

Environmental Protection Agency

Climate Change Research Programme



Overview

The research programme of the Environmental Protection Agency (EPA) is based on three pillars that represent key research priorities associated with protecting Ireland's environment.

PILLAR 1 <i>Water</i>	PILLAR 2 <i>Climate Change</i>	PILLAR 3 <i>Sustainable Environment</i>
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The Climate Change Research Programme (CCRP) is an essential component of Ireland's response to climate change. A key research focus is the sources, sinks and management of greenhouse gases (GHGs) in Ireland. The CCRP provides analyses of on-going climate change and projections of future climate conditions, including adaptation options. In addition, the CCRP has a strong emphasis on socio-economic and technological solutions to the challenges of climate change, and aims to identify opportunities in Ireland's response to climate change and outline pathways towards a future low-carbon climate resilient Ireland.

The research programme aims to:

- Provide scientific information and data to support policy development
- Build capacity to assess policy issues and options to address these
- Support engagement with the European Union (EU) and United Nations (UN)
- Improve analysis of greenhouse gas emissions and removals reported to the EU and United Nations Framework Convention on Climate Change (UNFCCC)
- Provide projections of future climate conditions in Ireland and adaptation options
- Provide analyses of pathways towards a low emission future and approaches and technologies to achieve a carbon neutral Ireland by 2050

Climate change research is carried out under 4 themes:

- **Greenhouse Gas Emissions, Sinks and Management Systems**
- **Ireland and Future Climate, Impacts and Adaptation**
- **Socio-Economic and Technological Climate Solutions and Transition Management**
- **Trans-Boundary Air Pollution/Short Life Climate Forcers**

The development of **observation systems** is a key cross cutting activity.



Theme 1 – Greenhouse Gas Emissions, Sinks and Management Systems

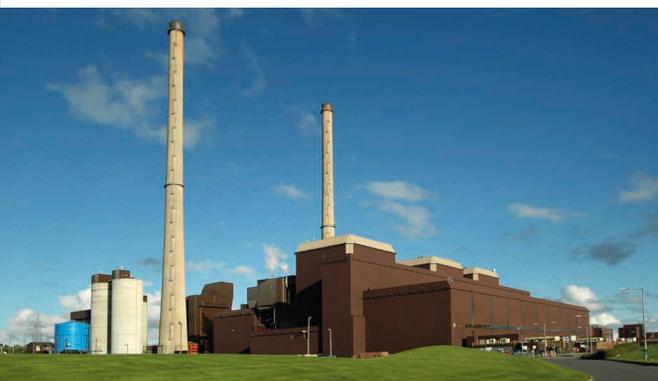
The objective is to advance bottom-up analysis of GHG emissions and sinks, and to improve methodologies used in the National GHG Inventory reported to the EU and UN, and couple this to independent top-down verification systems. The international targets for emissions reductions are based on the national inventory of emissions for each country. It is very important that the estimate of emissions be as accurate as possible, and reflect the conditions leading to emissions and sinks in each country. For this reason, there is on-going research to improve key aspects of the inventory and to provide independent verification of these.

The research supports the key EPA statutory function regarding the compilation of the emissions inventory and provision of this information to the UNFCCC, the European Union and the general public.

Theme 2 – Ireland and Future Climate, Impacts and Adaptation

Ireland is experiencing the impacts of global climate change which are projected to increase in the coming decades. This theme provides analysis of climate change and its impacts on natural and managed systems and projections of future climate conditions at temporal and spatial scales that are useful for decision making on adaptation in Ireland. Research is focussed on identification of vulnerabilities and optimising adaptation responses including responses to extreme events. This involves:

- Development of monitoring and observation systems;
- Refining models to determine the impacts of climate change on the Irish environment;
- Identification of measures to enhance our capacity to adapt (building adaptive capacity) and taking advantage of the opportunities presented by climate change;
- Making information available for those responsible for policy, planning and environmental decision making.



