VALUING NATURE PROGRAMME

Valuing Nature Programme Report No. 5

Delivering Business Impact from Valuing Nature Research

Report of the 2016 Valuing Nature Business Impact School

June 2016

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Acknowledgements

Special thanks are due to all the speakers from the business community who gave freely of their time, experience and expertise to provide informative and stimulating input to the School. We would also like to thank the early stage researcher participants whose interest and engagement created a vibrant atmosphere and who contributed excellent short presentations of their own research activities in relation to business impact.

The first two days of the School were very generously hosted by Willis Towers Watson in the Board Room of the award-winning Norman Foster designed Willis Building in the City of London. The Crown Estate at Windsor Great Park very generously hosted Day Three. We are particularly grateful to Olivia Darby and Sophie Evans at Willis Towers Watson, to Jane Baptist, Ted Green, Tom Jarvis and Dan West of The Crown Estate, and to Debra Frankiewizc and Ian Glover at Iver Environmental Centre and National Grid for their wonderful hospitality. Guy Duke would also like to thank Val Woods at the Centre for Ecology & Hydrology for the excellent administrative support.

The School and this report were funded by the Natural Environment Research Council. The School was delivered as part of the Valuing Nature Programme, a 5 year £6.8M research programme which aims to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. It funds interdisciplinary research and builds links between researchers and people who make decisions that affect nature in business, policy-making and in practice. The Valuing Nature Programme is funded by the Natural Environment Research Council, the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council, the Arts and Humanities Research Council, and the Department for Environment, Food and Rural Affairs

Preface

The importance of the impact agenda

The impact agenda is critical to contemporary research careers and an ability to design research with impact is vital for researchers to secure research funding. Research proposals to the UK Research Councils and the EU Horizon 2020 funding programme are required to address impact, and this is closely examined during the evaluation processes. Impact is also a key consideration in UK higher education funding to universities, and is assessed based on submissions including *Impact Case Studies*. An ability to deliver impact is therefore a key skill that universities and other research bodies look for when appointing and retaining researchers. The Natural Environment Research Council (NERC) recognises the importance of demonstrating the impact of environmental science in terms of delivering economic and social benefit as a key indicator of success of delivery of the NERC strategy.

Valuing Nature and business impact

The Valuing Nature Programme (VNP) is a 5 year £6.8M research programme which aims to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. It funds interdisciplinary research and builds links between researchers and people who make decisions that affect nature in business, policy-making and in practice.

The Valuing Nature agenda is increasingly of interest to businesses. A failure to properly value nature can present significant risks to businesses, while valuing nature throughout a business and its value chain can present significant opportunities to enhance return on investment and enhance reputation.

VNP is pursuing an active business engagement programme, with advice from a high level Business Interest Group (BIG). In May 2015, BIG produced a paper on Pathways to Impact with Business in relation to the VNP Health and Wellbeing Call, and the Coordination Team facilitated connections between research teams and businesses to enhance the business impact of proposals submitted under the call.

School aim, participants and speakers

The NERC-funded VNP Business Impact School aimed to help develop a Valuing Nature research community with a broader understanding of how research on valuing nature can be translated in to private sector decision-making and innovation.

The Valuing Nature Business Impact School, Willis Tower

The School provided fully-funded places for 25 early stage researchers (*Annex 2*). Applicants were required to be registered for a PhD or employed as a post-doc researcher and awarded a PhD on or after 1 January 2013, and to be registered or employed at UK universities or research bodies eligible for UK Research Council funding. The School was heavily oversubscribed. Participants were selected on the basis of: (1) relevance of their current research to the School content; (2) their motivation; (3) their publication track record (taking account of career stage). Consideration was also given to gender balance.

Speakers were drawn from the VNP Business Interest Group and other relevant businesses and business initiatives at the forefront of innovation related to valuing nature. They included speakers from Nestle, Intelligent Health, Interserve, National Grid, Satellite Communications Catapult, United Utilities, WSP Parsons Brinckerhoff, Willis Towers Watson and representatives from Aldersgate Group, Natural Capital Coalition as well as the Chair of the VNP Business Interest Group and members of the VN Programme Coordination Team. There was also a 'hands-on' session run by eftec and Natural England on understanding the business need for evidence and communicating with business. The programme (see Annex) offered plenty of opportunity for participants to interact with speakers.

This report and supplementary materials

This report aims to disseminate the content of the School to a wider VN audience. It contains narrative versions of the presentations given by speakers at the School.

The papers in this report complement, and can be read in conjunction with, the Powerpoint presentations, which are available on the VN website.

Guy Duke

Valuing Nature Programme Business Champion

Contents

1. Setting the Scene

Introduction to the Valuing Nature Programme

Michael Winter

Social Science / Arts & Humanities Lead, VNP Coordination Team

Professor of Land Economy and Society and Director of the Land, Environment, Economics and Policy Institute (LEEP), University of Exeter

Decision-making, including in relation to impacts on nature, is typically based on economics, which frequently gives nature a zero value. The natural capital approach seeks to make the value of nature economically visible. However, the value of nature is not only economic; nature also has social, cultural and historic values. While the natural capital approach is now increasingly well established (e.g. as a focus for the Defra 25 year environment plan), the relationship between assets (species, soils, freshwater, atmosphere) and benefits (food and fibre, recreation, wildlife, clean air, etc) are not well understood.

The five-year (2014-19), £6.5m Valuing Nature Programme (VNP) aims to better understand and represent the complexities of the natural environment in valuation analyses and to consider the wider economic, societal and cultural value of ecosystem services. It builds on the Valuing Nature Network 1 (2011-13, VNN1). While VNN1 was more focused on the environment and economics, the VNP takes a broader approach to valuation, reflecting the interests of the multiple funders.

The VNP focuses on three goals:

1. Developing the Valuing Nature Network:
    - building on VNN1;
    - developing interdisciplinary research capabilities;
    - bringing together researchers, businesses, policy-makers and practitioners.
2. Human health and wellbeing, examining the role of biodiversity and ecosystem processes in relation to:
    - natural hazards and extreme weather events;
    - pathogens and natural aquatic toxins;
    - urban ecosystems.
3. Tipping points (funding call February 2016):
    - the links between ecosystem stocks, ecosystem service flows and benefits that are delivered as a result in the context of defining critical levels of ecosystem stocks that avoid abrupt and damaging change in the delivery of benefits (tipping points);
    - how the values of ecosystem services and benefits change as tipping points are reached and exceeded.

The Health & Wellbeing funding call (June 2015) closed on 22 September 2015 and decisions on the applications were made in spring 2016. The selected projects start in June/July 2016.

The Tipping Points funding call (March 2016) closed on 5 May 2016. Up to £1.1 million (80% FEC) is available from NERC for three projects of up to 30 months duration and up to £370,000 (80% FEC). Selected projects are expected to start in autumn 2016.

The funders established a Programme Coordination Team to help build an interdisciplinary research community capable of working across the natural, biological and social sciences, and the arts and humanities. The focus of the Team is on the above three goals, but not exclusively limited to these three goals. The Team organizes a range of activities and events:

- the web-based Valuing Nature Network, which has over 1600 members (February 2016) and c.2500 Twitter followers (@ValuingN)
- a web survey and Scoping Meeting (Royal Society, March 2015) to gather input on which to develop the specifications of the Health and Wellbeing funding call
- a Business Interest Group meeting (Willis Tower, March 2015) which developed recommendations to enhance business impact of proposals responding to the Health and Wellbeing funding call.
- publication of a range of documents in support of the Health and Wellbeing call
- a Health and Wellbeing Call Event (Birmingham, July 2015) involving 120 participants, to promote the call and facilitate networking among potential proposal teams.
- gathering of more than 180 'offers' to participate in the Health and Wellbeing Call, through a web-based platform, helping to make connections including for those who could not participate in the Call Event.
- organising a Valuing Nature Placement Scheme, involving 12 short placements of researchers to work in a new discipline or applied setting for 1-3 months (half with academic hosts, half with bodies such as Defra, Welsh Government, Cornwall Council, WWF, RSPB) (this may be run again in 2017).

Future plans include:

- a Demystifying series – the first in the series is on economic valuation.
- a debate series – the next will consider 'is there value in valuing nature?'
- a Defra seminar and policy engagement event.
- joint events including with the Ecosystem Knowledge Network on The Historic Environment, Valuing Nature and Ecosystem Services (7 June 2016) and with the University of Kent on Valuing Nature and Participatory Decision-Making (19-20 July 2016).
- the 2016 VNP Annual Meeting (October 2016).

The Team is supported and advised by a Programme Advisory Group, a Business Interest Group and a Policy Engagement Group and reports to a Programme Executive Board on which sit representatives of the funding bodies.

The Valuing Nature Programme is funded by:

- the Natural Environment Research Council
- the Economic and Social Research Council
- the Biotechnology and Biological Sciences Research Council
- the Arts and Humanities Research Council
- the Department for Environment, Food and Rural Affairs.

Further information on the VNP is available on the VN website.

Michael Winter

Michael is Social Science / Arts & Humanities Lead for the Valuing Nature Programme Coordination Team and is Professor of Land Economy & Society at the Land, Environment, Economics & Policy Institute at the University of Exeter. He is a rural policy specialist and a rural social scientist with particular interests in applying inter-disciplinary approaches to policy-relevant research and in direct engagement in the policy process. Michael leads a project for Defra's Sustainable Intensification Research Platform and is a director of the Food Security & Land Research Alliance.

UNIVERSITY OF EXETER

NERC Innovation

Kay Heuser

Innovation Programme Officer, NERC

NERC fosters UK and international partnerships that bring business, government and civil society together with scientists to address the challenges and opportunities of managing the environment, and to drive UK innovation, economic growth and societal wellbeing.

We listen to the needs of the organisation and help you find and use the best data, knowledge and expertise, to translate existing knowledge or co-design new research and innovation to address specific business, policy or societal challenges.

Together we deliver innovation and growth with responsible environmental management.

Through working with our research base, policymakers, business and civil society can make decisions with the best possible information, develop innovative tools and solutions, ensure that high quality evidence is placed at the heart of policy-making, improve performance and ultimately contribute to economic growth with responsible environmental management.

We already have a range of activities developing within these areas:

- Sustainable food production
- Environmental data
- Infrastructure
- Natural Resources
- Risk Management
- Public Policy

Sustainable food production

The scale of the challenges businesses, policymakers and society face to achieve sustainable food production continues to require innovative, interdisciplinary thinking, and collaborative working between researchers and the private, public and third sectors. Climate variability, water quality, fertiliser and agri-chemical use are just some of the challenges that impact both terrestrial and marine food production systems, affecting both their environmental sustainability and economic viability.

NERC is working closely with businesses, their global supply chains, and relevant policymakers and regulators to ensure the concerns and key challenges of the agri-food sector are properly identified and disseminated to the research community. Furthermore, NERC is facilitating access to expertise, knowledge, and facilities to help deliver innovative approaches to addressing sustainability challenges. In doing so, NERC will strengthen the research community to underpin the long-term needs of the sector through research, knowledge exchange, research translation, and the provision of training.

Environmental data

NERC science and observations generate a large amount of data. Although collected for scientific purposes the environmental information provides an important resource for a number of applications outside of academia, for example in information services or in informing decision-making for the public, business and policymakers.

NERC wishes to work with academics, industry, policy and civil society to encourage and enable the application of its environmental data to create societal and economic benefit.

Infrastructure

Infrastructure forms the backbone of our modern economy. It underpins our living standards and contributes to the competitiveness of UK businesses. But the infrastructure that guarantees our energy and water supplies and enables safe and reliable road, rail and air transport is vulnerable to the effects of climate change and to the natural environment more widely.

Instead of seeing infrastructure as a set of disconnected assets, we believe that looking at infrastructures together with the systems connecting them - transport, utilities, communications and environmental management - will help us better understand how they are affected by our changing environment, offering important opportunities for the UK economy.

NERC wants to work with business and policymakers to build on these opportunities and to address the challenges facing our infrastructure in the 21st century.

Natural resources

Over the coming decades society faces a significant challenge to ensure a secure, safe and affordable energy mix while continuing to tackle climate change by reducing carbon emissions.

In pursuing its remit, NERC invests in world-leading research, training and innovation across the energy spectrum to provide society with evidence and expertise to inform decision-making.

Oil and gas currently provides 75 per cent of the UK's primary energy source. Over the last five decades no other industrial sector has created more prosperity for the UK (source: UK O&G Industrial Sector strategy).

The UK has high levels of scientific and industrial capability in relation to oil and gas, reflecting the legacy of North Sea development. NERC is committed to working with the academic research base, business, policymakers and the third sector to ensure its investments in research, skills and technologies in oil and gas are translated for their maximum economic and societal impact.

