

# EPA-STRIVE

## Sustainable Environment Research in Ireland



The environment is a key strategic resource and asset for Ireland, and it must be protected and managed to ensure that it remains as the basis for a healthy society and a strong economy. The latest State of the Environment report for Ireland has identified the most pressing and challenging environmental priorities for the coming years as follows:

1. Valuing and protecting our environment, in particular water and nature protection;
2. Building a resource-efficient, low-carbon economy;
3. Implementing environmental legislation; and
4. Putting the environment at the centre of our decision-making.

Research and innovation play a pivotal role in environmental protection by providing information on the current state of the environment; by building environmental projections; and by developing new tools for environmental management. Under legislation, the EPA is mandated to co-ordinate environmental research in Ireland.

The research programme of the EPA is based around three 'pillars' representing the key research priorities associated with delivering a protected Irish environment has been developed as follows:

<b>PILLAR 1</b> Water	<b>PILLAR 2</b> Climate Change	<b>PILLAR 3</b> Sustainable Environment
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*Sustainable Environment* is focused on ensuring that the natural resources and environmental conditions that are fundamental to the economic and social well-being of Ireland's future generations are protected and are not degraded or exhausted. Drivers in this area include a number of national and EU/ international strategies in the broad area of sustainable development and also in specific areas where environmental concerns are integrated within policies which impact on the environment. The specific focus areas of the Sustainable Environment pillar are listed below and then explored in more detail.

- **Environment & Human Health**
- **Waste & Resource Management**
- **Impacts on Biodiversity**
- **Soils and Land-use**
- **Socio-economic Considerations.**

Between 2007-2012, the EPA STRIVE Programme has funded 140 Research Projects (with budget > €10,000) related to Sustainable Environment with a total commitment from the EPA of approx. €27m. The range of projects funded include desk-studies, scholarships, fellowships and large-scale multi-annual and multi-partner awards.



## **Area-1: Environment & Human Health**

Environmental protection and health protection are inextricably linked. The WHO estimates that environmental hazards are responsible for as much as a quarter of the total burden of disease worldwide and that as many as 13 million deaths could be prevented every year by improving environmental quality. Conversely, when ecosystems are maintained in good condition they provide direct health benefits: a growing body of evidence demonstrates the value of contact with nature in the prevention/treatment of conditions including stress, depression and obesity. Research in this area provides the evidence base that underpins policy development and informs responses on key issues (e.g. air pollution, emerging pollutants).

## **Area-2: Waste & Resource Management**

Environmental degradation can be caused in the manufacturing, distribution, usage or disposal of products and services. We currently use natural resources inefficiently and create too much waste. If current trends continue unabated, our natural resources will be depleted. To reverse this unsustainable trend, we need to move beyond controlling emissions and waste, and begin to address the more fundamental issues of sustainable production and consumption. This area aims to provide research that will support the more effective management of wastes, resources and chemicals.

## **Area-3: Impacts on Biodiversity**

Biodiversity research contributes to enhancing our natural resources by forming a better understanding of the impacts of the significant pressures on biodiversity, how to prevent and reduce these pressures and the ways to improve the policies for biodiversity conservation and protection. Research also focuses on collecting information on status, trends and distribution of key significant habitats and species of National/EU interest. Research under this area complements the research undertaken by the National Parks and Wildlife Service.



## Area-4: Soils and Land-use

Land is subject to many competing demands. We rely on our land resource for food, energy (increasingly), agriculture and forestry, recreational opportunities and cultural amenities and, overall, for a good living environment. The rate and nature of land use changes indicate where future environmental pressures are likely to arise. The soil of Ireland is a valuable and finite, national resource, which forms and evolves slowly over very long periods of time. However, it can be damaged and lost. Soil is a biologically active, complex mixture of weathered minerals (sand, silt and clay), organic matter, organisms, air and water that provides the foundation for life in terrestrial ecosystems. Research in this area supports the development of sustainable soils and land-use policies.