Theme 3 – Socio-Economic and Technological Climate Solutions and Transition Management

The objective is to identify optimal policy responses to various climate change challenges and to maximise economic opportunities in the transition to a low emissions economy. Research is focused on achievement of 2020 emission reductions targets and identification of pathways for achievement of longer term mitigation goals to 2050. The overall vision is of a GHG neutral Ireland by 2050. This approach is described in further detail in the 'Addressing Climate Change Challenges in Ireland' (O'Reilly et al, 2012).

Research has enabled sectoral and cross sectoral analysis and model development. Modelling plays a key role in development of scenarios and assessment of policy options. Technology development, assessment and deployment and behavioural changes are essential to achieve greenhouse gas mitigation. Research in these areas is crucial to inform the public and policy makers on strategies to mitigate greenhouse gas emissions.

Theme 4 – Trans-Boundary Air Pollution/ Short Life Climate Forcers

The objective is to inform policy response to transboundary pollutants, addressed under the UNECE Convention on Long Range Transport of Air Pollution and the EU Clear Air for Europe programme, and optimise synergies with responses to climate change. It will be developed in the context of the revision of the Gothenburg Protocol and the recent focus on particulate matter including black carbon and ozone. These pollutants are also climate forcers and are being addressed through international actions. The aim is to enhance coordination and assessment processes including observations, studies of effects and analysis of policy options.

Linkages

The EPA has established a Climate Change Research Coordination Committee with other national research funders to enhance collaboration and synergies. This group includes representatives of the main government departments and agencies with responsibility for climate change research. It is working to improve co-ordination of climate change related research, sharing of data, and communication of research outputs to policy makers and decision makers.



A number of critical international linkages have also been established to promote Irish environmental research into the international arena including enhanced participation in the European Research Area.

Key Achievements

Greenhouse Gas Emissions, Sinks and Management Systems

- Carbon Restore (Wilson, D, Renou-Wilson, F, Farrell, C, Bullock, C & Muller, C, 2012). This report examines the potential for greenhouse gas mitigation through restoration of degraded peatlands.
- The potential for Grass Biomethane as a Biofuel (Murphy, JD et al, 2011). This report presents the technical and business case for the generation of methane from surplus grass production in the Irish landscape.
- An assessment of the potential for geological storage of CO₂ in the vicinity of Moneypoint, Co. Clare (Aurum Exploration Services Ltd., 2010). This report was an important preliminary report in analysis of potential for carbon capture and storage in Ireland.

Ireland and Future Climate, Impacts and Adaptation

- A Summary of the State of Knowledge on Climate Change Impacts for Ireland (Desmond, M, O'Brien, P and McGovern, F, 2009). This report summarises projected impacts of climate change across a number of sectors in Ireland. The report has been widely disseminated and referenced by the climate change adaptation community.
- National Adaptive Capacity Assessment (Final report, 2 summary reports and contribution to World Resources Institute Report) (Desmond, M and Shine, T, 2011 & 2012). These reports provide a baseline of climate change adaptation activities, research and policy implications for Ireland. The reports have been well received in policy circles and are quoted extensively in the National Climate Change Adaptation Framework (DECLG, 2012).
- The Status of Ireland's Climate, 2012 (Dwyer, N, 2012). This report examines Ireland's essential climate variables, and current systems for their observation in Ireland.

Key Achievements (continued)

- Robust adaptation to climate change in the water sector in Ireland (Hall, J, Murphy, C and Sweeney, J, 2012).
- On-going research in climate change modelling and observations, which contributes to building evidence of national and regional climate change.
- Development of tools and approaches to support the implementation of national adaptation planning.

