.uk/sections/research/technology\\_futures/sustainability.cfm](http://www.tees.ac.uk/sections/research/technology_futures/sustainability.cfm)

## 2. Technology Futures Institute

The Technology Futures Institute provides a focus for engineering research, building upon Teesside's location as a chemical and process industries cluster, and based on three interconnecting themes: advanced processing; sustainability and technology; and management.

Advanced processing encompasses work on advanced and functional materials, including the development of materials with novel structure, composition and/or properties. A second strand, on micro and nano systems, combines amongst others microfabrication, biology, electronics and algorithms to create miniaturised devices with high density and enhanced functionality. A third area of interest is modelling and testing materials, structures and process systems to predict service performance and develop new designs.

Sustainability research is coupled with business support in three areas, and is based in the **Clean Environment Management Centre (CLEMANCE)**. Carbon management focuses on the meta-analysis of carbon footprint data, benchmarking, and the implementation of the findings of these analyses. Industrial symbiosis supports companies to use one another's by-products to maximise resource extraction whilst minimising flows from and to the environment. Studies of contaminated land and water focuses on the use of complex microbial associations, including to restore chemically compromised soils and sediments.

Technology management research aims to develop and implement advanced management systems for the manufacturing and process industries, and multi-dimensional software tools for effective project planning and management of heavy civil, oil & gas and process industries. These tools are the first in the world with the capability of integrating 3D, processes and costing data, and have seen the development of international collaboration particularly with partners in Europe, Japan and South Korea.

**Contact:** [Professor Nashwan Dawood](#), Director of the Technology Futures Institute

**Weblink:** [http://www.tees.ac.uk/sections/research/technology\\_futures/](http://www.tees.ac.uk/sections/research/technology_futures/)

### **3. Social Futures Institute**

The mission of the Social Futures Institute mission is to support high quality research and enterprise around the theme of 'society' - in the widest sense, ranging from issues that affect and focus on individuals, and those that affect overall communities, societies and their political and social organisation. Research is conducted from a variety of perspectives, including social, economic and political.

Social exclusion, difference and diversity is an overarching theme, with particular interests including: gender, social inclusion and community cohesion; the potential supporting role played by digital technologies; health and well-being; Higher Education and pedagogical research; and innovative research methodologies. Other key research interests include: law, criminology and criminal justice; the development of the voluntary and community sector; and young people and youth issues, including experiences of the transition to adulthood.

Much collaborative research is undertaken with local authorities, governmental bodies, voluntary organisations and other research agencies, as well as universities nationally and internationally.

**Contact:** [Dr Barbara McGuinness](#), Director of the Social Futures Institute

**Weblink:** <http://www.tees.ac.uk/socialfutures/>