## Area-5: Socio-Economic Considerations

Many of the environmental strategies and much of the legislation being developed at EU level cover aspects of the environment or ways of managing the environment that are new and require new approaches. Integrating social and economic considerations into environmental policies ensures a more holistic approach to environmental management. This research area will focus on support for the development of analytical tools and empirical evidence upon which to build a sustainable future. Projects will investigate potential economic tools for environmental protection and examine the costs/benefits of good environmental management. The research will also seek to improve existing indicators and develop new ones to assess sustainable development policy priorities.

## LINKAGES

- Synergies and enhanced collaboration with other national funders is a key objective of the research programme which is facilitated by the Sustainable Environment Research Coordination Group set up by the EPA in 2011. Members include Department of the Environment, Community & Local Government; Department of Agriculture, Food & the Marine; Department of Communications, Energy & Natural Resources; Health Research Board; Irish Research Council; National Parks & Wildlife Service; and the National Economic & Social Council



- 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 (e.g. Framework Programme, Joint Programming Initiatives, SNIFFER). By ensuring that Ireland is represented in significant European initiatives related to Sustainable Environment, the EPA will promote an increased critical mass and impact of environmental research in Ireland.

## Key Achievements

### Environment and Health

- Researchers have developed baseline information on (emerging) pollutants such as nanoparticles, endocrine disruptors and pathogens, which been used by operators and policy makers in support of policy formation and implementation.
- A Health Service Executive-led research project concluded that no adverse health impacts were experienced following the operation of an incinerator at an EPA-licensed industrial facility.
- EPA funded researchers in UCD received significant international recognition with the announcement of their paper (Nano-Scale Pollutants: Fate in Irish Surface and Drinking Water Regulatory Systems) as the Human Health Risk Assessment Paper of the Year 2010.

### Waste and Resource Management

- A key finding from a research report led to the establishment within the EPA of the National Waste Prevention Programme (NWPP).
- Research models have generated national projections for waste generation and management in Ireland up to 2020 – allowing policy and decision makers to forecast future waste issues and likely policy responses.
- Recent research investigated the potential role that mechanical biological treatment of waste can play within the Irish waste management sector.
- A research team has patented a technology for the conversion of PET (polyethylene terephthalate) into biodegradable plastic. A spin-out company, Bioplastech Ltd, was founded to develop this biodegradable polymer as a new market product.

## Key Achievements (continued)

### Biodiversity

- The 'Ag-Biota' project outputs represented a significant input to Ireland's obligations under the United Nations Convention on Biological Diversity and will assist in the national aspiration to halt and reverse the decline in biodiversity within the wider countryside.
- Outputs from the BIOFOREST project have been used in the development of the Forest Environment Protection Scheme.
- The SIMBIOSYS project quantified impacts on biodiversity of key activities (bioenergy crops, road landscaping and aquaculture) and identified some win-win situations where both biodiversity and sectoral outputs can be maximised.

### Land Use and Soils

- The BOGLAND project developed a protocol for the sustainable management of peatlands in Ireland. Recommendations from this project have already been incorporated into the new birds and habitats regulations and will inform development of national peatland and wetland strategies.
- As part of a wide-ranging project on sustainable planning and development, Green City Guidelines were published which provide practical ways for local authorities, planners and property developers to protect and enhance biodiversity.
- Co-funded with Teagasc the development of a digital indicative soil map of Ireland which combines cutting-edge mapping technology and field assessment techniques that will, for the first time ever, be applied at national scale.

### Socio-Economics

- A sustainable development research model for Ireland (ISus) which forecasts environmental emissions and natural resource use was developed by ESRI with EPA-funding. Linked to the HERMES macroeconomic model for Ireland, ISus allows integrated planning of economic and environmental development.
- An EPA-funded research project has calculated a detailed ecological footprint of Ireland, which shows that if everyone on earth consumed at the same level as an Irish citizen then resources equivalent to three times those available on Earth would be needed.
- The CONSENSUS project involving TCD and NUIG is exploring sustainable consumption in Ireland in four key areas: transport, energy, water and food. A survey of over 1,500 households has informed a framework detailing policy measures and other initiatives to pave the way towards more sustainable living in Irish households.