We also plan to further develop innovation activity with the renewable energy sector and we are currently scoping what this interaction could look like.

Risk management

Our world is becoming increasingly susceptible to risks arising from natural hazards and extreme weather events, including flooding, tsunami, wind and storms. Business, policymakers and non-governmental organisations (NGOs) are taking steps to understand the risks and build resilience into assets, operations, supply chains and communities.

However there is an urgent need to improve assessments of natural hazard risk and for tools to communicate risk to enable decision-makers to take action despite uncertainty. The goal of these innovation activities is to make better use of science in both of these areas.

NERC wishes to work with the academic research base and business, policymakers and NGOs who are looking to understand and reduce the risks they face from natural hazards.

Public Policy

To develop and implement robust, sustainable policies, it is critical that the evidence used is of the highest possible quality, independent and unbiased, and is critically analysed and evaluated.

NERC works with the academic research base and key policy-making and implementing organisations to inform the direction of novel strategic research investments and to translate the expertise and knowledge of our scientists for tangible, real world utilisation. NERC works with policymakers to ensure that high quality evidence is placed at the heart of policy-making.

Kay Heuser

Kay is an Innovation Programme Officer in the NERC innovation team and has an interesting and wide portfolio of work. She currently works on the Environmental Science Impact Programme, Environmental Risk to Infrastructure Innovation Programme, Green Infrastructure and UK Water Partnership and provides support to the Knowledge Exchange Fellows. She previously worked at the Centre for Ecology & Hydrology where she was coordinator for the NERC Water Security Knowledge Exchange Programme and worked with the National River Flow Archive to develop their outreach activities.

NERC SCIENCE OF THE ENVIRONMENT

Valuing Nature Research Underpinning the Recommendations of the Ecosystem Markets Task Force

Guy Duke

Principle Investigator - Ecosystem Markets Task Force

Research and evidence gathering conducted 2012-13 for the UK Ecosystem Markets Task Force (EMTF) provides an example of valuing nature research with business impact.

The establishment of a business-led EMTF was a commitment made in the 2011 Natural Environment White Paper, the purpose being '*to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature's services.'* The EMTF was established in 2012 and reported in March 2013, via Green Economy Council, to the Secretaries of State for Business, Innovation and Skills, for Energy and Climate Change, and for the Environment Food and Rural Affairs.

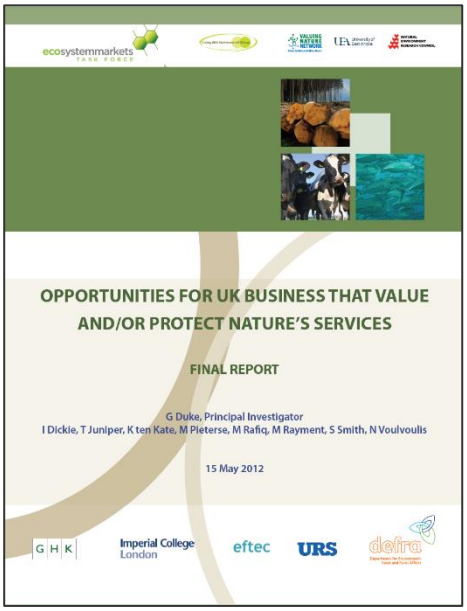
The Chair of the EMTF was Ian Cheshire, then Group CEO of Kingfisher plc. The members were: Kim Buckland, Co-Founder, Liz Earle; Vivienne Cox, Chair, Climate Change Capital; Jack Frost, Director, Johnson Matthey Fuel Cells; David Hill, Chairman, Environment Bank; Russ Houlden, Chief Finance Officer, United Utilities; Martin Roberts, Programme Director, Cambridge Natural Capital Leaders Platform; Amanda Sourry, Chairman, Unilever UK and Ireland; Mike Wright, Executive Director, Jaguar Land Rover; and Peter Young, Strategy Director, SKM Enviros and Chairman, Aldersgate Group.

In order to underpin its deliberations, the EMTF commissioned research and evidence gathering in two phases. The first, scoping, phase aimed to: (1) review the evidence for business opportunities that protect and/or value nature, available in the UK National Ecosystem Assessment (NEA); (2) establish the potential for business opportunities based on nature's services; (3) identify actions to enable relevant markets; and (4) identify priorities for further EMTF work. This was carried out by a study team composed of experts in a range of relevant fields related to nature-based businesses and markets. The scoping study was carried out through: (1) development of a conceptual framework; (2) application of the conceptual framework for analysis of the NEA; (3) innovative thinking in the study team to identify business opportunities, related enabling actions and further work required; and (4) stakeholder consultation, based on a discussion paper, involving a workshop and peer review.

Analysis of the NEA involved screening in particular chapters on: drivers of change; state and trend of habitats, status and trends in ecosystem services; changes in ecosystem service values; and responses. The screening aimed to identify all reference to business opportunity linked to nature, whether explicit or implicit. From this, the study team derived a comprehensive long-list of business opportunities that value and/or protect nature. These opportunities were categorised in 8 categories: (1) product markets; (2) offsetting; (3) payment for ecosystem services; (4) environmental technologies; (5) markets for cultural services; (6) financial and legal services; (7) ecosystems knowledge economy; (8) corporate ecosystem initiatives.

Building on the long-list of opportunities, the study team worked up approximately 40 business ideas, several per category, providing for each: (a) a brief description; (b) sector relevance; (c) potential size of market; (d) potential benefits for ecosystems; (e) enabling actions required to up-scale the opportunity; (f)

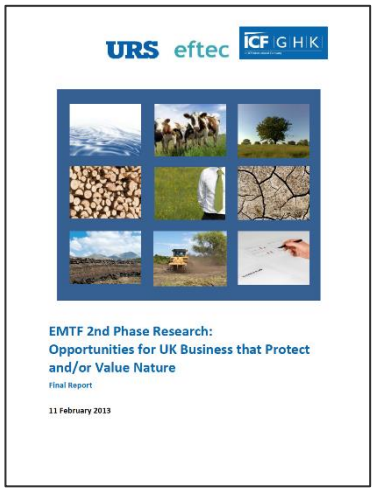
further research required to develop the opportunity; (g) synergies between various opportunities. These 40 ideas were presented as a 'catalogue' of proposals in Annex 1 of the Scoping Report.



The study team carried out further analysis of 12 'most promising' opportunities, as ranked by the study team, to better understand their market potential. This involved analysis of: (a) contribution to tackling risk faced by business; (b) potential demand; (c) scalability and transferability of good practice; (d) feasibility of overcoming any barriers; (e) strength of underpinning evidence; (f) potential role for SMEs; (g) short-term payback potential; (h) job creation potential, and (i) long-term potential to generate competitive advantage for the UK. For each opportunity, the team also suggested further EMTF and other research necessary to take forward the opportunity. The selection of opportunities sought to achieve a balance between those opportunities that may be taken forward by business alone and those requiring policy/regulatory actions.

Based on the report of this scoping study, the EMTF identified and agreed opportunities that they considered to be 'diamonds in the mud'. This involved consideration of: (a) credible short-/medium-term market opportunity, payback potential; (b) potential contribution to jobs & growth; (c) potential contribution to UK competitive advantage; (d) potential benefit to nature; (e) multi-sector &/or multi-scale (SME/corporate) business opportunity; (f) limited barriers, more-or-less ready to go; (g) potential for EMTF to add value; (h) potential synergies between those to take forward.

The EMTF then commissioned a second phase of research and evidence gathering on these 'diamonds' with a view to developing robust EMTF recommendations, including relevant 'buy-in'. This second phase considered, for each selected opportunity, the size of the opportunity (market scale, distribution of costs and benefits, benefit to nature, issues of market liquidity), ease of implementation (to what extent is there a conducive context for the opportunity, what are the benefits to business, how scalable is the opportunity) and risks. As an example, a summary of the findings for one opportunity (offsetting) is given in the table below. The analysis of each of the opportunities is contained in the study team's Second Phase Report.



Example of study findings: Offsetting (summary)

Size of opportunity:

- Market scale: c.6500 ha pa development impact to offset (England), creating demand for 6-10,000 ha pa offset sites, generating a market of £90-470 m pa (= 0.1-0.8% value of new-build construction); a potential £ multi-bn EU market; a significant export market.
- Distribution of costs and benefits: costs accrue largely to landowner selling land for development; benefits to businesses delivering offsets (largely rural SMEs)
- Benefit to nature: delivers over 20 years restoration/creation & long-term management of 108,000-338,000 ha habitat, with potential to revolutionize conservation in the UK.
- Liquidity: Mandatory framework would lead to increased demand and supply and greater liquidity; the market would be more liquid if trading is permitted beyond the local level; there is a need to generate supply in advance of demand; and there is potential to aggregate/pool offsets for greater benefit to nature.

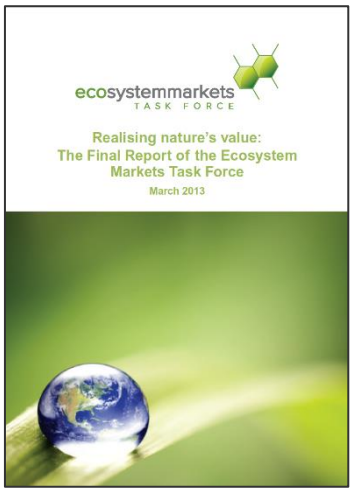
Ease of implementation:

- Conducive context: there is a policy and fiscal imperative, and a current policy window to introduce offsetting; strong potential demand, no shortage on supply side; data and methods available; main barrier is political concern for potential impact on growth, but offsetting can free up the planning system and boost growth.
- Benefits to developer: streamlined permitting; reduced uncertainties; more sites released for development; discharged long-term environmental liabilities; potential for gain in net developable area; and reputational gain.
- Scalable; innovators/brokers emerging; good practice is transferable; potential for public leverage of private activity.

Risks:

- Risks of perverse impacts on nature – mitigate through applying principles / best practice.
- Offset 'blight' – unlikely but need checks and controls.
- Impact on land values: may lead to slight reduction in price paid for developable land; supply side land values will be less volatile in a more flexible, liquid market (very limited local supply can result in increased land prices)
- Conflict with food production? – this was found to be a non-starter.

The opportunities selected by the EMTF and recommended to Government are contained in the EMTF Final Report, Realising Nature's Value.



Guy Duke

Guy is Business Champion for the Valuing Nature Programme. He was PI for the Ecosystem Markets Task Force is Innovation Lead for the EU Business & Biodiversity Platform. He is Deputy Chair of the Joint Nature Conservation Committee and Director Europe and Research with The Environment Bank Ltd (a broker in emerging markets for environmental assets). He is an Honorary Visiting Researcher at the Environmental Change Institute (Oxford University), a steering committee member of the €12 m FP7 project *Operationalisation of the Concepts of Natural Capital and Ecosystem Services* (OpenNESS) and evaluates and reviews research and innovation proposals and projects for the EU. He was previously Principal Administrator for Biodiversity Policy, European Commission where he introduced the concepts of natural capital and ecosystem services into EU policy and played a key role in launching *The Economics of Ecosystems and Biodiversity* (TEEB).

The Business Case for Investing in our Natural Assets

Peter Young

Chair, VNP Business Interest Group

Member (Founding Director & Chair), Aldersgate Group

Trustee, The Royal Society of Wildlife Trusts

Introduction

A number of businesses are already engaged and ready to invest in protecting and improving the state of the UK's natural capital, but need a supportive knowledge base and policy framework to underpin their activities. All companies have a dependency and reliance on natural capital.

Businesses are increasingly aware of risks from poorly managed natural systems and unmitigated shocks. To manage these risks requires:

- from the research community, an accessible knowledge base underpinned by high quality research; and
- from government, an incentivising framework to adopt more sustainable business practices.

Smart regulation and support for the creation of new markets in ecosystem services will allow the value of our natural environment to be better reflected in prices and business decision making. An enabling policy framework will facilitate action to improve the UK's natural capital, which will enhance prospects for long-term sustainable economic growth.

This introductory contribution explains the business case for investing more in our natural assets and what enabling actions are needed for business to facilitate this. For more information, see Aldersgate Group's report 'Investing in Our Natural Assets: How Government Can Support Business Action' which also contains eight case studies.

The business case for an ambitious natural capital policy

Natural capital improvements will strengthen the UK's resilience and wellbeing, improving business competitiveness and risk management.

Businesses use natural capital to describe all natural resources that provide goods and services of value. These goods and services benefits include the provision of healthy air, clean water, food, timber and opportunities for recreation as well as the regulation of flood risk and climate. Any business case for natural capital improvements starts with assessing the benefits of these goods and services. But some reasons for protecting and restoring the natural environment are not captured in natural capital arguments, and businesses may choose to act for more altruistic or reputational reasons.

