

Solving Business Problems with Environmental Data - Projects with NERC funding

Aim: to develop solutions and services which, that through the integration of multiple environmental datasets or environmental data with data from other sources (such as 'business data'), offer specific commercial benefits and/or limit business risks and increase resilience.

Requirements for the business led projects were:

- the inclusion of at least one potential end-user within the project consortia
- to address a specific business issue from one or more of the following areas – transport, food, agriculture, energy generation and supply, built environment (including Future Cities) and financial services.
- to integrate datasets (one of which should be environmental data) to create a new service or process.

Funded projects which include NERC funded academics (a full list of projects is available on the TSB website¹):

Title	Project Description	Business lead	HEI/RC Partner (Name of Investigator)	PI	Total Project cost*	Total Grant Awarded (TSB & NERC)*	NERC Contribution to grant
ForeCoast Marine: A strategic decision support tool for the marine renewable energy sector	Conducting Operation and Maintenance (O&M) activities in the marine environment brings with it significant business risks for the energy sector. At present, the scheduling of O&M activities for renewable energy arrays fails to integrate fully the available environmental and business data in order to plan for the impact of sea-state and weather conditions. When uninformed decisions are made with respect to the environment, significant commercial and H&S risks result. The aim of this project is to investigate the feasibility of improving O&M strategies through the development of a prototype O&M decision support tool, branded ForeCoast Marine. This tool will, for the first time, integrate multiple weather and sea-state forecast data (i.e. environmental data), O&M activity data (i.e. business data) and innovative software to inform and guide operations up to five days in advance. This will allow end users to minimise its commercial and H&S risks and increase its environmental resilience.	Jeremy Benn Associates Limited	NOC	K. Horsborough	£133,284	£94,591	£5,942

<p>Using macro environmental data to support long term adaptation, management and mitigation of sustainability and climate change issues within agriculture and supply chains to the UK food retail sector</p>	<p>This project brings together the University of Leeds and Grantham Institute with commercial developers from BioCarbon Tracker and ESRI UK to provide Sainsbury's with insights into site-specific, multi-parameter environmental risk profiles, both for now and for future forecasting. Risk profiles will combine three categories of data: multiple layers of geospatial data for environmental conditions; combined with crop models and production conditions (to predict performance); and linked to corporate data (such as supplier locations, supply chains, procurement volumes). Outputs from geoprocess models will indicate risks - by type and location - that affect product quality, availability or cost and allow model-based analysis of sustainability and risk. Within the project, ArcGIS Online will be used to share findings with Sainsbury's suppliers for specific sites, which will be validated with growers' direct experiences. The development of this system will provide insights to Sainsbury's and its vast network of suppliers to make them more competitive in the global market. Insights will ultimately inform investment decisions and contractual arrangements to shape supply chains of the future.</p>	<p>J Sainsbury plc</p>	<p>University of Leeds; Grantham Institute</p>	<p>Prof. T. Benton (Leeds); Prof. B. Hoskins (Grantham)</p>	<p>£185,000</p>	<p>£144,000</p>	<p>£49,975</p>
<p>Feasibility Study for a Spatial Decision Support Tool for Business Use in Biodiversity Offsetting</p>	<p>eCountability is leading a team that is aiming to prove the viability of an innovative new spatial Decision Support System targetted at enabling the construction industry to meet its environmental obligations whilst maintaining or improving national levels of biodiversity. Biodiversity offsetting is increasingly being used to ensure that development can proceed while protecting natural capital. The UK government sees it as central to reconciling economic growth with biodiversity protection and has published a Green Paper with commitment to announce proposals by the end of 2013. Major developers in the construction and energy sectors need access to high quality environmental data and an efficient process to assess and deliver biodiversity offsets so that developments can go ahead without delay. This project brings together a consortium of the leading national and local environmental data providers, experts in the biodiversity offsetting concept and geospatial solutions and one of the UK's leading construction companies.</p>	<p>eCountability Ltd</p>	<p>CEH</p>	<p>Dr. L Norton</p>	<p>£62,104</p>	<p>£53,313</p>	<p>£9,522</p>

