Innovate UK
Technology Strategy Board

Directory of projects

Environmental data

Introduction

Companies are keen to understand how quickly their businesses and the markets they operate in will be affected by environmental change.

Effective planning for disruption of this kind requires a comprehensive understanding of environmental factors.

Through various agencies, government has amassed a large amount of environmental data that businesses could use in managing future risks and exploring opportunities.

Data is routinely collected on subjects such as land cover, environmental change, precipitation, farm performance, biodiversity, water flows, geological surveys and marine environment. Integrating these datasets with commercial and societal data can enable innovation in important areas:

Agriculture and food

Energy generation and supply

Infrastructure (including transport, built environment and water)

Our competition, **Solving business problems with environmental data**, funded 33 feasibility studies with a total of £4 million investment, allowing companies to test their ideas and take them forward.

The feasibility studies we supported, in partnership with the Natural Environment Research Council (NERC), will help businesses to attract further investment for research and development, validation and eventual commercialisation.

This directory showcases the feasibility studies we funded in 2014 and the businesses involved. Projects lasted up to 12 months, with a value of up to £200,000. The profiles were provided by the companies. Those who used satellite-derived data are signified by this icon.

Mike Pitts, Lead specialist - Sustainability

Contents

Agriculture and food

Energy

Infrastructure and water

Airbus Defence and Space

Reliable forest degradation information using satellite radar data (SAREDD).

Project partner:
The University of Edinburgh.

Airbus Defence and Space is a division of Airbus dealing with the space market. We work across the full value chain, from building launchers and satellites through to providing integrated solutions based on space data.

What was the aim of your project?

Our aim was to explore the use of satellite data to determine forest degradation. We did this by applying an innovative algorithm to archived ENVISAT data.

What was your approach? Which publicly-funded environmental data sets did you use?

We took a set of ENVISAT data covering the area of interest and pre-processed it into a co-registered data time series. We then extracted degradation information by applying the algorithm and presented it to users via an online portal. We used radar data acquired by the ENVISAT satellite, which was funded by the European Space Agency.

How will you make money from this?

Forest destruction and degradation are of great interest, particularly as carbon credit schemes become more important. We will market our proposed system to customers involved in monitoring and verifying these schemes. There are also opportunities with certification schemes and general forest management. Anyone needing to monitor the health of a forest could be interested in our system.

What are your next steps?

We need to work on the operational capability of our system, primarily to make it more automated In addition, as ENVISAT has come to the end of its life, we must transfer our technique to the Sentinel 1 satellite.

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Assimila Ltd

Crop pest and disease warning system for food security in the developing world.

Project partner:
CABI.

Assimila is an earth observation applications consultancy that specialises in applying advanced research to real-world problems. CABI is a not-for-profit organisation that improves people's lives by solving problems in agriculture and the environment.

What was the aim of your project?

We wanted to develop a system that could estimate the risk of crop damage due to a range of insect pests affecting maize in East Africa and to then to devise a demonstrator to gain feedback from potential customers.

What was your approach? Which publicly-funded environmental data sets did you use?

We identified the most important cash and subsistence crops, along with the insect pests that cause the greatest losses to those crops. We then implemented models predicting the population growth rates of those insects, using climate reanalysis, weather forecast and rainfall datasets as inputs. We translated these growth rates to risk levels at a country level and mapped them on a demonstration web site.

How will you make money from this?

Revenue will come from subscription services as part of a package of information services to help farmers to improve yields and reduce losses.

What are your next steps?

We will undertake further validation experiments to demonstrate the skill of the prediction models and the usefulness of the risk warnings. We will also investigate add-on products to the basic risk warnings.

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Courtyard Agriculture Ltd

A soil zoning algorithm to improve productivity of arable farmers.

Project partner:
ADAS.

Courtyard operates the leading independent precision farming service in the UK and specialises in a soil science-led service. Established in 1990, we employ 20 staff and have seen rapid growth since launching our Intelligent Precision Farming (IPF) service in 2005.

What was the aim of your project?

We offer a service based on our proprietary 'soil brightness' algorithm, using satellite imagery to locate soil variation. This project looked at the feasibility of layering this data with other data sets to enable us to accurately describe soil characteristics based on the combination of soil brightness and other data.

What was your approach? Which publicly-funded environmental data sets did you use?

We identified potential datasets, including Ordnance Survey (OS Terrain 5) and British Geological Society (surface geology). We used our existing soil survey data as a control test, and applied a range of models to the layered data to try to predict soil characteristics.
We narrowed down specific characteristics to try to get an automated, but reliable estimate, which would have delivered automated soil maps.

How will you make money from this?

We intended to sell the outputs from the data as a value-added product on which farmers could base precision farming decisions. This would have created a highly efficient way for farmers to better understand their soil at a lower cost than with existing alternatives.

What are your next steps?

Unfortunately, we were unable to make successful predictions with the data sets we were using and we abandoned the project after nine months.
We are looking to see whether an alternative dataset might offer more success.

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Deimos Space UK Ltd

CropForecast.

Project partners:
SoilEssentials, The James Hutton Institute.

Deimos Space UK Ltd was created in 2013 to address the UK market for space systems, services and applications. SoilEssentials is an agronomy company delivering precision agriculture services. The James Hutton Institute is an interdisciplinary scientific research institute in Scotland.

What was the aim of your project?

We wanted to improve crop disease forecasting, using high-resolution earth observation data, accurate digital elevation models and local weather data to deliver risk maps at a sub-field level. The initial focus was to track and predict the spread of potato late blight in the UK.

What was your approach? Which publicly-funded environmental data sets did you use?

We looked to generate a new risk model for contemporary potato blight, to replace the 'Smith Period' model that was designed in the 1950s. Our model also uses environmental inputs such as weather forecasts from Met Office (refined to sub-field level using modelling tools), terrain elevation from Ordnance Survey and earth observation data (for information about crop canopy and biomass).

How will you make money from this?