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A natural capital approach broadens business understanding of how the goods and services nature provides impact on a whole range of life essentials from products and supply chains to profits and health. The interdependency of economic and urban development, job creation and the natural world means natural capital policy has broad economic, security and social implications.

The UK will derive significant economic benefits from maintaining and improving its natural assets. For example, if coastal developments were designed to enhance and not erode natural protection, the cost to business and society of maintaining the integrity of coastal communities would be reduced. If woodlands were planted nearer to population centres they could deliver net economic benefits of nearly £550m each year taking account of recreation and impacts on greenhouse gases. If every household in England had equitable access to good quality green space, £2.1bn could be saved in averted health costs.

Natural capital projects can also provide excellent business investment opportunities. Business can manage risk more effectively through a focus on natural capital and will reap the benefits in terms of resilience and competitiveness.

Improving natural capital through better policy integration

A joined up natural capital approach offers a route to greater efficiencies and cost savings.

Better integration between different policy areas could help improve natural capital and other connected objectives in a more cost-effective way. For example, agriculture, water supply and flood risk reduction are three policy areas with separate budgets. It is estimated that over the next 15 years, £100bn from taxes and bills will be spent on businesses delivering water supply, flood protection and in agriculture. Procuring integrated solutions could be more cost-effective and would avoid current antagonistic spending from deploying individual budgets.

Similar opportunities exist in health and social care, major infrastructure development and coastal defences. Integrating the climate change adaptation and natural capital agendas is also essential. Climate change is a key business risk and will exacerbate the degradation of the natural environment whilst increasing reliance on natural processes to regulate extreme events. Improvements in the extent and condition of the UK's key natural capital assets will help mitigate this risk.

Tackling the investment gap: a natural capital investment strategy

Businesses and landowners have begun to assess their dependence on natural capital but policy makers must make it easier to fund natural capital projects with long-term returns. Possible government levers to support investment include taxes, regulation and compensation payments from developers. Existing institutional arrangements should be utilised, such as embedding responsibility in licences or reforming subsidy schemes.

The farming and fishing industry plays a critical role in providing food, but also has significant potential to improve the UK's natural capital. Financial support to the farming and fishing communities, for example through EU policies, must reward activities that improve land and the marine natural assets.

The restoration of our natural capital will require new markets for ecosystem services and biodiversity. The extent and quality of environmental markets are typically determined by the quality of government regulations such as fiscal incentives, standards, smart regulation, targeted public procurement and, on occasions, voluntary approaches.

An example is the development of Payments for Ecosystem Services (PES). PES means the beneficiaries of an environmental service pay those who maintain the ecosystem that provides it. For example, Wessex Water makes payments to farmers to implement improvements in their farming operations. This helps improve water quality by reducing nitrates, phosphates, agrochemicals and sediment in surface run-off. There are a number of such schemes in the water industry but uptake in other sectors has been slow without any regulatory support. Business requires sources of capital to invest in new natural capital markets. The Natural Capital Financing Facility from the European Investment Bank is one. In the UK the Green Investment Bank must be privatised in a way that allows it to increase support for private investment in natural capital.

Incorporating natural capital in policy and corporate decision-making

Measuring reliance on natural resources will enable better decision-making and support economic growth over the long term. Providing measurement tools to assess the value of nature helps ensure that the benefits and services it provides are not overlooked. Such tools allow the development of business cases for investment, and action to avoid risks of natural capital depletion.

© Peter Young

Businesses require rapid development in measurement, valuation and accounting of nature to be able to carefully measure their reliance on natural resources and the efficiency with which they use them. Company level schemes of ecosystem accounting with board level engagement are required, such as Corporate Natural Capital Accounting, which is “a framework within which organisations can account for natural capital, documenting assets and liabilities in a balance sheet format that extends traditional financial reporting”.

The Natural Capital Protocol is designed for businesses "to measure and value their direct and indirect impacts and dependencies (positive and negative) on natural capital". It provides qualitative, quantitative and monetary valuation of natural capital impacts and dependencies, for different business applications and organisational levels (corporate, project, products and site) through the value chain.

What next for institutional arrangements?

Strengthening institutions such as the Natural Capital Committee (NCC) will safeguard the UK's natural capital strategy and signal to business that policies will be consistently steered towards delivering natural capital enhancement.

Business needs the NCC to monitor the state of our natural capital, oversee integration of natural capital metrics in the national accounts by 2020, and help development of markets for ecosystem services.

Other institutional arrangements could help business too. The Office for National Statistics could support the capture, standardisation and distribution of natural capital data. Public sector bodies and regulated industries who own and manage natural capital should have responsibility for maintaining it enshrined in their licences.

The 25-year biodiversity and food and farming plans need clear milestones to reverse the loss of their respective natural assets. They must state that the UK's natural capital must be enhanced for the benefit of the economy, business resilience and competitiveness, as well as for wider society and the environment.

Peter Young

Peter has spent his career working on environmental issues since the late 1970s, mainly in multi-disciplinary environmental management consulting. Until 2015 he was a member of the joint BIS/DECC/Defra Green Economy Council, Defra's Regulatory Challenge Panel, and was a member of the recent business-led Ecosystems Markets Task Force. Peter is an individual member of Aldersgate Group, having been a Founding Director and Chair from 2007 to 2015. He is a Trustee of The Wildlife Trusts. He is chair of the Business Interest Group for the Valuing Nature Programme, and a member of the Programme Advisory Board. He is also chair of the Industrial Advisory Panel for the School of Energy, Environment and Agrifood at Cranfield University, and on the Advisory Board of the School of Business and Management at Queen Mary College, London.

ALDERSGATE GROUP LEADERS FOR A SUSTAINABLE ECONOMY

THE wildlife TRUSTS

The Natural Capital Protocol

Mark Gough

Executive Director, Natural Capital Coalition

We are all dependant on natural capital. By this we mean 'the **stock** of **renewable** and **non-renewable natural resources** (e.g. plants, animals, air, water, soils, minerals), that combine to yield a flow of benefits to people.' Natural capital is fundamental to our lives and therefore also to business; it grants us numerous vital services, from the creation of raw materials, through to the happiness and wellbeing of members of staff. Without the natural capital of breathable air, uncontaminated water, edible plants & animals, sources of energy and so on, it's clear that there is no foundational environment in which business can exist and thrive.

Such an analysis in-and-of itself is self-evident and borders on the tautological, barely warranting mention when stocks of natural capital are superabundant, as they have historically been. However, within the context of the vast environmental damage caused by systemic global pollution and the cumulative effects of climate change, coupled with the subsequent outcomes of massive ecosystem degradation and the alarmingly accelerating loss of species, taking the position that stocks of natural capital are superabundant and perennial is now conclusively outmoded.[1]

Depleting stocks of natural capital pose very serious and far-reaching risks to businesses, and organizations are beginning to seriously acknowledge this. Accounting for natural capital may have once been viewed as a superficial exercise in enhancing brand-reputation, but now, with a better understanding of the great wealth of natural capital dependencies that businesses possess - alongside the knowledge that many of these stocks are dwindling or geographically unstable - it is clear that being able to measure and manage this is essential. In this sense, conserving and even enhancing natural capital represents one of the wisest economic investments that businesses could make.

We should be clear that protecting natural capital would have many more benefits for businesses than simply the guarantee of future access to natural materials and ecosystem services. Financial benefits, for instance through efficiencies and new markets, can also be determined. Ecosystem services operate in intricate and little-explored ways that would be very difficult and prohibitively expensive for organisations to substitute for using technology[2] and, in some cases, investing in natural capital can even prove more cost effective and efficient than using built capital to deliver key services. For instance, in the case of the New York City water board, which discovered that it could save an aggregate of $6.5 billion by spending $1.5 billion intelligently managing critical watershed lands in upstate New York, as opposed to spending $8 billion constructing a complex water filtration plant.[3]

When the Natural Capital Coalition interviewed 80 businesses from its Business Engagement Partner program, we identified numerous further benefits for organisations that make the decision to implement the Protocol and account for natural capital. As well as increased competitive advantage, reputation benefits and enhanced decision making capabilities, more accurate risk management was highlighted as

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[1] Secretariat of the Convention on Biological Diversity. 2010. *Global Biodiversity Outlook 3 – Executive Summary.* Montréal.

[2] Daily, G. 2009. *Nature's Services: Societal dependence on Natural Ecosystems.* Island Press.

[3] Salzman, J. 2005. Creating markets from ecosystem services: Notes from the field. *NYU Law Review.*

perhaps the most significant benefit to organisations.[4] Another Coalition Report, *"Natural Capital at Risk: The Top 100 Externalities of Business",* estimates that the failure to manage this class of risk effectively, costs the global economy upwards of $4.7 trillion per year in terms of the environmental and social costs which are generated as a consequence of the loss of ecosystem services, and from increased damage caused by pollution.[5]

Leading businesses have been aware of the many operational liabilities of their organisations for some time. Most have established Corporate Social Responsibility or sustainability programs which highlight the risks and opportunities surrounding environmental, social and governance concerns. As these programs evolve, it is becoming more and more obvious that it is not enough simply to have a program of good things with the hope that they will offset some of the more challenging aspects of a business. It's inescapably clear that what we really need to be doing is integrating the principles associated with these programs into core operations and the fundamental business models of organisations.

Of course this is easier said than done. However, in my experience, many people on company boards and within the senior management are well aware of the long-term strategic issues relating to environmental social and governance concerns. In leading businesses, boards will spend a significant amount of time strategizing in order to future-proof their operations against these types of uncertainty. They understand that this will not be possible if they deplete the goodwill of local communities, or the stock of natural capital on which they, and those communities depend. The difficulty then, is in entrenching this thinking into the crux of decision-making. This is what the Natural Capital Protocol aims to achieve.

The Natural Capital Protocol provides businesses with a standardized framework with which to measure and value their direct and indirect impacts and dependencies on natural capital. The Protocol is internationally applicable across all business sectors, geographies and organizational levels. It is designed to bridge the gap between the strategy and the day to day running of an organisation, by providing a common language which can be utilised when passing information throughout a business, and a framework in which to provide further analysis for management papers and project proposals. The overall vision of the Coalition is to transform the way business operates so that it conserves and enhances natural capital, by understanding and incorporating their impacts and dependencies into everyday decision-making. The intent is not to invent new methods, but to build on the front-runners that already exist, fill the gaps, and enable a period of experimentation in the market. Currently, companies that measure and value natural capital do so in a myriad of different ways, which prevents comparability, consistency and mainstream adoption of these approaches. The Protocol brings cohesion to the space by harmonizing the existing processes; this shows a level of maturity in the market.

More importantly, the Coalition provides a community of practice to actively share ideas and approaches and this has probably been our greatest success to date. Many organisations from different aspects of society have been progressing the thinking around natural capital for some time, but by working collaboratively, we are proving that we can produce something that is greater than the sum of its parts and we are helping establish partnerships that will continue to go on to deliver greater breakthroughs in the future. The development of the Protocol would not have been possible without the contributions of our members, who cover non-governmental organizations, science and research institutions, business,

[4] Natural Capital Coalition. 2015. *Business Engagement Partner Interview Report*.

[5] Trucost. 2013. *Natural Capital at Risk*.

associations, standard-setters, financial and accounting firms, public policy experts, and governments. We believe that by including all of these different stakeholders, we can build confidence and consensus, address challenges before they arise, and go further than we could alone. The Coalition is unique in the sense that a large group of organisations have come together, under contract, and have agreed to deliver something for the public good outside of traditional government channels.

The Natural Capital Protocol will be launched in July 2016, with two accompanying sector guides (Apparel and Food & Beverage). This though is only the start. The Coalition has already had interest from over 500 organisations that wish to pick up and start using the Protocol in July, and we expect this to increase substantially. We are also working to make sure that it is launched into an enabling environment, looking at the information and data inputs, and the policy drivers, whether they are top down, bottom up, or systems related. By 2020 we are confident that all leading companies will include nature in their decisions, and in doing so, they will be proving every day that nature is not a subset of the financial system, but in reality, lies at its centre.

Mark Gough

Mark is the Executive Director of the Natural Capital Coalition, a role he took on in March 2015. A strong believer in integrating sustainability into decision making where it becomes everyone's opportunity, Mark previously worked for The Crown Estate, helping to develop its integrated vision and approach to value measurement. Prior to this he was the Global Environmental Manager for the information company, Reed Elsevier. Mark is a Director of the Aldersgate Group, which brings together business, politics and civil society to drive action for a sustainable economy, and has sat on a number of national and international committees, including the Steering Committee of the United Nations CEO Water Mandate and the Board of the Alliance for Water Stewardship.