<p>Environmental data use for determining the temporal carbon flow consequences of biomass for energy</p>	<p>Renewable energy targets have led to a growth in demand for woody biomass, in turn leading to a re-assessment of methods for defining sustainable forest management and forest carbon stock. Well managed forest can be both productive and sustainable, maintaining a positive carbon balance whilst providing all sorts of ecosystem services. However, lack of data and tools to quantify the effect of forestry management brings uncertainty to the effectiveness of bioenergy policy as a climate change mitigation measure and poses a risk to the bioenergy and other wood processing sectors. In this project E4tech, Rezatec, the University of Edinburgh and Drax will develop a methodology to accurately identify the temporal carbon impacts of biomass removal from forests. Information will be extracted from different environmental datasets (satellite, radar and on the ground measurements) using information retrieval algorithms and linked to a forest growth model. The result will be a service that helps businesses in the wood industry understand the GHG impact associated to a given forest biomass feedstock and prove compliance with sustainability criteria to its stakeholders.</p>	<p>E4tech (UK) Ltd</p>	<p>University of Edinburgh</p>	<p>Prof. M. Williams</p>	<p>£145,488</p>	<p>£110,967</p>	<p>£8,802</p>
<p>Land Cover Plus: national agricultural land cover information for the water industry</p>	<p>Anglian Water needs detailed, up to date and consistent information on cropping within its drinking water catchment to better understand catchment risks and to target mitigation measures with greater accuracy and efficiency. The forthcoming Copernicus Sentinel-1 mission is designed specifically to service operational applications, including agriculture, with much improved all-weather frequent repeat radar imagery. Land Cover Plus will investigate the feasibility of integrating such satellite data with the UK Land Cover Map, produced by CEH, to generate an annual agricultural land cover layer. To achieve this, RSAC Ltd will develop an innovative automated parcel-based crop classification technique based on temporal curve matching that is robust enough to cope with regional and temporal variations in crop phenology. Target customers for annual crop maps include all 22 UK water companies, agricultural suppliers and government agencies. There are also many possible overseas customers. RSAC and CEH will work together to develop the market for Land Cover Plus and formulate an appropriate business model for exploitation of project results.</p>	<p>Remote Sensing Applications Consultants Limited</p>	<p>CEH</p>	<p>Dr. D Morton</p>	<p>£126,842</p>	<p>£100,359</p>	<p>£44,725</p>

<p>Global Monitoring of Soil Carbon from Space</p>	<p>Global Monitoring of Soil Carbon from Space - soils store vast amounts of carbon globally and have a major role to play in climate change mitigation, adaptation and food security. Sustainable management of soil carbon requires an understanding of soil carbon stocks under relevant land uses. Traditional methods for measuring soil carbon are impractical, expensive, and therefore not relevant to schemes where large-scale carbon sequestration is the primary objective. This project will develop a methodology combining big data processing, machine learning, ecosystem modelling and remote sensing to provide a wide-scale and cost-effective way to monitor soil carbon changes over time. The data will be available online via an easy to use web based interface and the end users will be able to draw in the boundaries of their areas of interest and extract this data without any specialist expertise. The end-users of the package will be organisations looking to quantify, monitor or evaluate changes in soil carbon for; sequestration, off-setting, agriculture, or for environmental purposes.</p>	<p>Global Surface Intelligence Ltd</p>	<p>University of Edinburgh</p>	<p>Dr. C. Lehmann</p>	<p>£113,056</p>	<p>£95,064</p>	<p>£41,088</p>
<p>On Demand Environmental Modelling: Groundwater Modelling as a Service for Flood and Drought Decision Support Planning</p>	<p>Modelling of groundwater is currently used for long term management of water resources but this has potential as a decision support tool during stress periods such as drought and flooding. Achieving this will require modelling on shorter timescales (weeks or months) and different data sources (i.e. forecasted rainfall). In this project, the partners will develop a prototype of a web-service to provide on-demand groundwater modelling. Such a tool will be interactive, enabling planners to explore the results of alternative courses of action under different scenarios and utilize a combination of current, historical and forecast datasets. Three organisations will contribute: Maxeler Technologies, with a track record in developing and delivering High Performance Computing hardware and software; the British Geological Survey, with a track record in developing groundwater models and supporting decision making; will work together to develop a product intended to meet the requirements of Thames Water, a large water supply utility, as customer. If successful this will be extended as a platform for delivery of multiple environmental models for the UK and global market.</p>	<p>Maxeler Technologies Ltd</p>	<p>BGS</p>	<p>A. Kingdon</p>	<p>£170,770</p>	<p>£129,780</p>	<p>£63,837</p>