# Sustainable Environment Projects Funded 2007-2012

## Environment and Human Health<sup>1</sup>

Principal Investigator	Title
Marie Coggins, NUIG	<i>Indoor Air Pollution and Health</i>
Brian Broderick, TCD	<i>A Personal Exposure, Activity/Location, GIS Model for the Greater Dublin Area (GDA) and its Satellite Towns (STs)</i>
Kenneth Dawson, UCD	<i>Visualisation and Quantification of the interaction of fluorescent nanoparticles with ecotoxicologically relevant species</i>
Kenneth Dawson, UCD	<i>High Content Analysis and Confocal Spectroscopies Platform (Infrastructure award)</i>
Dearbhaile Morris, NUIG	<i>CapE-Capture, Extract, Amplify: A Rapid Method for Monitoring Large Water Volumes for Pathogenic Contaminants</i>
Iseult Lynch, UCD	<i>Assessing the applicability of existing regulation to nano-enabled green technologies</i>
Meredith Brown, UCD	<i>Establishment and validation of a human blood-brain barrier model for screening and risk assessment of nanoparticle access to the brain.</i>
Padraig Murphy, DCU	<i>Nanotechnology: Engaging with the public on health, environmental and social issues</i>
Shouming Zhou, UCC	<i>Health effects associated with the atmospheric degradation of polycyclic aromatic hydrocarbons</i>
Valerie de Souza, HSE	<i>Comparative study of the health status in two semi-rural Irish communities</i>
Patrick Goodman, DIT	<i>Evaluation of the effect of domestic solid fuel burning on ambient air quality in Ireland</i>
John Wenger, UCC	<i>The Effect of Naphthalene Emissions on Air Quality</i>
John Sodeau, UCC	<i>Investigations of potential synergies between natural and anthropogenic airborne pollution</i>
John Wenger, UCC	<i>Identity, Sources and Health Effects of Oxygenated Organic Compounds in Atmospheric Particles</i>
Kenneth Dawson, UCD	<i>Role of engineered nanoparticles in protein fibrillation diseases</i>
Kevin Kavanagh, NUIM	<i>An investigation of the disease-causing potential of environmental isolates of Aspergillus fumigatus</i>
John Sodeau, UCC	<i>Toxicological Analysis and Chemical Correlation for PM2.5 in transit to Cobh</i>
Rebecca Williams, SNIFFER	<i>Screening tool for assessing deposition of ammonia &amp; dust on sensitive receptors from intensive pig &amp; poultry</i>
Marie Coggins, NUIG	<i>Evaluation of Indoor Air Quality, Thermal Comfort, Ventilation and Occupant Behaviour in Energy Efficient Homes</i>
Bidisha Ghosh, TCD	<i>Quantification of the Benefits of Active Travel (BeAT) in Urban Environment</i>
Aoife Donnelly, TCD	<i>Air quality modelling</i>
Mark Healy, NUIG	<i>Measurement and modelling of health impacts arising from the landspreading of biosolids</i>