NATURAL CAPITAL COALITION

2. The Water Industry

Benefits and Limitations of Integrating NCA (Natural Capital Accounting) & ESA (Ecosystem Services Assessment) into Water Company Activities: View from the Water Sector

Jonathan Dobson

Sustainability Advisor, United Utilities

United Utilities and the water industry

There are 12 water and wastewater companies in the UK, as well as over 15 water-only companies and inset companies who provide water and services to customers. The companies provide fresh clean water to over 60 million households and companies, take away their wastewater, clean it and return it to the environment.

Since the water and sewerage industry was privatised in 1989 a regulatory framework has been in place to ensure that consumers receive high standards of service at a fair price. This framework has allowed the companies to invest more than £108 billion in maintaining and improving assets and services.

United Utilities helps life flow smoothly for about 7 million people and 200,000 businesses in the North West by providing them with clean, fresh water every day. We also take away and treat the North West's wastewater helping keep our rivers and beaches clean.

As the UK's largest listed water company we are responsible for:

- Over 42,000 kilometres of water pipes, from Cumbria to Cheshire
- Over 76,000 kilometres of sewers
- 569 wastewater treatment works
- 94 water treatment works
- Over 55,000 hectares of catchment land

How does the sector benefit from natural capital and vice versa?

The water sector is inextricably linked to the natural environment.

We rely on it to provide the right amount and quality of water for treatment, and we rely on it again to receive treated effluent from wastewater treatment works.

There are the services we provide to protect ecosystem services and natural capital through the treatment of wastewater and attenuation of flow through storage of water in reservoirs.

And for those companies who own large areas of land there are also the services that we help to provide through land management – carbon sequestration in peat bogs, and wellbeing benefits from access and recreation opportunities on catchment land.

This is not to mention the impact we can have in natural capital and ecosystem services through the goods we buy (energy, chemicals, construction materials) and the manner in which we operate (pollution prevention, waste management).

Catchment management: everyone's favourite water company example

In 2005 United Utilities started our Sustainable Catchment Management Programme (SCaMP). This innovative programme's initial aim was to improve the condition of Sites of Special Scientific Interest (SSSI) designated land within our ownership. The majority of these SSSIs were designated as upland blanket bog. However, we knew that degraded upland catchments produced water with very high colour (Dissolved Organic Carbon) and was not particularly good at sequestering carbon.

In essence inappropriate management lead to loss of ecosystem services and natural capital, leading to loss of value and increased costs.

The SCAMP programme helped to provide holistic management plans for all our agricultural land holdings – the majority of which are tenanted. The plans focussed on improving the condition of SSSIs, improving raw water quality and providing tenant with business plans that were viable and productive.

Cost Benefit Analysis, undertaken on behalf of United Utilities by the Water Research Council (WRC) after SCaMP 1 indicated that from a total cost of £5.8 million, there were benefits totalling over £13.2 million (a ratio of benefits to costs of 2.275). Therefore a net present value of £7.4 million was achieved once all the 'wider' benefits are taken into account. However water quality was the smallest benefit and carbon sequestration the largest.

Chew Reservoir catchment 2006 pre-SCaMP interventions, showing degraded habitat and bare peat. © Jonathan Dobson

Chew Reservoir catchment 2014 after SCaMP interventions showing vegetation and habitat recovery. © Jonathan Dobson

Steps already taken

Several companies have attempted to use NCA and ESA for different purposes over the past few years, such as:

- United Utilities: Triple Bottom Line accounting – to look at the value the company brings to economy, society and the environment.
- Yorkshire Water: Environmental Profit and Loss account - for water resource management planning.
- Several companies: Cost Benefit Analysis - of catchment management in uplands or elsewhere.

This led to collaborations by companies with groups such as the Natural Capital Committee and Accounting for Sustainability. A research project was put forward in 2015 for United Kingdom Water Industry Research (UKWIR)

Collective action

UKWIR commissioned a study in 2015 to consider the opportunities and barriers to the broad introduction of Natural Capital Accounting (NCA) and/or Ecosystem Services Assessment (ESA) into water company business planning approaches.

The project, undertaken by Cascade Consulting in association with the Met office, had the following objectives:

- Undertake a review of current NCA and ESA initiatives that are relevant, or could benefit the water industry.
- Describe the potential benefits and implications of NCA and/or ESA for water companies.
- Identify opportunities, barriers and risks for integration of NCA and ESA into both the regulatory framework and water company planning and decision-making.
- Develop proposals for research to fill knowledge gaps.

Information was collated and reviewed via technical workshops, questionnaires, literature reviews and an industry workshop.

What did the project discover?

The following table summarises the initial part of the project and findings:

Understanding: • General not specific • Limited to specialist teams • Relatively recent • More evolved in GHGs	**Benefits:** • Risk management • Better CBA will result in better decisions • Opportunities for collaboration • Comprehensive assessments
Barriers: • Complex and evolving ideas • Difficult to demonstrate direct impact on some capital • Unintended bias • No standards	**Gaps:** • Absence of clear business case • Costs and risks of doing it • Regulatory leadership • Data • Impacts and assets outside of management control

Project recommendations and proposed research agenda

Based on the findings the UKWIR project recommended that the main output from the research programme should be the development of a flexible framework. The framework should consider both NCA and ESA techniques, with embedded decision support that allows the user (water company or strategic advisor) to assess the needs for and benefits of adopting the approaches. This could be viewed along the same lines as a Natural Capital Protocol sector guide.

The collection of information, evidence and best practice guidance will provide companies with comprehensive support in delivering these approaches, but importantly with the flexibility to deliver them in the way and to the timescale that best suits individual companies' situations.

Other areas for further research include:

- **Tools and Techniques**: an element of the research agenda should be focussed on providing resources that make it easier for individuals or teams within water companies to undertake the NCA and ESA.
- **Data**: It is not currently clear what data are available (if at all) across the water industry and so it is suggested that an element of research would be to identify what types of data are required to undertake an NCA & ESA, whether they exist in the correct format, and if they are uniformly (collected in a consistent manner) available across the industry.
- **Influencing strategy**: the research programme includes an influencing strategy and approach to work with stakeholders to establish the political and regulatory framework from which to promote support for such initiatives.
- **Pilots**: it will be necessary to demonstrate how the approaches might work across the industry through the use of relevant Pilots and case studies.

Where next?

Globally, and within the UK, there is a growing body of evidence of the benefits of creating a natural capital account, or of assessing the value of ecosystem services in order to understand the environmental and social impacts of companies' activities. There are an increasing number of organisations that have started to integrate these approaches into their business and there is increasing interest from a number of water companies in the UK.

The UKWIR research into the benefits and limitations of integrating NCA and ESA into water company activities has provided a view of the risks and opportunities that these techniques could hold for the sector. The project has identified through a framework potential research areas for taking application across the industry further.

Jonathan Dobson

Jonathan is Sustainability Strategy Manager at United Utilities. His role involves identifying and preparing the company for challenges across a broad range of sustainability issues. Recently his role has included developing UU's approach to social and environmental reporting. Jonathan has recently been involved with piloting corporate natural capital accounting with the Natural Capital Committee, having previously supported the company CFO in his role on the Ecosystem Markets Task Force.

United Utilities
helping life flow smoothly

3. Infrastructure Industries

Biodiversity Net Positive: Lessons Learnt from Industry

Julia Baker

Biodiversity Specialist, WSP Parsons Brinckerhoff

The number of businesses reporting their sustainability performance has grown rapidly in recent years. Yes, work was needed to eliminate the 'green wash' where companies falsely report sustainability credentials. But the uptake of sustainability policies led to a fresh approach; now, delivering environmental benefits is a core part of delivering business.

Metrics underlie business, and the corporate world embraced sustainable development by putting a number on an environmental issue, setting targets such as carbon neutral and zero waste to landfill, and monitoring progress. But here in the UK, there has been nothing comparable for biodiversity. No single metric but a host of different and seemingly unconnected initiatives such as green infrastructure, natural capital and ecosystem services. Consequently, biodiversity has lagged behind as the world of corporate sustainability advances, being the poor cousin to the likes of carbon, waste and water. This must change, especially as there's less than four years left to achieve the EU Biodiversity Strategy's target of halting biodiversity loss by 2020. And not only that, less than four years to turn around the finding from the mid-term 2020 review, which found that "no significant progress" was being made. But why? Review the literature and everything points to development - it's taking our green spaces and not accounting for their true value to our wellbeing and our planet. Biodiversity losses still occur despite many initiatives to address this issue. So, understanding the real reason why development causes biodiversity loss is more important than ever.

For the UK, a major difficulty is a legal and planning system that protects some, but not all, wildlife. While certain species are extensively protected, many are not, with the consequence that development can be 'legally compliant' but still lose biodiversity. Addressing this requires policies that guard against this 'silo species protection' and make it an absolute requirement that development causes no overall loss of biodiversity, and even brings a benefit where possible.

The biodiversity offset framework establishes 'no net loss' of biodiversity as the minimum outcome, with net gains where possible. A development project might not need to use offsetting after first avoiding and then minimizing and redressing biodiversity losses on site. But offsetting will account for biodiversity losses that are not currently picked up by legal and planning systems – and this is a vast improvement on status quo. However, offsetting is controversial; people suspect it of being an easy way for developers to buy their way out of conservation requirements. Indeed a pilot by the UK government raised concerns that development will damage biodiversity and then 'pay this off' somewhere else.

Despite this our transport giants Network Rail Infrastructure Projects and Highways England have committed to becoming 'Net Positive' for biodiversity. By doing so, they are sending clear messages to their supply chains ('get good at biodiversity because our projects are to benefit nature') and to the rest of industry ('this is the standard now'). This marks a new era for industry and means we need to measure biodiversity to know that 'Net Positive' has been achieved. But putting numbers to nature is difficult. Can one number represent the diversity of life or the complexity of ecosystems? There will be limitations of course, but we can use numbers wisely and appropriately.

As part of its pilot on biodiversity offsetting, the UK Government's Department for Environment, Food and Rural Affairs (Defra) issued a metric for industry to calculate gains and losses of biodiversity. This first Government-issued number for biodiversity meant that, finally, industry could set targets of 'No Net Loss' and 'Net Positive'. Defra's metric is habitat-based, so its advantage is that it focuses more broadly than 'silo species' legal and planning policies and covers overall losses of biodiversity, making it possible to see if No Net Loss or Net Positive has been achieved. Then if there is a loss, Defra's metric helps to answer the 'how much' question. How much compensatory habitat is needed to achieve No Net Loss or even Net Positive? In making these calculations, Defra's metric uses 'multipliers' to account for the risks of the offset failing. For example there's a multiplier to account for the difficulty in creating enough habitat and another to cover the time taken for the habitat to become established.

But the metric cannot answer questions about what and where any compensatory habitat must be, which wildlife are to use it and what ecological functions are to be created. Getting that right relies on a really good understanding of the biodiversity affected by a development, and a strategy for the compensation. So Defra's metric does not replace information gathered for example by ecological impact assessments. It just helps to understand if No Net Loss has been achieved and, if not, how much compensatory habitat is needed (and how much would achieve Net Positive).

Lakenheath Fen, © Dave Rogers

In the corporate world, a number for nature is simply vital to communicate with a business audience. Numbers help to engage businesses, and this 'opens the door' for innovation and embedding good practice. For example, we developed a Mitigation Hierarchy Evidence Base for environmental managers to record all actions to avoid and mitigate losses of biodiversity. They then report their performance in adhering to the mitigation hierarchy as part of their sustainability reporting. We also developed a Biodiversity Units Tracker to help environmental managers 'keep track' of losses and gains in biodiversity units during construction and be able to respond quickly when a seemingly simple change on site, for

example felling trees to re-route an access track, has severe consequences for the overall habitat loss of a project.

In the UK there is no industry guidance for achieving No Net Loss or Net Positive outcomes for biodiversity, as part of a development. So we adopted the good practice principles issued by Defra and the Business and Biodiversity Offset Programme. These principles set a strong foundation for offsets that are appropriate and actually benefit biodiversity by contributing towards conservation priorities at local and national scales. They also include stakeholder participation, which we 'translated' into business-speak as an opportunity for proactive engagement with local government and conservation organisations. While this ensures that stakeholders are involved in decision-making about biodiversity offsets, from a business point of view, it's better risk management.

A recent paper by IUCN describes how to make offset outcomes better. Its recommendations include applause from the conservation community for voluntary offset efforts, support for attempts to achieve 'no net loss' through good practice, and constructive criticism given within a safe learning environment. This is imperative to engage with businesses on all aspects of biodiversity, not just offsets, and ensure we address the real causes of biodiversity loss.