<p>Techno-economic feasibility of a system to measure farm environmental impact towards a Sustainable Intensification Audit & Management System- SIAMS</p>	<p>To measure 'sustainable intensification' we must compare crop yield (intensification) & gross margin (economic sustainability) with relevant, quantifiable environmental impact indicators (environmental sustainability). The main environmental indicators farmers should consider are Water Management/Pollution; Greenhouse Gas Emissions & Biodiversity. We propose to develop a system to assimilate, calculate & display this environmental impact data alongside yield, quality & fiscal performance data to create a valuable representation of farm physical, financial & environmental performance on a field by field basis. This feasibility study will look at the potential of utilising data already stored within GateKeeper (a farm data software tool) and several other data sources, combined with new farm scale data in a series of models, fused in a single software system we call SIAMS. These models will help the farm manager & agronomist identify & modify their agronomic inputs avoiding wasteful & potentially harmful applications. Subject to feasibility study results we will then need to develop the data fusion platform & possibly two systems for capturing & analysing localised flora & fauna data. This technology could position UK agriculture at the forefront of precision farming & sustainable intensification.</p>	<p>H L Hutchinson Ltd</p>	<p>CEH; Univeristy of Leeds</p>	<p>Dr. L. Norton (CEH); Prof. W. Kunin (Leeds)</p>	<p>£163,364</p>	<p>£125,736</p>	<p>£30,766</p>
<p>Aster Housing Association climate change risk and cost diagnosis</p>	<p>This feasibility study will prototype an Adaptation Planning Service for businesses in the UK. The APS integrates: 1) a needs assessment based on business processes, 2) interactive risk diagnostic and profiling tools, 3) quantitative data and models of impacts, and costs and benefits of adaptation actions, and 4) a strategic planning application to incorporate climate resilience in business decision processes. A key feature is the visual, interactive mapping of present and future climate change hazards, linked to decision trees and scorecards for potential adaptation options. The APS aides communication with business managers in developing effective means for reducing the economic and business costs of climate impacts.</p>	<p>Global Climate Adaptation Partnership (UK) Ltd [GCAP]</p>	<p>University of Manchester & Bath</p>	<p>Dr. J.G. Carter (Manchester); Prof. M. Finus (Bath)</p>	<p>£113,857</p>	<p>£89,134</p>	<p>£38,535</p>
<p>Developing breeding strategies for a variable climate</p>	<p>The project is a collaboration, led by Environment Systems Ltd, with Leeds University Institute for Climate and Atmospheric Science (ICAS) and Limagrain Ltd. The intention is to carry out a feasibility study addressing the potential for developing a tool, using meteorological data, along with other environmental datasets, to be used by crop breeders for producing new and improved arable arable crop varieties, more resilient to a fluctuating climate, more stable for helping global food security and with less impact on the environment.</p>	<p>Environment Systems Ltd (ESL)</p>	<p>University of Leeds</p>	<p>Prof. A. Challinor</p>	<p>£106,678</p>	<p>£90,663</p>	<p>£46,639</p>

<p>A toolbox for incorporating satellite-based data into weather index based insurance (SatWin toolbox)</p>	<p>Climate extremes, such as very low or high rainfall, expose African farmers to catastrophic losses with devastating impact on livelihoods. These are exacerbated by lack of access to traditional insurance. Since 2005, MicroEnsure has pioneered an alternative -- weather index-based insurance (WII). Rather than insuring a proven loss, WII pays out if a weather index is breached. Until recently, WII has been available only to farmers living within close proximity to a rain gauge. Thirty years into the environmental satellite data era, there is now the potential to use these datasets to insure the millions of farmers who do not live near a rain gauge. This project will develop technologies to scale out WII in a safe and sustainable manner that will enhance the livelihoods of some of the poorest people in the world - while establishing the UK as global leader in the microinsurance industry.</p>	<p>MicroEnsure (UK) Ltd</p>	<p>University of Reading</p>	<p>Dr. E. Black</p>	<p>£182,587</p>	<p>£153,665</p>	<p>£66,898</p>
<p>Crop pest and disease warning system for food security in the developing world</p>	<p>The project is concerned with developing agri-environmental services for developing countries by bringing together data on crop pests and diseases in the CABI Knowledge Bank with weather data and other environmental sources of information, including satellite data, freely available on the Internet. The resulting information will be used to develop value added services which will be offered on a commercial basis to agribusinesses globally. CABI will use revenues from the commercial sales to support the maintenance of the Knowledge Bank as an open-access global public good and hence create a virtuous cycle of more local information, leading to better information products, higher revenues and hence an ever expanding local networks across the world giving better advice.</p>	<p>Assimila Limited</p>	<p>CABI</p>	<p>Dr. S. Murphy</p>	<p>£92,956</p>	<p>£79,008</p>	<p>£37,164</p>
<p>Foraging behaviour of large gulls and the implications for offshore wind site selection</p>	<p>There are many environmental factors which influence the spatial location of offshore wind farms but there is a lack of data on many and this makes it difficult for marine spatial planners and developers to make an accurate risk assessment of the suitability of a site for offshore wind development. Large gull species have recently been identified as a key bird species which may be particularly susceptible to collision risk from offshore wind farms. The proposed project is to identify the foraging behaviour of large gull species to determine the potential implications for future offshore wind energy sites. This project will track the foraging behaviour of large gull species during the breeding season and, using existing environmental data sets, identify spatial links with marine habitats and opportunistic prospects to identify patterns and the drivers to this behaviour. A historical assessment will also be made using European Seabirds at Sea data. The results will then be applied to potential future areas of search to identify the potential risks to offshore wind development.</p>	<p>EDPR-UK</p>	<p>CEH (university of Aberdeen - in kind)</p>	<p>F. Daunt</p>	<p>£200,000</p>	<p>£136,378</p>	<p>£34,017</p>