## Socio-Economic Considerations

Principal Investigator	Title
Anna Davies, TCD	<i>CONSENSUS: A cross-border household analysis of CONsumption, ENVIRONMENT and SUSTainability in Ireland</i>
Edgar Morgenrath, ESRI	<i>Towards a Green Net National Product for Ireland</i>
Richard Moles, UL	<i>Evaluation of Policies to enhance environmental Sustainability in future planning of Irish settlements</i>
Sheila Flanagan, DIT	<i>ACHIEVing Sustainable Tourism Management: Putting the DIT-ACHIEV Model into Practice</i>
Alun Jones, UCD	<i>Innovation, agricultural diversification and environmental sustainability</i>
Corrado Di Maria, UCD	<i>The EU Emission Trading Scheme and the Greening of Technology</i>
K D Farnsworth, QUB	<i>An objective measure of value in biological entities for sustainable management and planning</i>
Michael O'Connell, NUIG	<i>Participatory Governance A Best Practice Model for Effective and Inclusive Decision-Making in Wind Energy Development in Ireland</i>
Colin Sage, UCC	<i>Sustainable food Systems An evaluation of the potato supply chain in Ireland using life cycle assessment.</i>
Craig Bullock, UCD	<i>ECORISK (Ecosystem services valuation for environmental risk and damage assessment)</i>
Tom O'Mahony, CIT	<i>Smart Heating System for Green Homes</i>
Anna Davies, TCD	<i>Bridge: communicating across the environmental science-policy divide</i>
Adrian O'Looney, Aqua TT Ltd	<i>Developing a framework for bridging the gap between scientists and policy makers</i>
Padraig Murphy, DCU	<i>Communicating Responsible Research and Innovation – steps towards future environmental science and public engagement</i>

<sup>1</sup> An additional 22 projects funded by the EPA are categorised under the Water Research Pillar (Impacts on Ecosystems and Human Health). See the Water Research Brochure for further information.

## Sectoral Impacts on Biodiversity

Principal Investigator	Title
Jane Stout, TCD	<i>Sectoral Impacts on Sectoral Impacts on Biodiversity and ecoSYSTEM services (SIMBIOSYS)</i>
Margherita Gioria, UCD	<i>Biodiversity of aquatic Coleoptera in the Irish farmed landscape. The significance of ponds.</i>
Nessa O'Connor, UCD	<i>Anthropogenic impacts on marine biodiversity.</i>
Mark Jessopp, UCC	<i>Nutrient and Ecosystem Dynamics in Ireland's only marine nature reserve.</i>
Brian Caffrey, Birdwatch Ireland	<i>Bird Atlas</i>
Catherine Dalton, Mary Immaculate College	<i>Palaeolimnological assessment of recent disturbance/regime shifts in sediment cores from ecotonal brackish lake systems</i>
John Parnell, TCD	<i>The genetic relationships, phylogeny and conspecificity of Irish E. aquaticum populations with those from Scotland and North America.</i>
Deirdre Brophy, GMIT	<i>Juvenile fish habitat requirements in changing coastal ecosystems</i>
Christine Griffin, NUIM	<i>Ecological impact of proposed first widespread use of biological control in Ireland Multispecies interactions in a below-ground forest ecosystem</i>
James Wilson, TCD	<i>Biodiversity and ecological requirements of meiofauna and a typology for Irish transitional waters.</i>
Ewen Mullins, Teagasc	<i>Evaluating the ecological impacts of cultivating genetically modified herbicide tolerant (GMHT) oilseed rape and maize</i>
Paulo Prodohl, QUB	<i>Population genetic structure, mixed stock analysis, and fisheries conservation management of the brown trout complex of Lough Derg.</i>
Dagmar Stengel, NUIG	<i>Temperature-controlled algal growth-facility (Infrastructure award)</i>
Dagmar Stengel, NUIG	<i>Natural resource exploitation and global change: the need for improved sustainable management to protect biodiversity</i>
Cliona O'Brien, National Biodiversity Data Centre	<i>National Framework on Invasive Species Data Management</i>
Tamara Hochstrasser, UCD	<i>A GIS-supported Integrated Biodiversity Assessment Methodology</i>
John O'Halloran, UCC	<i>An investigation of the applicability of terrestrial laser scanning technology in biodiversity assessment of a range of forest types.</i>
Cliona O'Brien, Heritage Council	<i>Development of the National Invasive Species Database</i>
Helen Sheridan, UCD	<i>Targeting payments for ecosystem services to address the favourable conservation status of key freshwater habitats</i>
Tamara Hochstrasser, UCD	<i>Enhancing biodiversity potential of urban parks through improved management and public engagement</i>
Marcel Jansen, UCC	<i>Invasive alien aquatic plants in Ireland; from ecophysiological traits to management strategies</i>
Mark Scott, UCD	<i>Integrating ecosystem approaches, green infrastructure and spatial planning (ECO-Plan)</i>
Florence Renou-Wilson, UCD	<i>Rewetted and restored wetlands: biodiversity for the future</i>