Julia Baker

Julia leads on biodiversity initiatives for WSP/Parsons Brinckerhoff, a multi-national consulting firm assisting public and private clients with infrastructure projects. Julia has designed and delivered a variety of 'no net loss' and 'net positive' initiatives, including her current work with Network Rail Infrastructure Projects. She provides technical support for implementing the good practice principles of biodiversity offsetting, runs professional training courses in biodiversity and support corporate teams to integrate biodiversity management into business strategies. Julia is also a Visiting Researcher at Oxford University where she is co-supervising PhD research on social aspects of 'no net loss' in Uganda, and Research Advisor for the 'Building capacity for pro-poor responses to wildlife crime in Uganda' by the International Institute for Environment and Development.

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Realising Value Through a Natural Capital Approach

Ian Glover

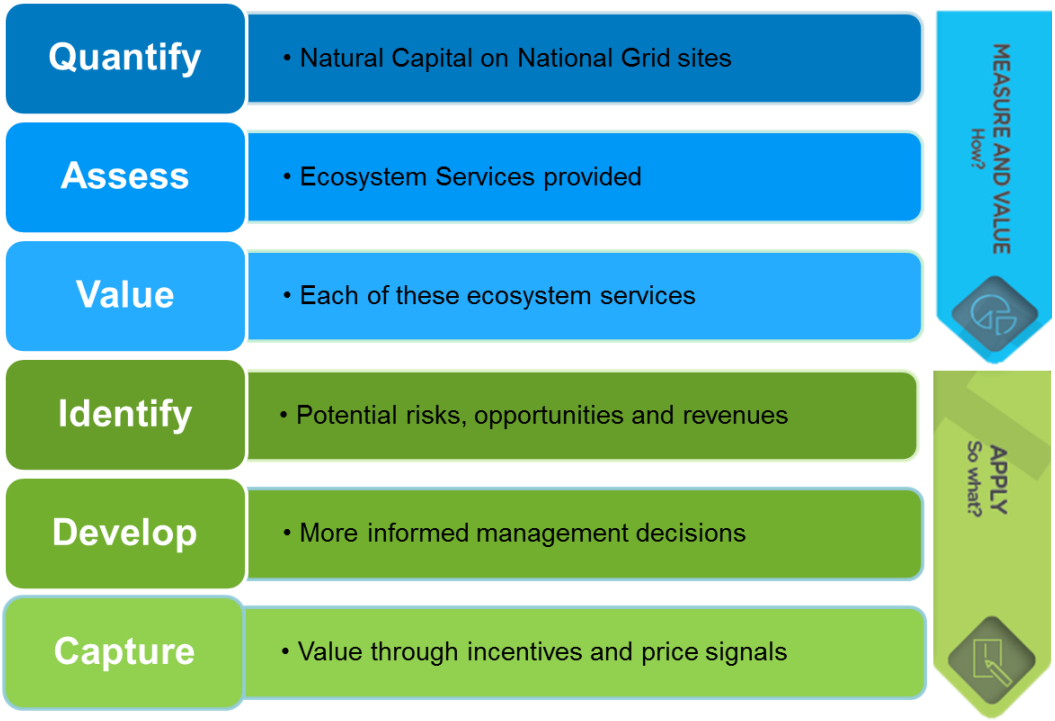
Environmental Sustainability Manager, National Grid

National Grid developed a Natural Capital Valuation tool that helps us to focus our approach to the proactive management of our non-operational estate, a key element of our sustainability strategy 'Our Contribution'. The tool helps us recognise and account for the value that our natural assets provide and manage them in a way that delivers greatest value to us and to our neighbours and stakeholders.

Translation of the value of nature into a language that resonates with a range of functions across our business has built greater engagement with land managers, asset owners and finance teams and supports our strategic ambition to embed sustainability, particularly to integrate sustainability factors such as carbon and natural capital, into our decision-making.

Natural capital accounting captures the value but also provides measurable outputs to track growth in value, helping to quantify risk, identify opportunities and develop prioritised programmes that target greatest need and opportunity. Understanding the value of these assets has identified new opportunities to work in collaboration with partners to protect and enhance our natural capital assets and the multiple benefits they provide.

Our valuation tool, developed with AECOM, is based around the identification, quantification and valuation of 10 broad habitat types and 12 ecosystem services (benefits that these habitats provide to us and others, e.g. carbon sequestration, flood attenuation, pollination, recreation...). The tool uses data from over 100 external sources to assign indicative financial values to these services. These values in turn provide us with a better understanding of which habitats deliver the greatest benefit and to whom, as summarised in the figure below.



Overview of National Grid's natural capital valuation process.

We use 'scenario analysis' to develop a series of management options and ecosystem service benefits (expressed in monetary terms) for each site. The valuation tool estimates benefits associated with environmental and social outcomes, for example recreation activities, pollinator services, air pollution and so on, whilst financial returns may be captured, for example, through Payments for Ecosystem Service schemes, biodiversity offsetting and carbon 'offsetting'. These benefits are not only those arising to National Grid, but also to broader stakeholders, such as local residents or agriculture. By selecting sites based on a range of criteria, and development of scenarios that set future possibilities and values, it has enabled cost-benefit analysis in monetary terms that drives informed, long term decision-making and targeted investment that optimises the natural capital value of our estate.

We have engaged widely with external stakeholder groups to help transform the value of nature at our sites. Local stakeholders are best placed to know what interventions may be possible on our land, where the constraints and opportunities lie, and how any management changes impact the wider landscape. We actively involve them in both the development and delivery of new management practices to realise how a site can be best managed to deliver benefits aligned to local and regional priorities.

Examples of natural environmental features at National Grid's Thorpe Marsh substation.

We have embedded joint management plans, delivered by partners including the Wildlife Trusts and other third sector organisations at over 20 sites, which preserve and enhance the value of the site to National Grid and deliver new spaces for wildlife, priority habitats and new educational or recreational spaces that support local skills, from conservation grazing to traditional hedge-laying.

The Natural Grid programme allows us to prioritise action on our estate, targeting investment where the greatest environmental, social and economic returns can be realised. Using a robust tool enables us to capture value, previously unidentified to the business. Coupled with a strategic programme of enhancements, this approach offers opportunities to create new value and derive financial and non-financial returns from the services provided by natural assets.

Case study

Our substation at Thorpe Marsh sits within 16 hectares of non-operational land, adjacent to the River Don and within 500m of a Yorkshire Wildlife Trust (TWT) nature reserve. The site hosts a range of habitats including former settlement ponds, a lake, grasslands, wet meadows and woodlands that support a wide variety of species, particularly birds.

We used the natural capital valuation tool to establish a natural capital baseline for the site, incorporating local knowledge and expertise to determine the primary ecosystem benefits and services under current management regimes, as well as identifying who were the principal beneficiaries and stakeholders.

Within the tool we then developed a number of potential scenarios that could facilitate growth in natural capital value and deliver shared benefit such as grassland restoration, woodland creation, community access whilst maintaining and improving key site drainage and water management services. Working with YWT we refined these scenarios and agreed an approach that aligned to the YWT 'Living Landscape' priorities, delivered our strategic ambitions and operational requirements whilst also facilitating positive links with the local community and positive outcomes for biodiversity.

The Natural Capital values were incorporated into a strategic business case and funding was secured to develop and deliver a long-term management plan in partnership with the YWT. This project represents a natural capital benefit:cost ratio of 8:1.

Ian Glover

Ian is Environmental Sustainability Manager at National Grid and has worked in a variety of roles focused on safety, environmental and latterly sustainability aspects of National Grid's operational activities for 15 years. He was extensively involved in the development and roll out of Our Contribution, National Grid's strategy for environmental sustainability and ongoing programmes to embed this across the business. He leads the natural grid programme, a theme dedicated to ecosystem enhancement alongside National Grid's energy networks. This encompasses engaging and involving stakeholder groups in the management of National Grid's landholdings through to developing and embedding tools to account for the value of nature in decision making. Ian chairs the Linear Infrastructure Network of the Green Infrastructure Partnership, the Corporate Ecosystems Group of the UK Business Council for Sustainable Development and works with the Prince of Wales' Accounting for Sustainability project on natural and social capital accounting work streams.

nationalgrid

4. Human Health

Good Health is in Our Nature

William Bird

CEO, Intelligent Health Ltd

Human beings are an evolutionary experiment that has accidently been rather successful. About 90% of our genes are redundant which indicate that most of our genes were innovations that failed often being introduced by virus epidemics over millions of years. The battery that powers all of us came from a free-living bacterium that used to swim in the prehistoric oceans. This is called the Mitochondria.

The story starts about 100,000 years ago when we were hunter-gatherers in East Africa. We were extremely good at it and slowly over the following thousands of years we spread around the world. To look at things in perspective it is helpful to take one hour for a thousand years then 100,000 years becomes a more manageable 100 hours. For over 90 hours we were very successful hunter-gatherers. 10 hours ago some of us started agriculture and 4 hours ago we started to live in ancient cities. But the real change came 9 minutes ago with industrialisation and 80 seconds ago with technology where we became indoor, inactive and disconnected with nature.

The whole body's system that was so perfect for being a hunter-gatherer is hopelessly suited for today's lifestyle. We have the wrong body for the wrong job. And the body will take many thousands of years to adapt yet we have changed roles in a blink of an evolutionary eye.

To be a good hunter-gatherer we need **people**. We are pack animals and very sociable. We need to have the support of our family and friends. Loneliness carries as much risk as smoking in developing heart disease.

We also need **purpose**. Hunter-gatherers organised everyone to have a job to do. Every day they had purpose of hunting, looking after the homestead, protection and gathering fruit and water.

But it is our connection to **place** that we will discuss now. Today our lives are increasingly indoors. Houses with trees or views of water that have no additional practical value fetch a higher price than those without. We go on holiday to the countryside to connect back to nature and even if we take a city break we try to find the park or river as part of our relaxation.

So nature has two groups of benefits. First it is associated with less bad things such as less noise, air pollution, urban heat and traffic. Secondly it can enhance health by reducing stress, getting people more active and bringing communities together.

Contact with nature can reduce stress. Even looking at nature generates calming electrical alpha waves in the brain, drops blood pressure and relaxes muscles within two minutes. In research studies people who viewed trees in a street or out of a window were better able to do calculations than those that looked at treeless streets or a blank wall.

Chronic stress can lead to diabetes, obesity, depression, dementia and heart disease in two distinct ways. First when we are stressed we change our behaviour and start to crave sugar and fat, we feel too tired to exercise and we may even take up smoking or drink more alcohol. Studies show that the more greenery in a neighbourhood the healthier people are with less obesity and more physical activity even when taking

into account the social class differences. In one study, children living near the park were 6kg lighter than similar children living further away because they were more active and less stressed.

The second way is a more direct way in which cortisol that is released when we are stressed causes toxic fat to be laid down in our tummy and it can make our mitochondria malfunction.

So we return to the mitochondria. This battery gives off dangerous free radicals if either we have too many calories (over-eating) or we let them charge up but don't use them (inactivity) both of which are increased with more stress resulting in premature ageing of our bodies and a much higher risk of diabetes, obesity, depression, dementia and heart disease.

In the NHS there is significant work to see how the health benefits of nature can be harnessed. One project called Beat the Street paid for by the NHS encourages up to 30% of a town's population to engage with RFID (radio-frequency identification) readers around the town placed on lampposts and in parks. This has allowed residents to engage with local nature often for the first time and the health benefits that follow are being quantified as a return on investment based on increased physical activity. For a scheme like Beat the Street the National Institute for Health and Clinical Evidence have developed a return on investment model based on getting more people physically active. Using Beat the Street for every £1 spent there is an ROI of £3.53 for transport, £14.58 for Healthcare and £16.39 for productivity at work.

William Bird

William is a family GP in Reading who founded Intelligent Health to provide ways to integrate physical activity into health and wellbeing, from Green Gyms and GP training to whole city physical activity strategies. Through Intelligent Health, he has been commissioned by cities in the UK and EU to help develop physical activity strategies and regularly addresses conferences throughout the world. William is a member of the Physical Activity Strategy Board for Public Health England, and an advisor to WHO and PH Wales. He is co-editor of the Oxford Textbook of Nature and Public Health and board member to the Parks Alliance. BBC Wildlife magazine recently voted him one of the top 30 influential conservationists in UK.

Intelligent Health

5. Insurance

Using Risk Management Approaches in Valuing Natural Capital

Olivia Darby

Chief Operating Officer, Capital, Science & Policy Practice, Willis Towers Watson

In order to establish the true value of natural capital infrastructure, we must evaluate the benefits that an asset or ecosystem delivers, both to an individual organisation and to the local community and possibly society more broadly. One way of doing this is to establish the reduction in the financial risk exposure that an entity benefits from which creates a financial incentive to protect and cultivate the natural asset.

