

launching, publicising, and maintaining data.gov – an ambitious attempt to create a repository of data generated with federal funding, which the public could then use to create new applications and technologies. Within a year, over 250,000 data sets had been uploaded. Despite initial operational hiccups, the utilisation of the dataset has gained national acceptance. Recently, the government has utilised the data to run apps challenges, including the particularly successful International Space Apps Challenge, which is sponsored by NASA and has nearly 100 teams participating on six continents in the 2014 event.

As the age of big data dawns, the Administration is taking every step to ensure that the United States is not left behind. It created the National Information Technology

Research and Development (NITRD) as the coordinating office for interagency big data group, in which over 20 federal agencies participate. NITRD coordinates over \$4 billion in research funding.

ADVANCED MANUFACTURING

Advanced Manufacturing was the third top priority issue. Building on the momentum the Bush Administration and Congress initiated with the America COMPETES Act in 2007 and again in 2010, the President announced the Advanced Manufacturing Partnership in June 2011. In the three years since, the initiative has developed into a network of manufacturing centres coordinated by the National Institute of Standards and Technology (NIST). Congress has not funded the National Network for Manufacturing Innovation (NNMI), but

consortia of businesses and universities have been rolled out, each with its own research portfolio. The most recent round includes the 60-member Lightweight and Modern Metals hub, headquartered in Michigan, and the Digital Manufacturing and Design Innovation Institute, headquartered in Chicago. Several new centres will be announced in the coming months.

The AMP's major accomplishment to date has been the coordination of several government-funded manufacturing initiatives, including the 25-agency National Nanotechnology Initiative, the National Robotics Initiative, and the Materials Genome Initiative.

TRANSLATING WORDS TO ACTIONS

Many of the Administration's science-based proposals have struggled to get off the ground, chiefly because of a lack of

funding and Congressional reluctance to fund something it did not create – this has been the case with all three initiatives named here. Over the past several years, Congressional appetite for large, sweeping initiatives has lessened, especially at the Committee level, and several Congressional science champions from both parties have retired. With midterm Congressional elections in 2014 and the 2016 Presidential election looming, little time remains to create and implement broad policies in science or other issue areas. Areas like open data and advanced manufacturing will continue to deliver results for the President's priorities. We in the UK's Science and Innovation Network will continue to champion and promote UK's science and innovation agenda in Washington and across the whole of the United States.

TELLUS

Meeting of the All-Party Parliamentary Group for Earth and Environmental Sciences on Tuesday 13 May

VALUING AND REALISING OUR NATURAL CAPITAL ASSETS – TELLUS ALL ABOUT IT

Andy Howard
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Mike Young



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The 2011 White Paper *'The Natural Choice: Securing the Value of Nature'* commits us to be the first generation to leave the natural environment in a better state than it inherited. The Tellus projects – a series of multi-partner environmental survey and research projects carried out in the UK and Ireland – have delivered innovative data and research that have successfully shaped policy and stimulated new investments in mineral, energy and infrastructure resources. On 13 May, at a meeting of the All-Party Parliamentary Group for Earth and Environmental Sciences, chaired by Martin Caton MP, Andy Howard, Mike Young and Marie Cowan explained how the Tellus Projects are transcending their original goals to contribute to the measuring and realising the value of our natural capital assets, and to deliver the world-leading research needed to inform decisions and measure success in meeting the White Paper objectives.

In the early 2000s the geological surveys of Britain, Northern Ireland, the Republic of Ireland, and Finland joined forces to design a Resource and Environmental Survey for Ireland (RESI). RESI's purpose was not only to provide new data to stimulate exploration investment and licensing in minerals and energy resources but also to inform research, regulation and management of other natural capital

assets including soil, groundwater and landscape amenity. Re-branded as 'Tellus', the first of these was completed in Northern Ireland between 2005-8, with funding from the Department of Enterprise, Trade and Investment. Building on a highly positive, post project cost benefit analysis of the impacts of Tellus, €5M funding was secured from the EU INTERREG IV programme for a second project – *Tellus Border* – which ran from 2010 to late 2013 and

maps that are delivered online, providing a stock take of the extent and quality of minerals, soil and water resources, a *health check* of both natural and man-made chemical and radiological contaminants in the environment, and an objective *data resource* for multidisciplinary scientific research.