## Soils and Landuse

Principal Investigator	Title
Rogier Schulte, Teagasc	<i>ISIS: Developing 1:250,000 soil mapping for Ireland with associated Soil Information System</i>
Peter Mooney, NUIM	<i>Geoinformatics Services for Improved Access to Environmental Data and Information</i>
Gerard Kiely, UCC	<i>Interactions of soil Hydrology, land use and climate change and their impact on soil quality (SoilH)</i>
Shane Donohue, UCD	<i>Characterisation of physical properties of soils using geophysics</i>
John Connolly, UCD	<i>Identification, mapping assessment and quantification of the effects disturbance on the peat soil C stock in Ireland</i>
Norman Allott, TCD	<i>Instruments for the measurement of carbon and nitrogen in environmental substrates (Infrastructure award)</i>
Nicholas Holden, UCD	<i>Remote sensing of grasslands for evaluating compliance with key environmental legislation</i>
Nicholas Holden, UCD	<i>Assessing and monitoring vegetation disturbance on Irish peatlands using satellite remote sensing</i>
Chaosheng Zhang, NUIG	<i>Characterising variation of heavy metal pollution in urban soils</i>
Fergal O'Gara, UCC	<i>Assessing the impact of conventional and decision based fertilizer inputs on rhizosphere microbial diversity and activity of three commercial crops.</i>
Thomaé Kakouli-Duarte, Carlow IT	<i>Nematode community structure analysis and its function as an indicator of heavy metal soil contamination in Ireland</i>
Stephen Boyle, Carlow IT	<i>Development of the nematode <i>Steinernema feltiae</i> as a bioindicator for soil pollution</i>
Frank McDermott, UCD	<i>Enhancement of sample introduction system for Multi-Collector Inductively Coupled Plasma Mass Spectrometer (Infrastructure award)</i>
Dermot Diamond, DCU	<i>Reference and field deployable instrument for Thin Sample and Bulk (soil) Analysis using XRF (Infrastructure award)</i>
Ned Dwyer, UCC	<i>Satellite Remote Sensing as a Tool for Monitoring Vegetation Seasonality</i>
John Fry, UCD	<i>Development of a methodology/framework for generating and evaluating alternative spatial and non-spatial scenarios</i>
Nicola Foley, UL	<i>Development and Testing of Key Performance Indicators for the Evaluation of SEA Effectiveness in Ireland</i>