Understanding and managing climate risk exposure is crucial to increasing resilience globally. Organisations are increasingly realising the importance of managing their risk exposure and this will only increase, as economic losses from natural hazard related disasters are estimated to be between $250bn and $300bn annually[6] (an increase from $140bn in 2013).[7] As climate risk exposure is exacerbated by the impacts of climate change, the upward trend – underpinned by demographic, economic and environmental factors – is likely to continue.

Unsurprisingly, building resilience (i.e. the ability of systems to resist, respond or adapt to disruption) to disasters has become a key element of international and national agendas for both the business sector and global society. In order to manage risk exposure, we have to understand it, quantify it and be appropriately equipped to manage it. The risk management industry is focused on building these capabilities through more widespread use of modelling and analytics and through risk transfer mechanisms (both traditional mechanisms such as insurance and non-traditional options such as catastrophe bonds and parametric-based structures).

Much of the work required in understanding the economic risks posed by natural hazards has already been done. The last 25 years of (re)insurance experience provides a method to achieve structural resilience to natural disaster risk in the decades ahead. This has been developed through:

- Data and analytics: sophisticated models based on engineering, science, and statistics to better understand risk and inform capital allocation and management decisions.
- Smarter capital: well-informed investors that understand risk are prepared to allocate insurance capital based on data and analytics.
- Regulation: required the adoption and disclosure of stress tests based on data and analytics for (re)insurers in balance sheets.

These approaches could be adopted more widely in society as a means of understanding and managing risk for a variety of difference applications including natural capital. Modelling tools and capabilities can be used by in a number of ways to understand what geographical areas are exposed and what the

[6] The human cost of weather related disasters 1995 – 2015, UNISDR, here: http://www.unisdr.org/2015/docs/climatechange/COP21_WeatherDisastersReport_2015_FINAL.pdf

[7] Swiss Re

probabilistic financial losses will be. This facilitates a more sophisticated understanding of risk and can help to build resilience by demonstrating the value of appropriate risk management practices.

By adopting these insurance-related tools, one of the ways business and organisations can capture their disaster resilience would be through implementing some of the principles and standard metrics developed in the (re)insurance industry. Central to this is the understanding that exposure to risk will likely discount the value of assets and that action to limit exposure will be reflected in a business's overall value. Currently (re)insurance companies must evaluate, disclose and hold enough capital in reserve to manage a probable maximum loss at a 1 in 200 year tolerance to risk exposure. If organisations within an industry or sector adopted this approach and used standardised metrics to quantify risk, this would enable us to compare exposure, and therefore resilience to extreme events, and to engage with organisations as better informed stakeholders. The quantified risk exposure could then be encoded in accounting and regulatory norms, and physical and financial resilience (including insurance) would be recognised as a true business asset.

This approach can help organisations to understand the role of natural capital in reducing risk exposure. It can provide a framework to educate organisations about the benefits they gain from building greater resilience to climate risk, whilst integrating financial, social and environmental impacts into one metric. It also makes disaster risk visible and tangible to stakeholders and so can help to demonstrate the reduction in financial risk exposure provided by natural capital infrastructure. Perhaps, most importantly, adopting these tools will create a financial incentive for organisations to protect and cultivate natural capital, promoting cleaner air, healthier populations, and likely opening economic growth opportunities for many industries, all whilst achieving a reduction in disaster risk exposure.

Adopting these risk management approaches will also create a stronger business case for the protection of natural assets resulting in a greater awareness of ecosystem services, quantifying the value of these services and encouraging organisations to protect natural infrastructure. Ecosystem services provided by natural resources are recognised as vital to support human wellbeing and, ultimately, a functioning planet. As a result, natural capital accounting is evolving as a means of valuing these services and measuring a business or organisation's impact. These benefits can be extended, as the approaches outlined above would benefit from the incorporation of natural capital infrastructure (or asset) evaluation. This evaluation would capture how ecosystem services contribute to business or community resilience which may be related to, for example, the value of access to a reliable water source, or protection from a hazard (such as the role of mangroves in reducing the impact of storm surge).

Further innovation is needed across communities and industries to help: build more resilient supply chains; support the needs of urban dwellers and the businesses and municipal services on which they depend; ensure municipal finances are resilient to natural disasters; increase the resilience of transportation, energy and wider utilities; and, increase investment in these sectors through risk reduction. Risk management and its related capabilities has a key role to play in protecting natural capital and in helping us to understand its true value both as a financial asset and to society.

Olivia Darby

Olivia is Chief Operating Officer of the Capital, Science & Policy Practice at Willis Towers Watson. The Practice confronts large-scale challenges of risk and seeks innovative uses of insurance-related mechanisms to build resilient economies and societies around the world to support sustainable growth. Olivia also sits on the Advisory Board of two climate finance organisations, the Global Innovation Lab for Climate Finance and the Finance for Resilience (FiRe) initiative. Olivia has an MA in Classics from the University of Cambridge and an MBA from Imperial College London.

Willis Towers Watson

6. Valuing Natural Capital for Profit

That's Interesting But How Do I Make a Profit Out Of It?

Mat Roberts

Group Sustainability Strategy Director, Interserve PLC

There is lots of talk but not a lot of real action when it comes to valuing natural capital in business.

In complex decision making systems the highly complex network of interaction that makes up natural capital is not engaged with.

The language of nature is not well understood in business.

SMEs make up 95% of the global business community. At the small end they are very small, very hand to mouth and very tightly focused. The medium-sized businesses get quite big, say 250 staff and 50 million euros turnover. Then there is the ill-defined large business that is not a corporate.

Even though big players like the Ministry of Defence's Development, Concepts and Doctrine Centre (DCDC) and World Economic Forum (WEF) identify natural capital as risks, when you drill into the business response the depth of understanding is weak. This means that the SME sector has almost no chance.

The game changer here will be about making natural capital a viable investment. I would argue that most of the money in natural capital investment is either public money or corporate responsibility money. In Europe this includes greening money under the Common Agricultural Policy (e.g. agri-environment measures) and green grant instruments (e.g. LIFE). The European Investment Bank's Natural Capital Finance Facility, launched a couple of years ago, is still not well supported, with only 2 projects in the pipeline at present.

Change

The impact of change, large-scale global shifts in behaviour, culture and values are often absent from many of the models that natural capital proponents use in their modelling and valuation.

The link between the habitats we operate with today and the inevitable changes we will see in species distribution is rarely articulated.

Waves

Sustainable development as experienced in the business world can be viewed as a series of waves that roll onto the business-occupied 'beach'. Depending where you are on this beach will depend how the wave affects your business.

Big corporates that straddle the full depth and width of the beach, above and below the strand line, in the rock pools, shingle banks and sand dunes, can adapt as these waves come in, waiting for the small pioneer companies to either survive the wave and show how to colonise or be smashed to bits.

We have seen the social wave roll in and out and we understand what a socially responsible business looks like; a good safety record, non-discriminating, high standards of trading and skills development, family-

friendly employment policies that attract and retain employees and enable communities to support the license to operate.

Corporate social responsibility (CSR) has morphed into either responsible business or social value and we now agonise about the best way to measure what we are doing.

These are really first world problems. There are many locations around the world where this does not happen, but we know what good looks like and what bad and improving also looks like. The flight path is understood and well-travelled.

The sustainable/responsible economics wave is drowning us now. The distribution of the richest 1% in the world, fat cat salaries, bankers' bonus payments built on subprime mortgages, pension miss-selling, forex abuse, PPI miss-selling and very aggressive tax planning.

We have reached a point where we have a moral rate of tax as well as an exchequer rate. Any business wanting to have a long-term presence in any market will have to demonstrate that it is not only socially responsible but it is also economically responsible to the people it employs and supports the externalities that it needs to trade.

One of the consequences of globalisation is a much deeper understanding in business leaders of all the costs of moving activities to a low wage country. There are good things like great talent but bad things as well; the hardship payments it has to make to senior leaders to run these businesses, etc.

Re-shoring did not reach the epidemic levels that were predicted a few years back but more thoughtful offshoring can now be seen in customer services, manufacturing and supply chain.

And so to the natural capital wave. It is coming, it's visible off the beach but it's small and moving slowly. For many of the above reasons.

Natural Capital

For the natural capital wave to immerse business and wider society it needs to help solve the big future challenges: food waste; migration/displacement; health care and ageing; energy storage; basic sanitation.

Natural Cities

We are thinking a lot about cities and how to service and support mega-cities with clean water and air, fresh food, effective waste systems and resilient networks of everything from power to education, fertility, faith, finance, friendship, democracy, justice, healthcare, etc.

Business needs to understand where the natural capital wave fits in with the other waves of digital, social, mobile, gig economy, workforce planning around age, gender, global nomads, the war for talent, automation of knowledge work and multi-polar global economic centres.

By 2025 there is a good chance that natural capital products will be as economically and politically critical as oil and gas is today.

Natural capital accounting as we see it today is a risk, reputation and supply chain management tool. We need to find ways of the investor community seeing and valuing all aspects of a business's activities and impacts. A business that can clearly demonstrate it has a grip of the natural assets they use, ownership of

the respective depletion and replenishment rates and methods and has priced these into its operating model should be more valuable.

The work of organisations such as the World Business Council for Sustainable Development in building full or true value models and metrics is vital to move the dial on natural capital.

Common standards of reporting such as those championed by the Natural Capital Protocol are moving us in that direction. At Interserve we are working on bringing context to many of the metrics that these tools reveal by modelling the data geospatially.

By placing business-specific data on digital maps that also contain public data sets about a location, we are building understanding of our business, its various sustainability capital (social, natural, knowledge and financial) and the communities in which we sit.

Monetizing or enumerating "capitals" is not an end its own right. The objective is to create understanding and to enable this understanding to be used to make better, more informed decisions.

Ultimately business needs to be able to create value from its deeper understanding and better decision-making with reference to natural capital.

Mat Roberts

Mat is Interserve PLC's Group Director of Sustainability Strategy. He leads on the development of the Interserve SustainAbilities Plan with a specific focus on the social and natural capital. Before joining Interserve was Head of Sustainability at Landmarc Support Services, an Interserve joint venture. Mat is an advisor to the EU Business @ Biodiversity Platform, a Trustee of The Princes Countryside Fund, a Non Executive Director of Cynnal Cymru Sustain Wales, the National Association of AONBs and a fellow of the RSA. Outside work he enjoys sailing, running and mountain biking.

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Ingenuity at work

7. Satellite Earth Observation

Satellite Earth Observation Services for Ecosystem Valuation

Nick Veck

Head of CEO Office, Satellite Applications Catapult

This paper provides a brief introduction to satellite earth observation (EO) and ecosystem services (ES) valuation, provides an example of the application of EO for ES valuation (the SENCE and Milton Keynes approaches), considers the relevance of the MK broad-scale habitat map and ES layers, and looks at future possibilities.

EO is the gathering of information about the Earth's physical, chemical and biological systems. EO is used for a wide range of purposes, including: natural resources management, agriculture, risk assessment, environmental protection, ecosystem services, urban planning, insurance, transportation, communication and tourism.

The satellites that deliver EO data are not that far above the Earth's surface, in low earth orbit, at 600-900 km in altitude (around twice the altitude of the International Space Station). Remote sensing (RS) systems make use of the whole electromagnetic spectrum in two ways: (1) collecting the radiation that is reflected, emitted or scattered by a target (passive systems); (2) illuminating a target with a pulse or beam of radiation and collecting the signal that is reflected back to the sensor (active systems). Passive systems rely on the energy supplied by the sun, using the visible light spectrum (400-700nm wavelength) while active radar systems produce their own energy (1cm to 1m+ wavelength). The advantage of active radar systems is that they can see through cloud and at night, so can obtain a picture each time the satellite passes overhead.

The resolution of satellite images has improved considerably over the last 25 years. As regards optical satellites, the SPOT2 satellite in the early 1990s had a resolution of 30-50m, Quickbird launched in 2001 had a 0.61m resolution, and Worldview3 launched in 2014 has a resolution of 0.31m. Radar satellites show a similar trend, from ERS1 in 1991 (30-50m) to TerraSAR X in 2007 (0.25m). EO thus offers 25 years of data, allowing for time trends to be studied, but earlier data is of lower resolution than that being produced today.

Ecosystem services (ES) are 'a wide range of conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfill human life' (Daily et al. 1997). They are the benefits people derive from ecosystems, and include cultural, provisioning, regulating and supporting services.