Socio-Economic and Technological Climate Solutions and Transition Management

- An assessment of the potential for geological storage of CO₂ in the vicinity of Moneypoint, Co. Clare (Aurum Exploration Services Ltd., 2010).
- Irish TIMES Energy Modelling Project (Ó Gallachóir, B et al, 2012). This report examined energy scenarios out to 2050 concluding that an 80% cut in emissions by 2050 is possible with current technologies. Outputs from this research were referenced in the National Review of Climate Policy by the DECLG, 2011.
- Scoping Study of Potential Options for Establishing Domestic Offsetting Scheme for Greenhouse Gas Emissions in Ireland (Ecofys UK Ltd., with Energy Services Ltd., 2011). This report found that a domestic offsetting scheme could catalyse private sector innovation and facilitate the transition to a low carbon economy.
- Addressing Climate Challenges in Ireland (O'Reilly, G, O'Brien, P and McGovern, F, 2012). This report examined a strategic approach to achievement of a carbon neutral Ireland by 2050 and the challenges and opportunities for Ireland in the context of green economy goals.

Trans-Boundary Air Pollution/Short Life Climate Forcers and Observation Networks

- Updated the critical loads of pollutants assessment maps for Ireland under the Convention of Long Range Transboundary Air Pollution (CLRTAP).
- Facilitated world class research and participation in international monitoring exercises at the Mace Head atmospheric research station.
- Allowed Irish participation in international research and monitoring programmes such as the International Carbon Observation System (ICOS).
- Produced innovative research findings on areas such as bio-aerosols.

Climate Change Research Programme 2007-2012

Greenhouse Gas Emissions, Sinks and Management Systems

Principal Investigator	Title
Christoph Muller, UCD	<i>CarbonRestore (Peatland Restoration)</i>
Jerry Murphy, UCC	<i>Biomethane from Grass</i>
Brian Kelleher, DCU	<i>Novel techniques for soil function</i>
John Connolly, UCD	<i>Remote Sensing for Peatland classification</i>
Gerard Kiely, UCC	<i>GHG emissions land use</i>
Ibrahim Khalil, UCD	<i>Modelling Soil Processing</i>
Enda O'Brien, NUIG	<i>Improved modelling for Extreme Events</i>
Kevin Black, FERS Ltd.	<i>LIDAR data for above ground biomass</i>
Christoph Muller, UCD	<i>GHG emissions and sinks from grassland on organic Soils</i>
Gerard Kiely, UCC	<i>Soil carbon survey</i>
John Devaney, UCC	<i>Forest Inventory</i>
Giovanni Martucci, NUIG	<i>Aerosol research support Mace Head</i>
Fiona Cawkwell, UCC	<i>Remote Sensing Land Use activity</i>
Colin O'Dowd, NUIG	<i>Emissions Verification</i>
Micheal Williams, TCD	<i>Scaling soil process modelling to national level</i>
Gerald Kiely, UCC	<i>Survey of GHG emission and sink potential of active and degraded blanket peatlands in Ireland</i>
Stephen Barry, UL	<i>Activity data for emissions of Non-methane VOC</i>
Jesko Zimmermann, TCD	<i>Identification of grassland management and land-use change using high resolution spatial databases</i>
Kenneth Byrne, UL	<i>Greenhouse gas balances in rewetted peatland forests</i>

Ireland and Future Climate, Impacts and Adaptation

Principal Investigator	Title
Gerald Kiely, UCC	<i>Extremes weather, climate and natural disasters in Ireland</i>
Alison Donnelly, TCD	<i>Climate Change impacts on phenology</i>
John Sweeney, NUIM	<i>Coordination, communication and adaptation for climate change in Ireland</i>
Maria Falaleeva, UCC	<i>Adaptive management for climate change adaptation</i>
Conor Murphy, NUIM	<i>HydroDetect: The Identification and Assessment of Climate Change Indicators for Irish Benchmark Network</i>
John Sweeney, NUIM	<i>Current and Future Vulnerabilities to Climate Change in Ireland</i>
Jeremy Gault, UCC	<i>Climate Information Platform for Ireland</i>
Peter Clinch, UCD	<i>Guidelines for risk assessment and costing of climate change adaptation</i>
Ned Dwyer, UCC	<i>Development of Global Climate Observation System (GCOS)</i>
Paul Nolan, UCD	<i>Development of regional climate simulations for Ireland</i>
Rowan Fealy, NUIM	<i>Next generation, high resolution, decadal and long term resolutions for Ireland</i>
Micheal Bruen, UCD	<i>WARNDIS: Extreme events and disaster warning</i>
Stefan Gray, UCC	<i>Developing guidelines for the integration of climate adaptation in Irish spatial planning and SEA procedures</i>
John Coll, NUIM	<i>HOMERUN: Homogenisation of Irish Synoptic station Network</i>
Andrew Parnell, UCD	<i>Extreme events in calibrated climate models: impacts for Ireland</i>