We will integrate the improved potato blight forecasting tools created by the CropForecast project will be integrated with existing agricultural services provided by SoilEssentials via their web information portal and precision agriculture service. CropForecast will add a 'premium' information layer to the basic service, with farmers paying to access the field scale maps of potato blight risk.

What are your next steps?

We will integrate the CropForecast risk maps into the SoilEssentials on-line platform and establish an operational service. We will also aim to integrate the potato blight risk layer into other platforms, including a Deimos UK project called KORE, to make CropForecast available to more farmers and agronomists.

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Environment Systems Ltd

Breeding strategies for a variable climate.

Project partners:
Limagrain UK Ltd,
University of Leeds.

We specialise in development and use of information in agriculture, environment, rural development, land and property sectors. We use remote sensing and geographic information system (GIS) technologies to provide techniques for environmental assessment and monitoring.

What was the aim of your project?

We set out to assess the feasibility of a tool for developing breeding strategies for variable climates. Our objectives were to: determine the cause of trial failure during seasonal extremes; assess the impact of recent climate variability on two-year breeding cycles; re-evaluate climate zoning using historical data; and develop a method to integrate high-resolution climate data into a breeding programme.

What was your approach? Which publicly-funded environmental data sets did you use?

We built on knowledge from previous research projects. We made assessments of the uncertainty chain, from climate models through to crop models, including identification and ranking of key bio-physical processes and sources of uncertainty. Statistical analyses of meteorological and trial data helped develop understanding for research.

How will you make money from this?

Commercial exploitation will focus on: the data modelling technology, a key part of the innovative nature of the project, with the aim of producing a model that is commercially available; and results from the modelling, in enabling better varieties of crops to be produced.

What are your next steps?

We will validate initial model outputs and move on to proof of concept before further development of the business model.

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Global Surface Intelligence Ltd

Global monitoring of soil carbon from space.

Project partner:
University of Edinburgh.

Global Surface Intelligence (GSi) provides big data predictive analytics of satellite and other data, enabling us to understand our planet in new ways and on new scales. We worked on this project with the University of Edinburgh's GeoSciences department.

What was the aim of your project?

Soils store vast amounts of carbon globally and have a major role to play in climate change mitigation, adaptation and food security. Existing methods of measuring soil carbon are prohibitively expensive. Our aim was to provide a wide-ranging and cost-effective way to monitor soil carbon changes over time from satellite.

What was your approach? Which publicly-funded environmental data sets did you use?

Using our big data machine-learning software platform, we developed a time-series analysis using satellite data covering the entire surface of the planet every eight days back to 2001. Coupled with GSi's unique global biomass data, multiple terrain and soil variables, we used high-performance software to develop a regression-based approach against the soil carbon map of Australia.

How will you make money from this?

We are already earning revenue after the Australian Minister for Environment requested a further project to examine GSi's solution. We are part of a consortium looking to roll this out to 250-plus farmers across Australia and another consortium being considered for the Virgin Earth Challenge prize, Sir Richard Branson's US $25 million fund for 'greenhouse gas removal' innovation.

What are your next steps?

We have responded to the Australian Government's request for proposals (RFP) to further test the GSi satellite-based method against more ground samples. We are awaiting feedback from the Virgin Earth Challenge Committee and the other consortium is seeking funding to roll out projects to farmers.

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H L Hutchinson

A system to measure farm environmental impact.

Project partners:
Farmade Management Systems Limited, The Technology Research Centre Ltd, Centre for Ecology & Hydrology, University of Leeds.

Hutchinson's is a family company which has operated for more than 75 years, delivering agronomic advice and farm supplies to 8,000 farmers throughout the UK in all crops. Our turnover exceeds £200 million.

What was the aim of your project?

To measure 'sustainable intensification' we must compare crop yield and gross margin, using relevant, quantifiable environmental impact indicators. The main environmental indicators farmers should consider are water management/ pollution, greenhouse gas emissions and biodiversity.

We wanted to develop a system to assimilate, calculate & display this environmental impact data alongside yield data.

What was your approach? Which publicly-funded environmental data sets did you use?

We explored the potential of data already stored within GateKeeper and several other data sources (Countrywide Survey, Agriland, BGS soil maps), combined with new farm-scale data in a series of models. The result was a single software system that collates and analyses these data sets collectively, to create an auditable overview of the sustainable intensification on a field-by-field basis.

How will you make money from this?

We have developed three business cases: the first, with the volume of farm customers rising to 5,000 by 2022, with prices fixed to cover costs; another based on under 800 farmer customers by 2022; and a model just to monitor water pollution and greenhouse gas emissions.

What are your next steps?

We will set up pilot projects with growers and water companies to test the assumptions in the economic model. We are currently developing a project on the Eye catchment with Prof Chris Stoate, of the Loddington Estate, and another with Anglian Water on the River Wissey catchment.

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Landmark Information Group

The relationship between potato crop groundcover and synthetic aperture radar (SAR) coherence measurements of vegetative cover.

Project partners:
Telespazio Vega,
NIAB-CUF.

At Landmark, we identify and translate environmental and property risk into facts, insight and opportunity. With data, technology and our team of experts at the heart of what we do, we deliver intelligence and solutions to enable customers to make informed decisions.

What was the aim of your project?

Our project aimed to establish the ability of SAR to reliably observe canopy development within potato crops when compared with the CanopyCheck data. The technical aspects of the project are supported by detailed evaluation of the commercial market and development of a suitable business model.

What was your approach? Which publicly-funded environmental data sets did you use?

Our prototype model for deriving agronomically usable information from SAR data has the potential to be used in yield forecasting models of potato crops. The project has delivered a detailed business review of market potential for SAR technologies in a significant global agricultural sector. We demonstrated that crowd sourcing is a viable method for collecting ground truthing data to support satellite remote sensing programs.

How will you make money from this?

Services exploiting SAR technologies could deliver up to £2.9 million in savings to the potato supply chain through improved intelligence for hedging options. Primary customers are large processors and packers who procure large tonnages of potatoes from a dispersed network of growers.