An increasing number of papers are reporting research on ES using EO. For example: (1) a 2009 review[8] of the use of RS data in landscape ecology (habitat assessment) found that RS was overwhelmingly used a

[8] Newton, A. *et al.* 2009. Remote sensing and the future of landscape ecology. *Progress in Physical Geography* **33**(4), 528-546.

source of land cover information, with other relevant RS data products rarely used; (2) a 2012 paper[9] reviewed RS applications for the quantification and mapping of ecosystem services supplies and demands; (3) a 2014 paper[10] addressed the potential contribution of RS to ES assessments; (4) a 2015 review[11] of the use of RS for the study of ES (1960-2013) found 211 papers which directly reference RS among almost 5920 peer-reviewed papers addressing ES and provided a summary of what has been done, what can be done, and what can be improved upon in the future to integrate RS in to ES research.

A BESS (NERC Research Programme: Biodiversity and Ecosystem Service Sustainability) workshop in February 2016 looked at the ES categories (as defined by the Millennium Ecosystem Assessment) addressed by published papers on remote sensing of ES. It found that some ES are more frequently addressed than others, for example food provision and climate regulation are the most frequently addressed, while energy provision is least frequently addressed. Studies of provisioning, regulatory, supporting and cultural ES were found to make use most frequently of land cover data, tough other kinds of RS data such as normalized difference vegetation index (NDVI), leaf area index (LAI) (both measures of greenness), land surface temperature, elevation and chlorophyll-a were also used. The workshop concluded that there is an overwhelming use of RS as a source of land cover (and vegetation biomass) information, with other possible RS products less frequently used. This was the first of a planned series of three workshops bringing together the ES and EO communities to build better understanding of the use of EO for ES research.

The most common approach in the published literature involves the use of optical sensors, which measure land surface reflectance at different wavelengths. Different land cover types produce differing spectral signatures. A supervised classification of these signatures is used to produce a land cover map. Land use is then inferred from this land cover, and valuation methods are then used to infer the ES value deriving from this land.

An example of a product applying RS data to underpin ES valuation is the SENCE (Spatial Evidence for Natural Capital Evaluation) approach developed by Environment Systems Ltd. This applies scientific knowledge, multiple RS datasets and evidence to analyse areas of land or sea. SENCE delivers a series of ES map layers designed for viewing in a Geographical Information System (GIS), available as individual files or via a Web Map Service (WMS).

SENCE was for example applied in Milton Keynes to develop a broad-scale habitat map with ecosystem service map layers. Each habitat type is scored for the extent of the benefit or disservice it provides in relation to each ES. This permits production of maps for each ES, such as: (1) carbon storage, showing where there is more or less carbon storage (e.g. woodlands store more, grasslands less), or the loss of carbon into the atmosphere; (2) surface water, showing where there is more or less water storage or rapid runoff; (3) water quality, showing where land contributes more or less to water filtration, or indeed adding impurities to water; (4) food provision, showing more productive arable land and less productive grassland; (5) pollination, showing areas more or less likely to support pollinators. Other layers include air quality, importance to biodiversity, and sedimentation. A synthesis produces a map showing areas

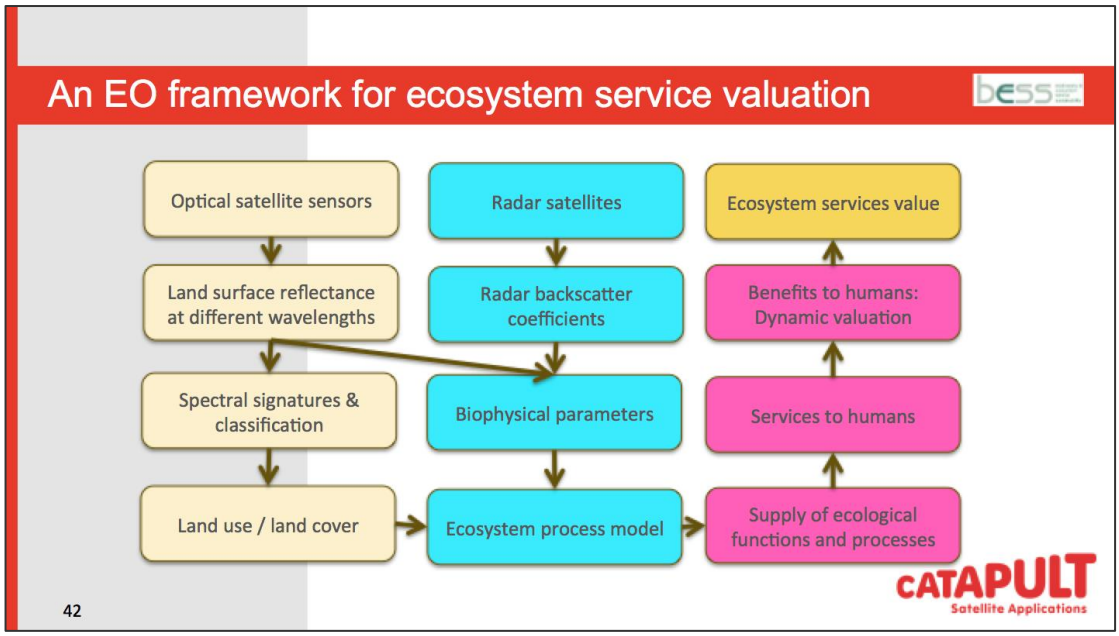
[9] Ayanu, Y. *et al.* 2012. Quantifying and mapping ecosystem services supplies and demands: a review of remote sensing applications. *Environmental Science and Technology* **46**(16), 8529-41.
[10] Andrew, M. et al. 2014. Potential contributions of remote sensing to ecosystem service assessments. *Progress in Physical Geography* **38**(3), 329-353.
[11] Barbosa, C. et al. 2015. Remote sensing of ecosystem services: a systematic review. *Ecological Indicators* **52**, 430-443.

delivering more or fewer multiple benefits. This mapping can be used to support natural flood management, biodiversity conservation, and spatial planning (e.g. housing), monitor and detect change over time, inform strategic environmental assessment and environmental impact assessment, and support scenario modeling, e.g. for catchment management and for spatial planning.

As we have seen, EO offers more than just land cover data. Other data products include Normalised Difference Vegetation Index (NDVI), Leaf Area Index (LAI), Fraction of Absorbed Photosynthetically Active Radiation (fAPAR), Land Surface Temperature (LST), Fire Radiative Power (FRP), burned area, active fires, soil moisture index, digital terrain models. Derived data products include habitat fragmentation, aboveground forest biomass, river sinuosity and many others. All of these can be important for ES valuation. Ongoing research is addressing how to do this.

In conclusion, most studies to date focus on linking land cover and habitat maps to ES through empirical production functions. However, researchers aim to go beyond this by incorporating novel EO developments. This includes: time-series analysis of biophysical features (LAI, fAPAR, NDVI), assimilation of EO in to models, use of higher spatial resolution data better thematic content and greater data availability, as well as the processing capability of the Cloud and UK investment in CEDA/JASMIN.

A new framework (see figure below) is emerging for the use of EO for ES valuation. This involves the integration of both optical and radar EO data to derive an ecosystem process model from which the supply of ecological functions and processes, ecosystem services and consequent benefits and values can be derived.



The European Space Agency (ESA) is launching a new family of satellite missions called Sentinels, under the Copernicus programme, offering significant potential for ES valuation. Each Sentinel mission is based on a constellation of two satellites (to fulfill revisit and coverage requirements). These missions carry a range of technologies, such as radar and multi-spectral imaging instruments for land, ocean and atmospheric monitoring:

Sentinel-1 is a polar-orbiting, all-weather, day-and-night radar imaging mission for land and ocean services, delivering spatial resolution up to 5 m. Sentinel-1A, was launched in April 2014, Sentinel-1B in April 2016.

Sentinel-2 is a polar-orbiting, multispectral high-resolution imaging mission for land monitoring to provide, for example, imagery of vegetation, soil and water cover, inland waterways and coastal areas. Sentinel-2A was launched in June 2015 and Sentinel-2B will follow in the second half of 2016.

Sentinel-3 is a multi-instrument mission to measure sea-surface topography, sea- and land-surface temperature, ocean colour and land colour with high-end accuracy and reliability. The mission will support ocean forecasting systems, as well as environmental and climate monitoring. Sentinel-3A was launched in February 2016. Sentinel-3B is scheduled for launch in 2017.

Looking further in to the future, there is potential for EO to deliver video images at 1 m resolution.

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Nick is Head of the CEO office, at the Satellite Applications Catapult in Harwell, near Oxford, UK. He has worked in the space sector since 1983 and is respected as an ambassador between the space and ground segment engineering sectors, user markets, government research and policy-making, academia and the geo-information industry. He has worked within government at the previous British National Space Centre (BNSC), holds an honorary professorship at the University of Leicester and was Chairman of UKSpace, the national trade association. He has chaired a number of other industrial, government and academic committees and boards, offering advice for various policy and funding matters related to Earth observation science. Until joining the Satellite Applications Catapult in 2013, he worked for more than 20 years with Astrium Geo Information Services and Infoterra, responsible for the development in the UK of satellite Earth observation related services, including the exploitation of the forthcoming NovaSAR satellite.

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8. Food Value Chain

THE BUSINESS CASE FOR MANAGING NATURAL CAPITAL

Anna Turrell

Senior Public Affairs Manager – Sustainability, Nestlé UK&I

Nestlé is the world's largest food manufacturing company, with 442 factories in 86 countries, and a workforce of more than 339,000 employees. We have presence in 197 countries around the world. With such a large corporate footprint, we have a responsibility to both operate with respect and consideration for the natural environment and ecosystems within which we inhabit, as well as ensuring that our partners across our value chain do the same. Our commitment to upholding this responsibility, comes from a more fundamental way of working as a business, which focuses on 'Creating Shared Value', both to business and society, and forms a central pillar to how we operate as a business.

Increasingly, businesses are becoming aware of the value of natural capital – nature's limited stock of resources and services, including biodiversity, clean water and soil, that economic activity depends on. As a company that sources a wide range of ingredients from the natural world, we recognise the vital importance of preserving and enhancing natural capital.

We believe that treating natural capital as a valuable business asset is a key part of what it means to be a sustainable business. We strive to understand and manage our dependencies and impacts on natural capital throughout our operations and across our value chain. Through our supply chain partnerships, we encourage our dairy farmers and other suppliers to do the same.

Nestlé has taken a strong position on natural capital at a global level. We were one of the pilot members of the Natural Capital Coalition, a global, multi-stakeholder platform set up to help shift corporate behaviour towards preserving and enhancing natural capital, and have been testing the soon to be launched Natural Capital Protocol. In 2013, we made a global commitment to acting as a responsible steward of natural capital, and reporting regularly on our progress in this area.

In the UK, we work to measure and manage our impact on natural capital both in our own sites and also throughout our UK supply chain, with a focus on our dairy farms in Cumbria and Ayrshire. Through our partnerships with organisations and initiatives such as the Cambridge Institute for Sustainability Leadership and the Green Alliance programme, we also share knowledge and shape policy on natural capital in the UK.

At an operational level, one of the strategic pillars of Nestlé UK&I's Environmental Sustainability plan for 2016 is 'working with nature', which looks at building a natural capital programme across the Nestlé businesses in the UK and Ireland. Our ambition is to build resiliency in our value chain through the preservation and restoration of the ecosystems we depend upon. Initial stages of the programme of work to achieve this ambition have focused on a phased approach, which broadly follows the steps outlined below:

- Identify which factories are near protected areas or national parks near
- Prioritise the factories

- Conduct site audit/assessments starting with priority locations, looking at identifying business dependencies and impacts on local natural capital
- Review site audit/assessment findings for all factories
- Agree a site management plan for each factory

This approach is based on our understanding that in order to develop an effective natural capital management plan for our sites, we first need to fully understand how our factories impact on natural capital.

Working with Wild Business, an independent consultancy that specialises in helping businesses engage with wild spaces, we've begun rolling out a programme of natural capital assessments across all our sites in the UK. In 2014 and 2015, assessments took place at Dalston, Fawdon and Buxton, and these will help us develop a natural capital management plan for each of these sites.

Whilst recent years have seen us take a more holistic and coordinated approach to natural capital management across our diverse and geographically disparate operating sites in the UK & Ireland, we have been putting in place site-specific programmes for a number of years, including the application of sustainable drainage systems (SuDS) at our factory sites to mitigating the risks of flooding.

Since 2009, we have been using a sustainable drainage system at Tutbury to manage the quantity and quality of water flowing back into the local water system. As part of our continued commitment to sustainability, the SuD system will be extended into two new areas as part of the site's factory expansion programme. Water from the site is fed into specially created ponds. These help minimise the risk of flooding by providing storage and also, through their reed beds, naturally filter the water.

We recognise that in order for any natural capital approaches to have tangible and sustainable long-term impact, we have to go beyond our own operations and work closely with our value chain to address critical issues, particularly our upstream suppliers such as our farmers.