<p>Identification of Sites for Micro-hydropower On Rivers Through Applied Satellite and Environmental Data (ISMORTASED)</p>	<p>Most rivers in the UK can produce much more hydropower than is currently being exploited, albeit at small but very numerous sites. The problem being solved by this project is the identification of sites where micro hydropower turbines, of different types and sizes, might easily and inexpensively be deployed to the benefit of the local communities and without damage to the environment. This can be achieved by accessing and combining data sets from government agencies, such as the Environment Agency, with data from existing satellite-based earth observation service providers. In revealing the potential of individual sites on rivers where "green" electricity can be produced 24 hours a day, we will stimulate growth in renewable energy jobs, cut Carbon emissions and establish localised secure supplies of electricity.</p>	<p>High Efficiency Heating UK Ltd.</p>	<p>University of Leicester (G-STEP)</p>	<p>Dr. K. Tansey</p>	<p>£154,282</p>	<p>£119,536</p>	<p>£61,200</p>
<p>Using environmental data to improve great crested newt surveying.</p>	<p>This feasibility project will apply cutting edge next generation DNA sequencing methodologies (NGS) to ecological surveys with specific reference to an endangered UK amphibian, the Great Crested Newt (GCN). GCN are a protected species which makes it an offence to move or kill them, or disrupt their habitat. As such land that is earmarked for re-development and with potential to harbour GCN populations (ponds) will need to be surveyed for GCN. This can be a costly process and one that delays the development of land. The proposed methodology to be evaluated within this study has the potential to not only survey this species, but all animal species within a particular ecosystem, in parallel, by analysis of the trace amounts of environmental DNA (eDNA) which had been released into that environment from the sloughing of cellular material from the animals within that ecosystem. eDNA monitoring by NGS will allow cost-effective species monitoring in environmental surveys, with potentially greater sensitivity than those surveys that are currently carried out by conventional trapping/sighting methodologies.</p>	<p>ADAS UK Ltd</p>	<p>Nottingham University</p>	<p>Dr. K. Gough</p>	<p>£185,111</p>	<p>£138,956</p>	<p>£26,096</p>

<p>SAREDD - An operational service providing reliable forest degradation information using satellite radar data</p>	<p>The monitoring of tropical forest degradation has a major contribution to make to the global challenge of climate change and the wellbeing of those who live in these environments. Compared to tropical deforestation, the monitoring of forest degradation has not received the same level of research and significant challenges remain. Astrium Geo-Information Division, University of Edinburgh and the Gabon Ministry of the Environment have created a partnership to develop a system that uses satellite radar data to deliver annual maps of tropical forest degradation. The launch of the Sentinel-1 satellite by the European Space Agency in 2014 will provide substantial amounts of radar data over the tropics and the project will develop techniques that will integrate those images with other datasets to produce the required maps. This will take place within a system capable of processing the large amounts of data involved and providing an efficient means of distribution. A prototype system using currently available radar data will demonstrate the feasibility of the proposed service.</p>	<p>Infoterra Ltd trading as ASTRIUM Geo-Information Division</p>	<p>University of Edinburgh</p>	<p>Dr. E. Michard</p>	<p>£149,954</p>	<p>£123,704</p>	<p>£74,000</p>
<p>Using environmental data to help industry invest in the UK biomass market</p>	<p>Biomass produced from perennial energy crops, Miscanthus and short-rotation coppice, can reduce the carbon intensity of energy production. The UK Government has had incentive policies in place, targeting farmers and power plant investors to develop this market, but growth has been slower than anticipated. Market expansion requires farmers to select to grow these crops, and the construction of facilities to consume them. This project develops and uses environmental data linked to a model of biomass supply and demand to improve our understanding of the behaviour of the energy crop market in the UK. The project is led by a consulting company (Ecometrica) developing a data platform that will be available to potential market participants, based on scenario results from a market model developed by academic researcher (SRUC). Realistic market scenarios will be developed and tested using the decisions facing a major energy market participant (E.ON). The outcome will be a credible set of business scenarios of market development useful for both government and private investors, and information on the environmental impact, including the lifecycle carbon cost.</p>	<p>Ecometrica Limited</p>	<p>Scotlands Rural Agriculture College (SRUC)</p>	<p>Prof. D. Moran</p>	<p>£122,861</p>	<p>£89,026</p>	<p>£47,521</p>