What are your next steps?

We need to automate data processing to reduce the cost of production and ensure effective delivery of output. ESA Sentinel-1A data would further reduce costs and preliminary testing suggests this data could be viable. We need to work on establishing parameters for models covering different crop management practices.

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MicroEnsure

A toolbox for incorporating satellite-based data into weather index-based insurance.

Project partner:
The University of Reading.

We are a specialist service provider in insurance programmes for the under-served, low income population in developing countries. We specialise in mass-market products, including mobile-based, health, life and agriculture insurance. Our partner for this project was the University of Reading.

What was the aim of your project?

The aim was to develop weather index agriculture insurance for small farmers in sub-Saharan Africa, particularly in Zambia and Kenya. We wanted to increase agriculture insurance coverage for farmers, open up access to finance and to farming inputs, while providing livelihood protection as well as risk mitigation within agricultural value-chains.

What was your approach? Which publicly-funded environmental data sets did you use?

We used publicly-funded satellite databases, such as TAMSAT and NDVI, along with data and local knowledge from Zambia and Kenya. To deal with the Basis risk, we developed crop insurance products based on both satellite data and localised risk assessment, a significant challenge for parametric insurance (paying out on an event rather than proven loss). We covered about 12,000 farmers in Zambia over two years via agri-businesses, farm input suppliers and farmer organisations.

How will you make money from this?

Insurance for small-scale farmers is typified by very cheap products so profit margins are very low on a per-farmer basis. The viability of this programme depends heavily on being able to scale up. We are on track to extend insurance coverage to 80,000 farmers. Our project has enabled better access to finance, farming inputs, livelihood protection and risk mitigation for value chains.

What are your next steps?

We want to improve the application of satellite data to improve parametric insurance products and to scale up operations with agri-businesses and farmer organisations. Hybrid products will improve risk transfer to insurers/ reinsurers. We will use local knowledge to develop a soil-moisture index for further development of weather index insurance.

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Rezatec Ltd

Optimising sugar beet growth yields through the use of space and environmental data.

Project partner:
British Sugar

Rezatec helps businesses better manage their land-based assets by making use of the increasingly sophisticated but complex array of earth observation imagery and data available. British Sugar is a leading supplier of sugar to the UK.

What was the aim of your project?

Working with British Sugar, we sought to optimise sugar beet growth yields through the use of space and environmental data.

What was your approach? Which publicly-funded environmental data sets did you use?

We did this by processing data from a wide range of sources, providing a comprehensive field monitoring and yield prediction service that assimilates data and populates it across crop growth models. We used the following data sources: unmanned aerial vehicles (canopy cover/ crop stress); from field/farmer; sugar beet analysis; tablet result datasets; weather station datasets. We assessed the satellite data component and identified the methodology for further projects.

How will you make money from this?

We plan to roll this out across British Sugar's supply base in the UK and Spain over the next few years.

What are your next steps?

We will learn from the feasibility study to further develop the crop management tool. We will then take a commercial offering to British Sugar's suppliers in Spain and the UK and will also identify other markets outside of sugar beet.

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Sainsbury's Plc

Adaptation, management and mitigation of sustainability and climate change issues within grocery supply chains.

Project partners:
Mack, Chingfords, 3Keel LLP, Leeds University, Imperial College London, Esri UK.

This project was led by major UK retailer Sainsbury's with two fresh fruit suppliers, Mack and Chingfords. Academic support was from Leeds University and Imperial College London, with management by 3Keel LLP. Esri UK provided mapping services.

What was the aim of your project?

Sainsbury's sells 30,000 products from 2,000 suppliers and produced by over 17,000 farmers across the globe. We wanted to develop a methodology to assess multiple risks – climatic, environmental, social and others – that could be applied to all of our agricultural supply chains.

What was your approach? Which publicly-funded environmental data sets did you use?

We developed a step-by-step methodology for understanding supply chain risks. We systematically recorded product/crop vulnerabilities for different regions across a 12-month cycle, to inform the data sets we required. We compiled a database of publicly available satellite data. These were queried for specific fruit-growing locations in South Africa for temperature conditions, and validated against weather station recordings. Coarse satellite data resolution posed a challenge in interpreting results.

How will you make money from this?

We proved that we could extract greater value from existing Sainsbury's data by building a system to gather product vulnerability knowledge from technical teams and geospatial information on existing supply chains. We also proved the value of external data – from satellites, regional expertise and local weather stations. Combining internal and external data can provide early warnings within season, and intelligence for long-term supply chain planning, reducing procurement costs and environmental impacts.

What are your next steps?

We will embed the methodology within Sainsbury's core processes, contributing to category teams' continual product management and centralised strategic supply chain planning. We will develop relationships with regional providers in strategic locations, and continue to work with project partners to use external data and modelling for methodology application.

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BRE

Solar performance mapping and operational yield forecasting.

Project partners:
Met Office, University of Exeter.

BRE provides independent consultancy, research, training and certification for the built environment sectors. BRE National Solar Centre focuses on the performance and quality of solar energy systems.

What was the aim of your project?

BRE National Solar Centre, Met Office and University of Exeter are collaborating to provide good quality mapping and forecasting services for solar photovoltaic (PV) operators, developers and end users. The aim is to provide mapping services and also forecasting services on a commercial basis.

What was your approach? Which publicly-funded environmental data sets did you use?

We have taken historical and live solar electricity generation data and compared this to Met Office climatologies, including predictive models, observed data sets and satellite observations/ models. This enables a higher resolution performance map for producing annual predictions and short term yield forecasting for geographical points. The combination of data sets is innovative. Securing data has been challenging.

How will you make money from this?

Solar developers, end users, financiers and project owners will be interested in the information that our services will produce. This is part of the development of the solar industry and integration of large scale solar assets with the wider electricity balancing market

What are your next steps?

