



Environmental sustainability and resilience

Image - Neil Palmer (CIAT), Flickr 2011

The sustainable use of the Earth's natural resources is central to human wellbeing. However, we now face an unprecedented global environmental challenge: we need to feed a growing and increasingly urban population in a warming world, while protecting biodiversity. Addressing this critical global challenge calls for innovative thinking, strengthened cooperation between countries and academic communities, and a willingness to cross the boundaries between disciplines.

Research conducted within this theme at the University of York aims to increase system resilience in the face of short-term environmental shocks and long-term environmental change, while developing sustainable methods for mitigating adverse human impacts on the environment. Research areas include:

- healthy soils, sustainable food production and resilient agricultural supply chains
- biotechnology, bioenergy and the bioeconomy
- policies promoting sustainable use of resources, including soils, water, food and energy
- rapid urbanisation and its environmental impacts
- impacts of climate change on species and ecosystems
- monitoring and modelling of environmental pollutants
- employing ecosystem services to provide mitigation measures for environmental hazards, including flooding.

Our research excellence

- The *Times Higher Education* ranks the impact of the University of York's research in ecology and environmental science as second in the UK and 17th in the world.
- In the latest UK Research Excellence Framework 2014 (REF), 70 per cent of academic outputs related to the theme are world-leading/internationally excellent.
- The Department of Biology was ranked first in the REF for the impact of its research outside academia, with three of the five case studies highlighting how our research has influenced environmental policies in the UK, the EU and internationally.



Case study

The wood-boring marine pest powering our search for biofuels

The destructive power of a tiny wood-boring marine creature, known as the gribble, *Limnoria quadripunctata*, has been harnessed by our biologists in a bid to tackle waste generated by rice farming. Burning rice straw produces black carbon, a major driver of global climate change which has detrimental impacts on human health. Research led by Professors Simon McQueen-Mason and Neil Bruce (Department of Biology/Centre for Novel Agricultural Products) led to the discovery of an enzyme – found in the gut of the gribble – which could help turn rice straw waste into biofuel, reducing the need to burn it, while at the same time creating a carbon-neutral alternative to oil and gas.

King, A., et al. (2010). Molecular insight into lignocellulose digestion by a marine isopod in the absence of gut microbes. *Proceedings of the National Academy of Sciences of the United States of America*, 107(12), 5345-5350

Marriott, P.E., et al. (2016). Unlocking the potential of lignocellulosic biomass through plant science. *New Phytologist*, 209(4), 1366-1381



Case study **Protecting, conserving and restoring marine areas**

History was made when the world's first network of high seas marine protected areas (MPAs) was declared in the North Atlantic. Proposals for these MPAs were researched and drafted by a group led by Professor Callum Roberts (Environment Department). The six MPAs cover half a million square kilometres, twice the size of the UK, and aim to protect and

prevent degradation of maritime species, habitats, and ecological processes. The development of MPAs represents a paradigm shift in the conservation and protection of our valuable marine environments.

O'Leary, B.C., et al. (2012). The first network of marine protected areas (MPAs) in the high seas: the process, the challenges and where next. *Marine Policy*, 36(3), 598 – 605

Partnerships and impact

Our relationships with major companies such as IBM, Siemens and PerkinElmer help drive the development of novel, leading-edge environmental technologies which have been used in innovative ways to research pollution impacts on land, in the atmosphere and in water. Notable examples of this successful approach include the EU-funded CAPACITIE network (Cutting-Edge Approaches for Pollution Assessment in Cities) and research conducted in the Wolfson Atmospheric Chemistry Laboratory.

The University's Biorenewables Development Centre bridges the gap between the world-leading academic knowledge base at York and the commercial needs of industry. These strong links with industrial partners promote the exchange of expertise and provide access to cutting-edge facilities, positioning York as a thriving centre of successful innovation for the bioeconomy and agri-food sector. These strengths are recognised in the University-initiated BioVale innovation cluster and the York-led N8 AgriFood programme.

Strong academic networks have also been established. For example, the NERC-funded Biodiversity and Ecosystem Service Sustainability research programme is led by a directorate based at York and brings together 150 researchers from 24 different universities

to investigate the functional role of biodiversity in ecosystem processes at the landscape scale.

A collaboration between the University and the Stockholm Environment Institute, the world's top-ranked environmental think tank, facilitates the translation of science into policy to produce real-world impacts. An outstanding example is the novel ozone flux-based risk assessment model, which led to the revision of the UN Gothenburg Protocol in 2012, introducing tighter controls on air pollutant precursor emissions of ozone across Europe.



Organisations like the [University's] Biorenewables Development Centre and their partners, who are doing pioneering work to turn municipal waste into reusable products such as biofuels and chemicals, will help make UK businesses more sustainable and more competitive."

Professor Sir Mark Walport
Chief Executive, UK Research and Innovation

For more information on the University of York's interdisciplinary research themes see
www.york.ac.uk/research

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