WaveCERT	<p>WaveCERT will provide a tidal and wave power planning and monitoring tool innovatively helping marine renewable providers to choose the best spot to install their equipment using space data. WaveCERT utilises satellite data so all observations are conducted remotely, this gives three main benefits:</p> <ul style="list-style-type: none"> - A sites' potential output can be determined remotely and frequently thus minimising the cost and danger of field expeditions. - The near term output of the site can be predicted repeatedly (by potentially up to 72 hours in advance.) - The effect of sediment buildup can be modeled so steps can be taken to minimise the negative effects of build up and support more enviromental and effective site selection for this new energy. 	Stevenson Astrosat Ltd.	BGS; SAMS; Heriott Watt University	G. Carter (BGS); Dr. John Howe (SAMS); Dr. David Woolf (Heriott Watt)	£196,746	£163,532	£63,101
HARIMAP (Harmfaul Algae Risk Index MAP)	<p>HARIMAP provides a way for the insurance industry to set insurance premiums for fish farms and other marine aquaculture in relation to algal blooms. Algal blooms are natural events, but they can be harmful to marine animals such as farmed fish and shellfish. Shellfish exposed to algal blooms can also be toxic or even fatal to humans and as such exposed farms are closed until the event has passed and cleared. These closures are both costly to the owner and the insurance company who insures against such events. In order to set realistic insurance premiums, the insurance industry needs a way of scoring the risk of algal blooms at a given location in the ocean where aquaculture may be sited. HARIMAP takes data from satellites and numerical models to generate such a risk score that can be presented as a map and used alongside standard maps and charts of the marine environment. The products are delivered by SeaZone, which is an established supplier of marine data products.</p>	HR Wallingford Limited	SAMS	Dr. K. Davidson	£132,091	£85,389	£32,189
Improving Forecasts of African Dust Storms for Oil and Gas Operations	<p>Fugro GEOS and the University of Leeds are collaborating on a project to designed to improve dust forecasting for the Energy industry operating in North Africa. The project will seek to use knowledge derived from the NERC sponsored Fenec project, and to combine this with EUMETSAT data products, Fugro GEOS atmospheric modelling and in-situ data provided by an International Oil Company. The project aims to help the oil industry to reduce risk to its operative working in the remote harsh climate of North Africa.</p>	Fugro GEOS Ltd	Univeristy of Leeds	Dr. J. Marsham	£159,225	£127,885	£69,683

Smart Clean	<p>The Project is a feasibility study to determine how valid it may be to use environmental data combined with traffic volume and behaviour, in using this to reasonably predict potential 'hot spots' where water pollution may be likely to occur at problematic levels as a result of toxins from roads.</p> <p>Where toxins are forecast to cause a detriment to waterways impacting aquatic life and vegetation, this information may be used to inform highways maintenance operational decisions in terms of what maintenance activities to carry out and at what point in time, taking into account the type of toxins, upcoming rainfall, locations to sensitive waterways and so on. This study will determine the viability of this approach to enable smarter maintenance of UK Roads and Gullies.</p>	InTouch Ltd	Lancaster University	Prof. N. Davis	£254,902	£199,999	£47,598
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* Proposed Total cost and Grant awarded. All are subject to grant offer and Technology Strategy Board conditions being met.

¹ https://www.innovateuk.org/competition-display-page/-/asset_publisher/RqEt2AKmEBhi/content/solving-business-problems-with-environmental-data?p_p_auth=dN7UCfvG