As well as completing the project, we will continue developing tools to provide mapping and forecasting services.

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E4tech (UK) Ltd

CarbonStockTaker: determining the temporal carbon flow consequences of biomass for energy.

Project partners:
Rezatec Ltd,
DRAX Power Ltd,
University of Edinburgh.

Strategy consultancy E4tech, experts in bioenergy sustainability issues, and Rezatec, a value-added processor of earth observation data, joined forces with forest carbon dynamics experts from the University of Edinburgh and low-carbon power generator Drax.

What was the aim of your project?

We addressed the question: how can biomass-users ensure that biomass extracted from forestry systems has not negatively affected the carbon stock of those systems? We explored the feasibility of a service that provides carbon sustainability assessments based on accurate, observation-based carbon stock estimates of the forest areas this biomass is sourced from.

What was your approach? Which publicly-funded environmental data sets did you use?

Using several study areas in the USA to trial our approach, we developed and implemented a method to generate spatially-explicit carbon stock estimates from a combination of Landsat, SRTM, and GAP data, using FIA data for calibration.
We then processed and interpreted these estimates to yield carbon sustainability assessments. Incorporating the DALEC model of forest carbon cycle processes allows us to use the system when FIA data is not available.

How will you make money from this?

E4tech and Rezatec will offer the CarbonStockTaker service to European power generators who use forest biomass as well as major producers of industrial wood pellets, providing a cost-effective way to demonstrate the sustainability of their use of forest biomass. The service should also be of interest to users and producers of residential wood pellets, developers of forestry carbon credit projects, and the sustainable forestry sector at large.

What are your next steps?

We will further refine our offering and are planning to start demonstration projects with selected end-users.

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EDP Renewables UK

Foraging behaviour of large gulls and implications for offshore wind site selection.

Project partner:
Centre for Ecology and Hydrology (CEH).

EDPR is a leading global renewable energy company with operations in Europe and across the American continent. We have been developing wind farms since 1996. CEH is the UK's centre of excellence for integrated research in terrestrial and freshwater ecosystems.

What was the aim of your project?

Our main aim was to identify the drivers affecting the distribution of large gull species, to determine the potential implications for future offshore wind energy sites.

What was your approach? Which publicly-funded environmental data sets did you use?

The project involved tagging individuals of two large gull species in the north of Scotland to identify their foraging behaviour during the breeding season. We then assessed their movements in relation to the environmental variables of sediment type, distance to coast, water depth, sex and fishing activity, to identify whether any specific feature or combination of features influenced behaviour patterns. The publicly funded dataset we used was Vessel Monitoring System data.

How will you make money from this?

The results can be applied to current and future areas of search for new offshore wind sites to assess the potential site specific and cumulative impacts associated with large gulls. They will also support future strategic environmental assessments for new national plans for offshore wind development. The de-risking of projects during site selection will support the development of a sustainable offshore wind energy industry.

What are your next steps?

Next steps will include disseminating the results – by presenting at conferences, publishing the report online and in peer reviewed journals. The project team will also investigate the potential to extend the study in order to increase the address the remaining data gaps.

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Element Energy

Forecasting climate change impacts on electricity distribution loads at network asset level.

Project partners:
UK Power Networks, Met Office.

Element Energy is a specialist low carbon energy consultancy that has been working across the electricity generation and distribution, transport and built environment sectors for more than 10 years.

What was the aim of your project?

We set out to assess the feasibility of combining Met Office climate forecast data with electricity distribution network operator (DNO) load data. That would allow us to forecast the extent of climate change impacts on demand (such as more summer cooling and less winter heating) and generation, including changing solar insolation and wind levels, at specific network assets.

What was your approach? Which publicly-funded environmental data sets did you use?

Our approach enables us to assemble and combine high-resolution Met Office historical and UKCP09 climate forecast data with asset-specific DNO historical and projected load data. We established innovative ways to overcome the different approaches to geospatial resolution, certainty, temporal resolution and subject matter between these datasets. That produced meaningful indications of the impact of climate change on future loads for several illustrative primary substation assets.

How will you make money from this?

DNOs are forecast to spend £43 billion in the UK by 2050 on reinforcing the electricity network to accommodate future demand. As much as 12% could be saved if climate change impacts on load are integrated effectively into load forecasting. Using existing load forecasting relationships we have with UK DNOs, we plan to develop the proposed solution to integrate into existing business planning processes.

What are your next steps?

We plan to combine these datasets at business planning scale – across a full urban network – where climate impacts on load are greatest. We will address the risks of applying this to more challenging assets and integrating climate impacts into the complex existing DNO load forecasting process.

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Fugro GEOS Ltd

Improving African dust storm forecasts for oil and gas operations.

Project partner:
University of Leeds.

Fugro is a leading supplier of meteorological and oceanographic (metocean) services for offshore and coastal applications, providing marine information to manage risk. With more than 30 years' experience worldwide, we are well placed to respond to clients' metocean needs.

What was the aim of your project?

We set out to use knowledge gained by Leeds University in projects funded by the Natural Environment Research Council (NERC) to improve dust forecasting for the energy industry in North Africa. The aim was to reduce the risk of working in harsh climates by supplying an attractive product that offers simple interpretation by non-meteorologists.

What was your approach? Which publicly-funded environmental data sets did you use?

We recognised the need for a number of atmospheric model and data processing chains. We achieved good results from in-house, high resolution weather research and forecast (WRF) modelling and used data from various NERC-funded projects to optimise the WRF model set-up.

To mitigate the possibility of the modelling missing events, we used satellite-derived data (EUMETSAT) to develop a dust imagery interpretation process, including trajectory modelling.

How will you make money from this?

Fugro GEOS will offer this as a premium service, differentiating ourselves from the competition by combining automated processing and forecaster intervention to increase forecast accuracy. The tools developed in this project will provide guidance for our forecasters and allow them to deliver a comprehensive service to our clients.

What are your next steps?