# Waste and Resource Management

Principal Investigator	Title
Kevin O Connor, UCD	<i>The upcycling of post consumer polyethylene to a biodegradable plastic: Waste to value added product</i>
Mary T Pryce, DCU	<i>The design of new photocatalytic systems for the generation of hydrogen from water using solar energy</i>
Gary Walsh, UL	<i>Application of novel enzymes derived from thermoacidophiles to second-generation biofuel production.</i>
John Mulcahy, UL	<i>Innovative Process for Recycling of LCD Displays</i>
Kieran Nolan, DCU	<i>Micro-photochemistry – a New Resources-Efficient R&amp;D Approach</i>
Gregory O'Hare, UCD	<i>WAIST – Waste Augmentation and Integrated Shipment Tracking</i>
Nick Gathergood, DCU	<i>Biodegradable Catalytic Asymmetric Methods – A study of solvents, organocatalysts and magnetic-nanoparticle supported catalysts</i>
Michael Gaffney, Teagasc	<i>Compost in Crop Production: availability disease suppressive properties.</i>
Colin Fitzpatrick, UL	<i>RE-EVALUATE: Reuse of EEE Evaluation and Mainstreaming</i>
Eric Moore, UCC	<i>Microfluidic platform for enzymatic biofuel cells</i>
Lorraine Nagle, UCC	<i>Zero carbon emission microfuel cell design</i>
David Dowling, Carlow IT	<i>Development of specific bacterial detoxification enzymes as bioindicators and biosensors of environmental pollution</i>
Tadhg Coakley, CTC	<i>Study of pay-by-use systems for maximising waste reduction behaviour</i>
Noel Duffy, CIT	<i>Development of an Integrated Waste Management Life Cycle Analysis and Carbon Footprinting tool for the major waste streams in Ireland</i>
Siobhan Jordan, DKIT	<i>Spent mushroom compost (SMC) management and options for use.</i>
Niall O' Leary, UCC	<i>Biopolymer production from Irish Dairy Industry Wastewaters</i>
Dermot Diamond, DCU	<i>Web-Based Monitoring of Gas Emissions from Landfill Sites using Autonomous Sensing Platforms</i>
Ronan Farrell, NUIM	<i>Investigation of Novel Technologies and New Procedures for Environmental Enforcement</i>
Michael A Morris, UCC	<i>Environmental Scanning Electron Microscope (Infrastructure award)</i>
Donal Keane, UCC	<i>Emerging new nano-technologies for separation of ethanol and water for bio-ethanol production</i>
Angela Boyce, UL	<i>Minimization of hazardous waste generated by CIP operations in the dairy processing industry</i>
Mark O'Mahony, UCC	<i>Recombinant DNA approaches to enhance activity of the pathway for degradation of the toxic pollutant styrene</i>
Mark Kelly, GMIT	<i>The Development of a Waste Prevention Design Tool for Architects and Designers</i>
Michael Hayes, UL	<i>The laboratory analysis of Irish municipal and agricultural biomass wastes and evaluation of their utilisation in biorefining technologies.</i>
Kenneth Dawson, UCD	<i>SKEP Nanomaterial in REACH – evaluation of applicability of existing procedures for chemical safety assessment to nanomaterials</i>
Ciarán Prunty, QUB	<i>Demonstration of an adaptation to the activated sludge process; for reduced sludge generation.</i>
James Sullivan, UCD	<i>Catalysts for the promotion of green selective oxidation reactions</i>
Patrick O'Leary, NUIG	<i>Selective Catalysts for green oxidation upping performance reducing waste.</i>
Charles Spillane, NUIG	<i>Biodiscovery of microalgal strains and microalgal technology development for carbon capture and mitigation in Ireland.</i>
Justin Holmes, UCC	<i>Carbon Nanocages as Environmental Adsorbents</i>
Kieran Nolan, DCU	<i>Synthesis of Fine-Chemicals through Solarchemical Photooxygenations and Environmental Performance Evaluations using the EATOS method</i>
David J Timson, QUB	<i>Exploitation of sugar kinases in green chemistry</i>
Cormac Murphy, UCD	<i>Fungi and fluorinated drugs the development of microbial models of mammalian metabolism</i>
Evelyn Doyle, UCD	<i>Informing the design of bioremediation protocols for polycyclic aromatic hydrocarbon (PAH) contaminated soil.</i>
Nick Gathergood, DCU	<i>In situ Enzymatic Conversion of Biomass into Glucose in Biodegradable Enzyme-compatible Ionic Liquids</i>
Sara Pavia, TCD	<i>Irish bio-composites for building.</i>
Stephen Connon, TCD	<i>Biodegradable Imidazolium and Pyridinium Reagents</i>
Nick Gathergood, DCU	<i>Green Organocatalysis A biodegradation and (eco)toxicity study</i>
Paula Colavita, TCD	<i>New delivery agents for nanosized zero-valent iron Fe/C nanocomposites for in situ reductive remediation of pollutants</i>
Wolfgang Schmitt, TCD	<i>Fixation, Storage and Activation of CO<sub>2</sub> using Iminodiacetic Acid-Based Coordination Complexes</i>
Brid Quilty, DCU	<i>Novel bioaugmentation product for Fats, Oils and Grease (FOG) degradation</i>
Niall O' Leary, UCC	<i>Investigation of Biodegradable Plastic Production by an Activated Sludge Microbial Consortium Treating Dairy Industry Wastewater.</i>