Socio-Economic and Technological Climate Solutions and Transition Management

Principal Investigator	Title
Aurum Exploration Services Ltd. with DMT and TNO	<i>An Assessment of the Potential for Geological Storage of CO₂ in the Vicinity of Moneypoint, Co. Clare</i>
Richard Tol, ESRI	<i>Future Emissions Targets and International Approaches to Mitigation</i>
Andrew Kelly, APEnvEcon	<i>IMP Ireland</i>
Brian Ó Gallachóir, UCC	<i>Irish TIMES</i>
Margaret O'Mahoney, TCD	<i>Barriers to Sustainable Transport in Ireland</i>
Carmel Breslin, NUIM	<i>Ionic Liquids for Carbon Sequestration</i>
Aoife Foley, UCC	<i>Modelling the Impact of Electric Vehicles on GHG Emissions</i>
Ecofys UK Ltd. with Energy Services Ltd.	<i>Scoping Study of the Potential Options for Establishing a Domestic Offsetting Scheme for Greenhouse Gas Emissions in Ireland</i>
WSP Ireland Ltd.	<i>National Transport Model for Ireland: Feasibility Study and Road Map</i>
Andrew Kelly, APEnvEcon	<i>Integrated Modelling Project Ireland; Climate and Air</i>
Brian Ó Gallachóir, UCC	<i>Irish TIMES Phase II</i>
Luke Redmond, UCD	<i>Flexible Mechanisms Fellowship</i>
Fionn Regan, UCC	<i>Climate Technology – realising the potential</i>
James Patrick Breen, UCD	<i>Factors Affecting The Adoption of Greenhouse Gas Emissions Abatement Technologies on Irish Farms</i>

Trans-Boundary Air Pollution/Short Life Climate Forcers

Principal Investigator	Title
Julian Aherne, Trent University	<i>Acid Sensitive Lakes</i>
David J Timoney, UCD	<i>ETASCI – Small scale combustion/transport emission inventories</i>
John Sodeau, UCC	<i>BIOCHEA – Bioaerosol research</i>
Julian Aherne, Trent University	<i>Critical Loads assessment</i>
Michael Geever, NUIG	<i>Transboundary Air Pollution network fellow</i>
Damien Martin, NUIG	<i>Transboundary Air Modelling Fellowship</i>
Darius Ceburnis, NUIG	<i>Mace Head Fellow</i>
William J. Smith, UCD	<i>EFOCDF – Small scale combustion emission inventories</i>
Darius Ceburnis, NUIG	<i>An Integrated Source Apportionment and Climatic Implications of PM_{2.5} & PM₁₀ Particulate Matter</i>
Giovanni Martucci, NUIG	<i>GAINFUL: Ground-based remote-sensing and in-situ aerosol-cloud synergy for hemispheric trans-boundary air pollution studies</i>
Thomas Cummins, UCD	<i>Ammonia2 – Baseline Ammonia Deposition Rates in Ireland</i>
Julian Aherne, Trent University	<i>Critical loads and dynamic soil-vegetation modelling</i>

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FURTHER INFORMATION

All EPA research projects are on the EPA Research Searchable Database
<http://erc.epa.ie/smartsimple>

You can find out more about the EPA's climate work on our webpages
<http://www.epa.ie/climate/>



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