We are incorporating the results and techniques from our project into the operational forecasting business and we have begun to promote the service to our client base in North Africa. Seasonal testing and validation are showing encouraging results which will aid the marketing and sales processes to new clients.

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High Efficiency Heating UK Ltd

Identifying sites for micro-hydropower on rivers.

Project partners:
GoldmineBD,
University of Leciester

We are a specialist heating engineering company focused on renewable energy technologies, established in 2009, with six full-time employees. Our team for this project was managing director Andy Baxter, plus business development consultant Martyn Cowsill, of GoldmineBD.

What was the aim of your project?

We set out to create a software tool that would identify large numbers of potential installation sites for micro hydropower on rivers. Our software is aimed at overcoming the market failure that has occurred in the UK micro-hydropower industry following changes to the feed-in tariff scheme.

What was your approach? Which publicly-funded environmental data sets did you use?

We used Environment Agency data on river flow, flood risk, sites of special scientific importance, special nature conservation areas and Land Registry data sets on land ownership

How will you make money from this?

We will sell software under licence to: the existing hydropower installer industry, large land-owning bodies such as RSPB, Forestry Commission and pension fund managers. We will also create a business unit to take individual installation opportunities through to completion, with the reward being in a share of the feed-in tariff.

What are your next steps?

We need to establish pricing and a strategic marketing plan, to refine some of the datasets already provided, to meet industry requirements in other countries, especially in the developing world. This will need further funding, which is unlikely to come from private investors at this stage, so we will seek Innovate UK funding.

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JBA Consulting

ForeCoast Marine: A strategic decision support tool for the marine.

Project partners:
Scottish Renewables, Met Office, National Oceanography Centre.

Our business comprises engineers, environmental consultants, designers and scientists, committed to improving the natural and built environment and creating sustainable communities.

What was the aim of your project?

We wanted to improve operation and maintenance (O&M) strategies by developing a prototype 'whole system' metocean planning tool. ForeCoast® Marine will help to reduce costs and health and safety risks, to manage complex partnerships and to demonstrate best practice to marine warranty surveyors, financiers/insurers.

What was your approach? Which publicly-funded environmental data sets did you use?

Our approach was to integrate multiple metocean forecast data (environmental data) and O&M activity data (business data) into a sophisticated web-based software system designed to guide and track operations days/weeks/months in advance. We developed our project in collaboration with ScottishPower Renewables (SPR), the Met Office and the National Oceanography Centre (NOC).

How will you make money from this?

Our main route to market will be direct sales of consultancy services, software licensing, support, training. For SPR, ForeCoast® Marine will reduce costs and risks in marine operations. The Met Office can offer a premium forecasting service and data licences, as well as partnering JBA in consultancy, forecasting and support services. Data licence sales also offer opportunities for NOC.

What are your next steps?

We will take ForeCoast® Marine through the technology development stage in collaboration with the European Marine Energy Centre (wave and tidal) and SPR (offshore wind). Throughout this process, we will continue to engage with industry to meet their needs and to secure clients.

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Scottish Hydro Electric Transmission Plc

Valuing land use change and ecosystem services.

Project partner:
SSE.

The consortium is a business-led collaborative project involving SHE Transmission, the regulated body for the North of Scotland transmission network, and SEPA (Scottish Environment Protection Agency), Scotland's environmental regulator.

What was the aim of your project?

We set out to combine environmental data sets with ecosystem service information, to build a prototype geographic information system (GIS) tool to assist the environmental impact assessment (EIA) process for corridor-style developments. The project is unique as it values land use change and ecosystem services ahead of any large scale developments.

What was your approach? Which publicly-funded environmental data sets did you use?

We undertook initial research into GIS tool developments of similar scope and held stakeholder workshops to examine possible applications. We gathered environmental datasets and created a prototype within GIS to aid the initial selection process for linear developments. We used data sets from SNH EUNIS, Historic Scotland (battlefields, gardens and designed landscapes, scheduled monuments and World Heritage sites), OS River Data and OS Terrain50.

How will you make money from this?

As a web-based subscription tool and as a packaged analytical tool to send out to users, our product could generate income for the project partners and support employment. Within SHE Transmission, we could cut costs for customers by enabling a more effective and efficient project delivery programme while safeguarding natural capital.

What are your next steps?

We intend to further develop the GIS prototype tool development to support and share knowledge with Masters students. We will publicise our work on the prototype through project reports, published case studies, and by submitting an academic research paper and attending international events.

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WaveCERT.

The consortium involved in this project combined skills in satellite data processing, marine science, finite element analysis (FEA) modelling and industrial analysis of the off-shore renewable energy sector.

What was the aim of your project?

We wanted to determine the feasibility of site assessment tools for the marine renewable energy sector by combining numerical simulation and space-based oceanographic data. The first stage was to test whether the available technology could estimate tidal energy.

What was your approach? Which publicly-funded environmental data sets did you use?

We constructed numerical models of the Firth of Lorn and the Pentland Firth, using bathymetric and tidal harmonic data to form a test bed for analysis. A field campaign collected synchronous, in-situ and satellite data to cross-validate both the observations and the models. We combined these with archived satellite data to determine if tidal energy could be directly assessed.

How will you make money from this?

There are two ways to exploit our work: a direct feed to the end-user community on a retained basis (with monthly reporting of site activities); a larger and potentially more profitable route in using satellite data to improve the services of enterprises in the off-shore renewable energy supply chain.

What are your next steps?

The next phase is begin a dialogue with the satellite operators and data providers to feed back our findings on technology and knowledge gaps in existing space data. The in-house skills developed within the project will be transferred to spin-off projects.

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ADAS UK Ltd

Using environmental data to improve great crested newt surveying.

Project partners:
University of Nottingham, Environment Agency.

ADAS, established over 60 years ago, is one of the UK's largest independent providers of environmental and rural solutions and policy advice. The project team consisted of ADAS, The University of Nottingham and the Environment Agency.

What was the aim of your project?