## Waste and Resource Management (continued)

Principal Investigator	Title
Biqiong Chen, TCD	<i>Investigation of the toughness of recycled polymer-clay nanocomposites for plastics recycling</i>
Alan Dobson, UCC	<i>Elucidation of global regulatory signals controlling a biotechnologically significant pathway for the degradation of styrene,</i>
Leon Barron, DCU	<i>Pharmaceutical residues within sewage sludges</i>
Patrick Daly, BESrac	<i>Lime Hemp Bio-Composite as a Building Material in Ireland</i>
Tadhg Coakley, CTC	<i>Roadmap for a National Resource Efficiency Plan for Ireland</i>
Alan Dobson, UCC	<i>Beckman Coulter Avanti J26 XP centrifuge + rotors (Infrastructure award)</i>
Colin Fitzpatrick, UL	<i>A Cost Efficient Method For Enabling Reuse of Personal Computers</i>
Cora Plant, RPS Consulting Engineers Limited	<i>Beneficial use of old landfills to provide parkland amenity for areas under urban influence</i>
Carmel Breslin, NUIM	<i>High Frequency Electrochemical Impedance Spectroscopy (Infrastructure award)</i>
Derek Bridge, UCC	<i>Using Recommendation Technology to Enhance Waste Exchange Services</i>
Joseph O'Mahony, WIT	<i>Organic Photovoltaic Materials – Identification Simulation and Characterisation for Environmentally Safe Systems.</i>
Alan Hunter, UCD	<i>The Beneficial effects of using Composted material on Golf course fairways</i>
Garret O'Donnell, TCD	<i>Investigation of energy efficiency in Polymer Processing – Internal recycling of energy</i>
Niamh Power, CIT	<i>A comparison of biogas to CHP and transport fuel technologies for small to medium scale projects</i>
Michael A Morris, UCC	<i>Design and testing of novel flat sheet membrane technologies for Pervaporation (PV); Applications in biofuel production.</i>
Munoo Prasad, Composting Association of Ireland	<i>Capacity Building for Decentralized Organic Waste Management and Composting in Ireland</i>
Colin Fitzpatrick, UL	<i>A cost efficient method for enabling reuse of personal computers</i>
Vivienne Brophy, UCD	<i>Implementing Passivhaus technologies to reduce environmental emissions in housing in Ireland</i>
Joseph Harrington, CIT	<i>A technical, environmental and economic analysis of dredge material recovery and reuse techniques for Ireland</i>
Kieran Nolan, DCU	<i>LED-Micro-photochemistry – a new resources-efficient synthesis tool</i>
Eddy Fitzgerald, WIT	<i>Development of a modified biosorption system for the control of metals in an industry waste stream</i>
Nick Gathergood, DCU	<i>Biodegradable Ionic Liquids</i>
Robert Baker, TCD	<i>New Approach to WEEE Recycling of Rare Earths and Platinum Group Metals</i>
Gary Walsh, UL	<i>The potential of whey in industrial fermentations and broader characterization of the agri-processing waste</i>
Cormac Murphy, UCD	<i>Fungal biofilm as a novel biocatalyst for production of important pharmaceutical compounds</i>

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### FURTHER INFORMATION

Over 140 research reports have been published by the EPA in the past 10 years in the area of Sustainable Environment. Further details on the EPA research programme are available at the following link.

<http://www.epa.ie/downloads/pubs/research/>



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