From an original cost of £5.8M, the outcome and impact of Tellus Northern Ireland has been considerable. The maps

proceeding with the release of the Tellus Border data. Furthermore, 20 new Tellus data-based research degrees and 16 short term grants have delivered on topics such as cancer epidemiology, critical metal resource potential,

landscape, flood plains and natural habitats. Sampling of organic films on the beds of streams, for example, is looking for tell-tale evidence of the impacts of industrial activity on the smallest organisms in the food chain. At the other end of

... samples for analysis of over 50 key elements ...

wetland ecosystem status and trace element toxicology.

Following the lead of the Tellus projects in Ireland, the Tellus South West project in Devon and Cornwall is the first regional scale project of this type in Great Britain. The region presents a unique combination of future mineral and geothermal resource opportunities counter-balanced by environmental constraints on development, some of which

the scale, an *airborne lidar survey* flown by an aircraft from the BAS fleet has used high precision laser range-finding technology to make a 3 dimensional map of the ground surface, built assets and vegetation canopy, accurate to within a few centimetres. Combining these datasets provides us with a powerful set of tools to value resources and measure environmental change at a range of scales and timespans. We can model and



Presenters at the Tellus South West project launch, Eden Project Cornwall, October 2013

surveyed the six border counties of the Republic of Ireland.

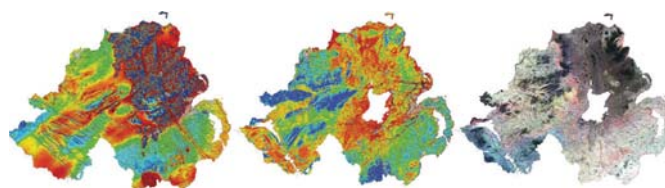
What does a Tellus survey involve? Firstly, an *airborne geophysical survey* flies a specially equipped light aircraft at low altitude over the landscape, in some places only 60m above ground. On-board sensors measure trace amounts of magnetism, radioactivity and

and data have led to investment commitments of over £32 million in new minerals exploration activity, with licensed blocks increasing from 15% to 70% of Northern Ireland's land area. The data are now routinely used to inform implementation of soil, water and waste directives, and deliver new maps on diverse themes such as

... world-leading research needed to inform decisions ...

electrical conductivity to build a 3 dimensional map of the properties of the soils, rocks, minerals and fluids below ground. At the same time, ground-based geochemical survey teams collect soil, stream sediment and water samples for analysis of over 50 key elements from the periodic table, representing a combination of the most essential minerals, nutrients and contaminants present in the environment. The results are combined into datasets and

radon hazard, soil moisture and carbon stocks, residual Chernobyl fallout, soil erosion and landfill contamination. Data on subsurface properties of aquifers, notably on previously unresolved barriers to groundwater flow, have informed new strategies for managing Belfast's groundwater supplies. Commercialisation of the Tellus data to provide information products and expert services to the agricultural industry on nutrient balances in soil, water and feed is



Magnetic (left), conductivity (centre) and radiometric (right) airborne geophysical survey maps, Northern Ireland. Coastline © Crown Copyright DMOU205

relate to the region's industrial and mining legacy and others to a changing natural environment. Funded by the Natural Environment Research Council, the project is a collaboration between 3 of the NERC's research centres, the British Geological Survey (BGS), the Centre for Ecology and

predict how much rainfall is absorbed into the soil, how much runs off into streams and rivers, how nutrients and man-made contaminants are mobilised and transported by this water, how much of this water is taken up by vegetation, and which areas may be at risk of flooding and landslides.

... value resources and measure environmental change ...