The main aim was to develop and evaluate DNA sequencing methodologies for the detection of environmental DNA as a tool for monitoring great crested newts within bodies of water. This species is recognised as a major barrier to smooth changes of land-use, placing a strain on time and resources.

What was your approach? Which publicly-funded environmental data sets did you use?

We developed DNA sequencing methodologies to allow detection of animal DNA from environmental water samples. We compared the data generated to alternate datasets (environmental survey and species-specific animal DNA, both available through ADAS). We used DNA sequencing to monitor species composition/biological communities in a variety of environments. However, a service for detecting great crested newts using this method is not yet available in the UK.

How will you make money from this?

Our project has shown that this technology can be used as an environmental monitoring tool to be marketed alongside existing ADAS services. In the long-term we would extend the methodology to monitor other species for which we already carry out specialist surveys. These include at-risk or protected species, and also invasive species that threaten native wildlife.

What are your next steps?

Results of the study will be published in peer-reviewed journals. The approach will be discussed with Natural England, for application to great crested newts and other invasive/threatened UK aquatic species. We will need the agreement of Natural England that we can use DNA sequencing to provide information on species distribution.

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BRE

Property flood resilience database (PFR-d).

Project partners:
AXA Insurance,
Lexis Nexis.

BRE led a consortium with AXA Insurance and Lexis Nexis to undertake this project, focused on flood technologies. AXA provided the insurance perspective and Lexis Nexis formed the database platform.

What was the aim of your project?

The aim was to develop a database that insurers could use to identify locations where measures taken to improve properties' flood resilience. This should allow properties within flood risk areas to obtain affordable levels of insurance.

What was your approach? Which publicly-funded environmental data sets did you use?

We carried out an assessment of technologies and approaches to improve the flood resilience of buildings, using data gathered by surveyors. Other work involved: design of the database and implementing the PFR-d framework; developing a surveyor 'app' to communicate with the PFR-d/score risk reduction; trials using buildings in flood zones; disseminating to a wide audience. We used flood risk data.

How will you make money from this?

The PFR-d will be made available to insurers on a subscription basis. As the amount of data grows the value will increase. There will also be a small charge to enter data on to the PFR-d, including refreshing entries at set intervals. We will develop a parallel certification scheme for surveyors to manage data capture and transfer to the PFR-d, with training, membership and lodging fees.

What are your next steps?

We will launch the PFR-d and sell it to the insurance market. Further research will be required to fully develop the surveyor app and associated PFR-score. The certification scheme for surveyors is planned for launch in early 2016.

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Daniel Black & Associates

Climate change risk and cost diagnosis for Aster Housing Association.

Project partner:
GCAP.

Global Climate Adaptation Partnership (GCAP) and Daniel Black & Associates are consultancies supported by University of Bath (economics) and University of Manchester (spatial mapping and climate change). Aster Group provides 28,000 homes, with 75,000 customers.

What was the aim of your project?

Using client-specific and open data, we set out to develop and test a service package for Aster Group (and other social housing providers) to rapidly improve their planning for and resilience to extreme weather and a changing climate.

What was your approach? Which publicly-funded environmental data sets did you use?

There were three main work strands: using spatial mapping software (GIS) to overlay climate hazard data (such as EA Flood Risk) with Aster Group's internal data on housing stock and tenant vulnerability; modelling current and forecast costs from climate hazards across the portfolio; integrating this data into the client's decision-making structure. We used multiple data sets, including UKCP09, British Geological Survey and Natural England.

How will you make money from this?

We will generate revenue through direct sale of consultancy services on a project-by-project basis or by partnering with larger consultancies offering specialist expertise.

What are your next steps?

We are engaging with potential end-users to raise the profile of our project. We have also submitted an application to Innovate UK's 'Solving urban challenges with data' competition to adapt this model to look at health impacts from climate change across the city region.

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eCountability Ltd

A spatial decision support tool for businesses to use in biodiversity offsetting.

Project partners:
NERC, Forest Research, Yorkshire and the Humber Ecological Data Trust.

eCountability Ltd is a small ecological consultancy which has been engaged in due diligence assessment and software development for two years. Our clients seek high-quality and innovative advice from experienced consultants. Our partners are UK environmental research organisations and data providers.

What was the aim of your project?

Our aim was to provide developers in the construction sector with access to reliable environmental data within a robust, spatial framework, for biodiversity offsets. Developers need advice on how to optimise offset design and delivery so that their proposals can proceed while protecting natural capital in line with government policy.

What was your approach? Which publicly-funded environmental data sets did you use?

Our tool is a decision support system using spatial data on habitats and species to calculate development impacts and identify suitable offsets for planned developments. With advice from construction companies, we integrated publicly funded datasets such as the Land Cover Map 2007 to produce a prototype. Feedback from local authorities ensured that the tool accommodates the needs of the planning process in development cases that could involve offsetting.

How will you make money from this?

We will market the tool to private sector developers and local authorities in the UK, in the form of licensed software with the option of online access. Our client base needs to determine biodiversity impacts and offset requirements, so we will use the tool ourselves to generate consultancy advice. Our development plan assumes an initial turnover of £500,000 a year and employment for three full-time-equivalent posts.

What are your next steps?

We are working with our data providers to enhance underlying datasets with more detailed local habitat and species data. We are also improving the user interface in consultation with potential clients. We plan to launch our new service in Greater London in June 2015.

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HR Wallingford

HARIMAP: harmful algae risk index map.

Project partners:
Scottish Association of Marine Science, Willis.

HR Wallingford is an independent civil engineering and environmental hydraulics organisation delivering practical solutions to the complex water-related challenges faced by its international client base.
The HARIMAP project draws on expertise from the Scottish Association of Marine Science and Willis.

What was the aim of your project?

HARIMAP will provide the UK finance sector with a baseline to score harmful algal bloom risk at specific locations and to set insurance premiums. There is currently no metric to determine this risk. A prototype product will provide a repeatable index that can be used to score risk at any location.

What was your approach? Which publicly-funded environmental data sets did you use?

HARIMAP takes as input environmental datasets derived from in-situ instruments, earth observation and numerical models. Through feature extraction and statistical processing it provides a repeatable index that can be used to score risk at a given location in the marine environment. We are developing HARIMAP as a prototype product for UK waters, with plans to extend the concept to globally.

How will you make money from this?

We will create a new data product with risk indices for UK waters, providing the UK finance sector with a means to score risk and set insurance premiums with reference to harmful algal blooms. Insurers of aquaculture-related businesses will supplement their existing risk management tools and benefit from realistic risk appraisal of harmful algal blooms, allowing them to offer insurance to potential customers for the first time.

What are your next steps?

This product will have an impact on the insurance industry and how they currently assess the aquaculture risk. We will be looking at potential partners from the industry who may be able to invest and enable us to further enhance the product to make it available on a global scale.

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ImageCat Ltd

Flood Foresight: near real-time assessment of flood impact potential for the insurance and civil contingencies sectors.

Project partner:
JBA Associates Ltd.

This project was a partnership between ImageCat and JBA Consulting. ImageCat is an SME developing geospatial tools and data for insurance and disaster risk reduction sectors. JBA is an environmental engineering consultancy specialising in flood risk modelling and management.

What was the aim of your project?

We wanted to develop a prototype system for assessing current and future impacts from unfolding fluvial flood events. We investigated a number of diverse and large environmental datasets and brought them together to provide a dynamic and globally scalable impact monitoring and forecasting tool to be applied in many sectors.

What was your approach? Which publicly-funded environmental data sets did you use?

Our tool is globally scalable, rapid and flexible, incorporating flood monitoring and forecasting models, and impact assessment algorithms. We identify flooding by processing a number of environmental datasets, including meteorological and flow data (Environment Agency) and flood hazard maps (public or proprietary). We calculated impact by overlaying monitored and forecast flooding with client-specific or public assets, including Ordnance Survey. Maps and statistical outputs are integrated into existing client front-end applications.

How will you make money from this?

The tool will be licensed for use in many sectors, including civil contingencies, infrastructure and re-insurance/insurance. We identified many cross-sector benefits through user-consultations; allowing stakeholders to take a proactive view on unfolding flood events enables effective mobilisation of resources. Dynamically updated flood information also helps improve communication across teams and sectors. For partners, there is increased job creation, internationalisation of products and greater market awareness.

What are your next steps?

The partners will continue their collaboration and have established an early adopters' phase in two initial market sectors, for additional technical refinement. We have defined a 'minimum viable product' focused on the UK, before expanding the tool to cover international territories.

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International Synergies

Novel materials for the built environment.

Project partners:
University of Birmingham,
Highways Agency,
Birmingham City Council,
Environment Agency.

International Synergies is the world's leading expert in industrial symbiosis, with over ten years' experience. We apply our expertise and proven methodology/techniques to support implementation of projects at regional, national and international level in over 21 countries world-wide.

What was the aim of your project?

We set out to evaluate the use of data to identify where waste streams could be used as low-carbon and/or low-cost, alternative raw materials for major construction projects. This would benefit businesses generating waste materials by identifying alternative uses within the construction sector for their waste streams.

What was your approach? Which publicly-funded environmental data sets did you use?

We evaluated the use of Environment Agency data (integrated pollution prevention and control and Waste Interrogator) data to identify waste streams with potential as low-cost, and low-carbon, alternative raw materials for major infrastructure (construction) projects.

How will you make money from this?

Our project identified a large number of alternative raw materials from a wide variety of different sources from across the UK. These materials can be used in the construction sector and will reduce the cost base of these projects. We are now selling this service to the sector.

What are the next steps?

We are actively targeting the sector in both the regional, national and international market places.

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InTouch-ltd

Smart Clean.

Project partners:
Carillon Plc,
University of Lancaster.

InTouch provides data and communications solutions, mainly with the highways maintenance sector. Our consortium included Carillon Plc and the University of Lancaster.

What was the aim of your project?

The Smart Clean project set out to assess the feasibility of using environmental and 'internet of things' (IoT) highways data to provide highways maintenance businesses with a cost-effective method of minimising the environmental impact from pollutants entering UK waterways.

What was your approach? Which publicly-funded environmental data sets did you use?

We used data from weather (MET) and local rainfall sources and in-gully sensors to see if there was a notable relationship between traffic volume and behaviour, weather and toxins of concern and interest to the Environmental Agency. A challenge was to gather and sample silt from in-gullies and analyse this for toxin content, and then to determine models for the analysis.

How will you make money from this?

We will continue to sample toxin data (wider research) and build upon the project, using the findings to gain further interest from potential customers and collaborators, continuing to research, develop and invest in innovative highways maintenance solutions in gully, water and toxin management. We will also roll out further the In-Touch gully management products which will support future growth as we gain more understanding in this area.

What are your next steps?

We intend to secure further funding to de-risk additional effort in this area. We will also seek to attract more interest from local authorities, highways maintainers, the Environment Agency and Highways Agency, and continue to build products and research in associated areas.

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Maxeler Technologies

Groundwater modelling service for flood and drought decision support planning.

Project partner:
BGS.

Maxeler is a high-performance computing solutions company employing 50 people in London. Our dataflow systems offer a competitive advantage in performance per unit of space, computations per Watt and best price-performance, considering total cost of ownership for monolithic applications.

What was the aim of your project?

Our climate is changing rapidly, with extreme conditions becoming the norm along with accelerating urbanisation. This poses challenges for water management in densely populated areas where an increase in economic risks is just one of the consequences. To address these challenges, we propose a novel groundwater modelling service for early prediction of extreme conditions.

What was your approach? Which publicly-funded environmental data sets did you use?

We set out to develop a prototype of a web-service to provide on-demand groundwater modelling. The tool would be interactive, enabling planners to explore the results of alternative courses of action under different scenarios and use a combination of current, historical and forecast datasets. We demonstrated remote data interaction and scenario testing and also identified detailed technical system aspects required to take it to the market.