Hydrology (CEH), and the British Antarctic Survey (BAS). The University of Exeter Camborne School of Mines connects us with local businesses and the research community. Tellus South West has augmented the original Tellus specification with surveys of the status of the

The most important outcome of these projects is the 'Tellus Effect', the ability of these projects to encourage knowledge exchange and collaboration between specialists in businesses, research and government with a common

interest in the data. Launches of the Tellus Border data in October 2013 and the Tellus South West data in May 2014 brought together data users from the minerals, energy, agricultural and water industries, from local government and environmental regulators, from heritage and conservation bodies, and from researchers in geoscience, ecology, hydrology, agricultural science and environmental health. Most importantly, the data from both projects are available free of charge both to view and download from easily accessible web portals. This catalyses the further sharing of environmental data among these groups, and the development of new partnerships to deliver value and innovation from new cross-disciplinary combinations of research capability. Momentum is building from one Tellus

project to the next, with new surveys and new partners contributing to more diversity of data and joined-up research. With a bid for INTERREG V funding, we hope to expand Tellus into the marine environment, joining the Irish Sea, western Wales and eastern Ireland, and partners are currently being sought for other



Airborne geophysical surveys require low altitude flying to acquire high resolution data on the subsurface. Image courtesy Tellus Border project, supported by the EU INTERREG IVA Cross-Border programme.

projects in the so-called Energy Coast of north west England and in the major regeneration areas

of the central belt of Scotland.

So what of Natural Capital, and the White Paper commitment? The Tellus Effect helps to pull together the partnerships of businesses, decision makers and researchers that need to work in concert to value, manage and sustain our natural capital. The projects provide an 'instrument panel' of indicators and 'big data' to observe and learn lessons from past and present human impacts on our environment, and measure our future progress towards a 'better state' for future generations. Working together, we hope that these projects, and others like them, can help us understand the business of the environment, and ensure that economic growth and a sustainable natural environment are mutually compatible objectives.

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Tellus Partners:

Geological Survey of Northern Ireland
<http://www.bgs.ac.uk/gsni/>
Geological Survey of Ireland
<http://www.gsi.ie/>
Natural Environment Research Council
<http://www.nerc.ac.uk/>
British Geological Survey
<http://www.bgs.ac.uk/>
British Antarctic Survey
<http://www.bas.ac.uk/>
Centre for Ecology and Hydrology
<http://www.ceh.ac.uk/>
University of Exeter Camborne School of Mines
<http://emps.exeter.ac.uk/csm/>

Tellus websites:

Tellus <http://www.bgs.ac.uk/gsni/Tellus/>
Tellus Border <http://www.tellusborder.eu/>
Tellus South West
<http://www.tellusgb.ac.uk/>

WHY EXPLORE THE SOLAR SYSTEM?

Tom Gunner
Parliamentary Space Committee

In September last year, the P&SC teamed up with the Parliamentary Space Committee in a special session chaired by Andrew Miller and Phillip Lee, to hear from Britain's leading planetary scientists what we have learnt recently about our own Solar System, what more there is to find out, and why it matters.

Space still has a mixed rep in and around Parliament. Probably the most common question asked on the subject, is "I didn't know we did space!" rapidly

followed by, "why do we do space? Isn't that a cold war superpower thing? Can we really afford to do that kind of thing?"

... rely on gas pumped through National Grid's national network ...

There are many responses to these questions. The response to the first question, is yes, we do space. And we do it very well. Britain's space sector now supports 83,000 jobs, and adds £9.1 billion to the economy. When you think about it, it's perhaps not surprising. In your

average day, you will quietly depend on a host of space-enabled services. The shower you take, if it is gas powered,

could rely on gas pumped through National Grid's national network of 170,000 miles of pipeline, managed by a network of nearly 500 switch points. The instructions to these points are transmitted up into orbit and back, because satellites offer some of the most secure form of communications available.

Whether you pick up a broly or sunscreen will depend on the information satellites provide the Met Office. All data for five day forecasts, and 90% of the data for shorter term forecasts, come from satellites. And then of course as you move about, most people now depend on navigation services powered by satellites. And no, satellites are not responsible for driving you into ditches. That's the software. For many in remote areas, satellites are the only realistic chance of getting online, to fill in DEFRA's online farm payment forms, perhaps. But perhaps