How will you make money from this?

A groundwater modelling service will serve specific customers, such as major utilities and water supply companies, local government, government agencies and insurers. An annual licensing model, at a fee of £15,000, could target more than 300 clients in the UK for a total market worth £24 million per annum in the UK, with 25% of that market as realistic objective.

What are your next steps?

We developed a new project for the next phase toward commercial exploitation, with a proposal to Innovate UK's "Solving urban challenges with data" competition (Real-time forecasting risks of groundwater events. We also considering an application to the forthcoming Horizon 2020 BigData call.

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Remote Sensing Applications Consultants (RSAC) Ltd

Land Cover Plus: national agricultural land cover information.

Project partners:
NERC Centre for Ecology, Hydrology (CEH).

RSAC Ltd, an SME established in 1986, provides specialist services to developers and users of earth observation, including governments and space agencies. The company offers expertise in the use of remotely sensed data and associated technologies for land applications, world-wide.

What was the aim of your project?

Land Cover Plus is aimed at producing an annual crop map of the UK, based on Sentinel-1 radar data. It will be an add-on layer to the National Land Cover Map, which has just a single class for all arable and horticultural crops.

What was your approach? Which publicly-funded environmental data sets did you use?

Using a time series of Radarsat-2 images and the Land Cover Map 2007, we were able to discriminate between different crops, field by field (or planting area land parcel) using multi-temporal radar backscatter measurements. This was trialled in three UK areas and used, together with a large ground dataset, to classify crops by temporal profile matching. We demonstrated classification accuracies of around 90% for all areas. Adding an optical satellite image acquired in spring improved separation of winter and spring crops.

How will you make money from this?

RSAC and CEH plan to produce a crop map product for the whole of England or the UK in 2015. This will use data from the new Sentinel-1 satellite which will consistently collect radar images covering the whole country every 12 days, from April 2015. We will market and distribute annual Land Cover Plus products through our existing CEH Land Cover Map sales channel.

What are your next steps?

We are continuing to adapt processing chains for large quantities of Sentinel-1 data, and to refine the eight year-old Land Cover Map. An update of this – independently or as an integral part of Land Cover Plus mapping – would significantly improve the quality of the final products.

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Sea Level Research Ltd

Intelligent prediction for cargo traffic routing (iPrediCTOR).

Project partners:
AIMES Grid Services Ltd, Met Office.

Sea Level Research uses machine learning to improve efficiency in ports and shipping, specifically through predicting sea level surge. Established in 2012, we are a team of three: Simon Holgate (CEO), Paul Furley (CTO) and Graham Morgan (CSO).

What was the aim of your project?

Our aim is to solve the 'last mile' problem in shipping (actually ~50km) by optimising the journey into port and maximising cargo loading. In an era of mega-vessels, ships frequently burn excess fuel to arrive in their 'tidal window', incur huge costs by missing tides and load sub-optimal quantities of cargo.

What was your approach? Which publicly-funded environmental data sets did you use?

By combining Met Office weather data with Environment Agency/British Oceanographic Data Centre sea level data we have built a machine-learned model to complement EA numerical surge model predictions. Our model is cloud-hosted and learns from errors, enabling us to correct the numerical model, and provides dynamic confidence intervals for the predictions. Our app delivers more accurate predictions to port pilots and terminal operators. No other solution provides this.

How will you make money from this?

Our app and planning dashboard will be used by terminal and vessel operators who will pay a subscription for its use and provide it to their port pilots. Using our predictions will significantly improve efficiency for the terminals and vessels and reduce costs by approximately £250,000 per operator annually. The predictions also help reduce ship CO2 and sulfur emissions, with wider environmental and health benefits.

What are your next steps?

We are in discussions with investors to enable continued development and delivery of our products. We are also actively engaging with other companies to provide our prediction solutions either directly or via our API. With investment and revenue we expect to take on a developer and a sales representative.

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Shoothill Ltd

RiverAlerts.

Project partners:
Environment Agency,
RailMet Limited,
Shropshire Council

Shoothill are prominent software developers specialising in data visualisation. We create bespoke solutions, using interactive maps and other powerful visualisation technologies. Transforming complex statistical and geographic data into easily accessible formats, we work with a diverse range of clients.

What was the aim of your project?

The aim of 'RiverAlerts' was two-fold. We wanted to research the practicality of providing real-time data from over 3,000 Environment Agency (EA) monitoring stations (river levels, river flow and water borehole) to help business and local authorities make better decisions when planning water abstraction / flood precautions. Secondly, we set out to connect 2,418 river gauges to Twitter.

What was your approach? Which publicly-funded environmental data sets did you use?

We started by analysing river level, flow and borehole data collected by the EA. Next, we created a set of APIs allowing the processing of each dataset and displaying each on a cloud-based mapping system. We then developed a solution to create over 2,400 Twitter accounts (each one subservient to @Gaugemap), and a prototype website (www.gaugemap.com) to display the gauges simultaneously and colour them according to status.

How will you make money from this?

The project led to the release of www.GaugeMap.com which helped Shoothill establish an area of expertise. It generated orders from other parties with similar requirements. The development of the river-level APIs led us to releasing a set of Environment Agency APIs for which we were paid. Finally, the knowledge gained from creating so many Twitter accounts, has brought enquiries from the USA, Canada and China.

What are your next steps?

We want to achieve better integration for RiverAlerts / GaugeMap with the Shoothill 'FloodAlerts' system. We also want to expand the concept abroad, and enhance the Twitter feature by creating accounts for the remaining river level and flow monitoring stations in additional to 2,418 river level gauges.

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Innovate UK is the new name for the Technology Strategy Board – the UK's innovation agency. We know that taking a new idea to market is a challenge. We fund, support and connect innovative businesses through a unique mix of people and programmes to accelerate sustainable economic growth.

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