As part of the Nestlé Milk Plan, we work with key organisations including our farming cooperative, First Milk, local farmers, and organisations such as the Rivers Trust in order to develop understanding and capacity across the farmer base, on what mitigations can be taken in order to most sustainably manage the potential or actual impacts on the local river catchment area of the Eden, a designated a Special Area of Conservation. By managing up the supply chain and into the catchment area, we are able to more effectively manage associated risks further downstream.

Such collaborative approaches to natural capital management are really changing the way we work with our supply chain on a more fundamental level. We are working to realise opportunities to develop low-cost interventions which will help our farmers not only economically, but more broadly, in their management practices, for example, by reducing the prevalence of cattle flu associated with standing water by developing better drainage mechanisms. The mechanics of these collaborations are still being developed, discussed and worked on to ensure that longer term, the approaches we take work for everyone involved.

In the coming years we will continue to work to better understand our impacts and dependencies on nature across both our operations and more broadly across our value chain. By 2020, our objective is to implement natural capital improvement plans for all of the priority areas identified through our current natural capital assessment process, such as catchment area management in our upstream supply chain.

We recognise that whilst there's a lot of work still to be done, we can't afford not to do it. If we don't manage our natural assets responsibly today, we won't have a business in the future. It's that simple.

Anna Turrell

Anna is Senior Public Affairs Manager for Sustainability at Nestlé UK & Ireland. Prior to joining Nestle, she spent 10 years in sustainability consultancy in Europe and Asia. During this time, she focused on developing corporate sustainability strategies, social and ethical performance strategies and programmes (human rights, supply chain, bribery & corruption), stakeholder engagement and communications for regional and global businesses. She has worked with clients across a range of sectors including; FMCG, F&B, extractives, telecommunications, financial services sectors as well as government and the third sector. Anna is also an independent trustee of UK-based global development education charity, Think Global, and a Macmillan Quality Environment Mark (MQEM) User Assessor.

Nestlé

9. Hands-On Session

Evidence: Understanding Customer Needs and Communication

Ece Ozdemiroglu

Director, Economics for the Environment Consultancy (eftec)

Tim Sunderland

Principal Specialist in Economics, Natural England

Introduction

There is both art and science involved in understanding and communicating evidence. As well as being an expert in your area you need to listen to, understand and empathise with people in the business world in order to make your research relevant to them.

The hands-on session was delivered by two economists, because economics tends to be the funnel through which all evidence gets channelled towards decision-makers. Economists seek to understand the relevance of the evidence to the decision, and ask awkward questions like, 'why?' and 'so what?' These are questions you need to ask yourself to make your work relevant to business audiences.

Part 1 – Understanding the need for evidence

The world of research

The world of research could be characterised by four sorts of actors: business people, government, consultants and academics. In general these groups have different approaches, needs and priorities and these are shown on the table below.

	Accountabilities	Time-style	Audience for the research
Business People	Commercial – return on investment, risk and reputation	Often fast, short-term. Exception possibly for large businesses	Sometimes an information need inside the business, sometimes for publication and wide consumption. Differences across the audience depending on the size and sector of the business and its position in the sector (a thought leader or follower)
Government	Policy and political	Medium-term, research to inform policy development	Primarily funding department, but published and widely available
Consultants	Commercial	Depends on client	Depends on client
Academics	Publication, Research Excellence Framework	Long-term projects, medium-term papers	Other academics, increasingly relevant stakeholders

However, it's important not to caricature but to treat everyone as an individual. Listening to your stakeholders empathetically will help you understand their motivations and accountabilities.

How and whether to pitch for business research work

Each pitch is different so avoid copy & paste or using stock text.

There are key questions you can ask yourself to establish whether you are the right expert for them and they are the right business for you:

- Is your research necessary to meet the objectives of your 'client'?
- Is it sufficient? If not can you collaborate with others to build the best team?
- Is the client right for you?
- What evidence do they think they need?
- What evidence do you think they need?

Assess the objectives of the business and capabilities of your competition.

Ensure that your written and presented work enables your audience to respect, like and trust you. These are the three key characteristics people look for in others whom they choose to work with.

Agree the scope at the start; don't over or under sell what you can achieve; clarify gaps and assumptions, uncertainties and risks and monitor through progress reports and meetings.

Nine principles for economic valuation research

Tim developed this set of principles for economic valuation research, but they are relevant to anyone doing research that is designed to inform decision-making by a business (or by government). The principles are:

Relevance. Is your research relevant to decision-making by business? Does it relate to a question that is important to them? Does the way the evidence is offered connect with their corporate decision-making processes? For example evidence rooted in social cost-benefit analysis will resonate more powerfully with government than businesses, who in most cases will be more interested in return on investment.

Evidence gaps. Researchers are motivated to find things out, and close evidence gaps. This is appropriate but decision-makers cannot wait for an evidence base to be perfected, and must make decisions now, with uncertain and incomplete evidence. Uncertainties, evidence gaps and minority opinions are important to good decision-making and should be clearly communicated to decision-makers. The best decisions are informed by all available evidence. Evidence should not therefore by excluded because it is uncertain, but the confidence level in the evidence should be clearly flagged.

Subjectivity. For many decisions there is insufficient peer-reviewed literature and no clearly established consensus as to the right way forward. Decision-makers must therefore take into account grey literature, opinions of experts and other less formal sources of evidence. A rigorous method of considering these sources and possible biases enables the decision to be as objective as possible.

Quality. Similarly to the subjectivity point, advice to decision-makers should have an explicit and transparent method of assessing the quality of the evidence that forms the evidence base. There is no simple rule or 'one-size-fits-all' approach here because quality is related to the decision in question. Evidence might by highly relevant to one research question, but bear only tangentially on another. Also

the evidence should be proportionate to the decision in question, with higher quality evidence being expected for higher stakes decisions.

Accessibility. The research is of no use at all to businesses if they cannot find it, or interpret it. This means that to have impact research must be actively promoted to appropriate networks. It also means that significant effort needs to go into translational research to make the new evidence available to business. Tools which become embedded in 'business-as-usual' practice are probably the most effective way of doing this.

Interpretability. Businesses need to make sense of the information offered. This means that the way the research is summarised is just as important as its entire content. A bewildering array of numbers or data-points is likely to be of little help. However, an answer in a single ratio, such as a cost: benefit ratio, may hide important assumptions and risks and these should be communicated too. Additional work is required to understand the relevance of the findings to the business.

Transparency. Placing accurate and meaningful values on environmental change is difficult. We are often forced to leave gaps and make assumptions. This is appropriate, but the full methodology for arriving at the conclusions should be published and available for review. Without this it is impossible for third-party experts to review and understand the recommendations and assess how much weight should be placed on them. Transparency also speeds up the collaborative learning process in this area.

Quality control. Within academic publishing there is quality control in terms of the peer-review process. However it is also important that there is quality control in the development of tools for use by business and applications of these tools.

Affordability. Academic research is driven by novelty of method and approach and has the resources for complex methodologies and the time for multi-year investigations. This is helpful in developing new knowledge, but can create a barrier in terms of the widespread application of new tools to businesses. This is because the tools that are developed through academic processes can be too expensive, or take too long, for application by businesses on a day-to-day basis.

Part 2 – Communicating the evidence

Understand your audience

The better you understand your audience the better you will be able to present. If possible take this beyond the corporate level to the individual level. What will they be hoping to get from the meeting? Are you able to deliver that?

Make friends with your audience

Before launching into detailed research plans or finding, take time to establish yourself as someone that your audience want to listen to. You need to establish why you are there speaking to them, your credibility to speak on the subject and that you are here to enable them to make decisions and learn from them too.

Tell them a story

Stories are fundamental to the way people communicate. Information presented in the form of a story can capture attention and bring an audience with you, where the same information presented as mere data will cause them to disengage. All stories have certain key features. Firstly they have a setting. The extent to which the audience understands and relates to this setting is crucial to their engagement. This is your

opportunity to show your audience that you understand their world and you can see the big picture within which your research fits.

Then there is a significant threat or opportunity that will change things for better or worse. What is the threat to their business that your research will help them avoid or mitigate? Alternatively what is the opportunity that your research will help them to grasp? If you can engage your audience in this way your information will be perceived as important and relevant.

Classic stories also have a resolution, for good or bad. Your 'story' might have, or you might be at a point where success or failure is still to be decided. This is fine, but you then need to include what you plan to do about it, and what you need others to do about it in order to ensure that the threat is avoided or opportunity grasped.

Have a clear outcome

In a business context you are never communicating for communication's sake. You are always trying to move something forward. For example, are you presenting a proposed scope for a research project, on which you are looking for feedback? If so make this clear at the beginning, because you will cue up your listeners to listen in the right way. The same applies at other stages in the research process.

Tips for the use of slides

Write the talk first, then decide if it will be helpful to add slides at any point.

Avoid using bullet points to say what you plan to say – your audience will read them ahead of you and their attention will be divided.

Use text for key points – or quotes. The less text the better.

Slides are particularly helpful for pictures, maps, graphs and data presentation. Make sure they are large enough to be clearly seen.

Don't cram too much on a slide – using an extra slide costs nothing!

Don't put too much detail on a slide. Do your audience need to see the formula you've used or the coefficients? Focus instead on key messages.

Ece Ozdemiroglu

Ece is an environmental economist and the founding Director of eftec (Economics For the Environment Consultancy). At eftec she has undertaken, directed and quality assured over 400 projects generating and interpreting economic value evidence on natural capital, ecosystem services, green infrastructure, water and flood management, remediation of environmental damage, cultural heritage, chemicals and value of information. Ece is Economics Lead for the Valuing Nature Programme, a member of the Adaptation Sub-Committee to the Climate Change Committee, steering group member of the Natural Capital Initiative, and associate editor of the Journal for Environmental Economics and Policy.

eftec

Tim Sunderland

Tim is Principal Specialist Economist at Natural England, a non-departmental public body sponsored by the Department for Environment Food and Rural Affairs to promote nature conservation, protect biodiversity, conserve landscape and promote access to the countryside. His previous experience includes lobbying for regeneration funding with the Alliance of Traditional Industrial Areas, managing policy for the Sector Skills Council for fashion and textiles and representing Christian Aid. His education is from the University of Leeds (BA Development Studies & MSc Ecological Economics) and he lives in Bristol with his wife and three children.

NATURAL ENGLAND

10. Natural Capital Accounting

Corporate Natural Capital Accounting at Windsor Great Park

Allan Provins

Director, Economics for the Environment Consultancy (eftec)

Introduction

The Crown Estate is an independent company set up under an Act of Parliament to manage the property owned by the monarch. Its role is to ensure that the land and property it invests in and manages are sustainably worked, developed and deliver the best value over the long term. Revenue surpluses are remitted to HM Treasury for the benefit of the public finances.

The Crown Estate's rural property portfolio is around 146,000 hectares. Within this the Windsor Estate features 6,400 hectares of parkland, woodland and gardens and is primarily managed for public enjoyment, attracting around 3 million visitors a year. The estate includes Great Windsor Park, which is nationally and internationally renowned for its biodiversity. Large areas are designated as Sites of Special Scientific Interest (SSSI). The park is particularly noted for its rare beetles and flies, with over 2,000 species of beetle being recorded in recent years, some of which are unknown elsewhere in the British Isles. These, along with several species of hole-nesting birds, depend on the veteran oak and beech trees found in the park. Some ancient oak pollards date as far back as 800 years.

During 2014 The Crown Estate supported the work of the Natural Capital Committee, contributing to the development of a framework for corporate natural capital accounting (CNCA)[12]. The Windsor Estate was one of four case studies that piloted the framework, examining the long-term benefits associated with the sustainable management of the estate, which is recognised to be of a high environmental and cultural value.

Business challenge/need

The Windsor Estate is a microcosm of the wider challenge faced by The Crown Estate in measuring and reporting the contribution it makes to the UK. In particular, it is challenging to demonstrate that the total value generated by the estate is much greater than reflected in the revenue generated for public finances - especially since there is means to show the substantial environmental and cultural value through conventional financial accounting. Indeed financial reporting reflects the management costs, along with the liability (in the balance sheet) of the obligation to maintain the estate. The management costs are partially offset by income from the estate (including income from agricultural tenants and visitors), but the annual upkeep is dependent on cross-subsidy from income generated by The Crown Estate's wider property portfolio.

To address this challenge, The Crown Estate has developed an integrated reporting approach to measure and communicate its environmental, social and economic impact. This focuses on identifying how material issues are managed - such as economic impact (gross value added), greenhouse gas emissions,

[12] eftec et al. (2015) Developing Corporate Natural Capital Accounts, Final Report for the Natural Capital Committee.

waste, etc. - and the added value this generates for the business and society[13]. The CNCA pilot provided an opportunity to contribute to the integrated reporting by adding to the understanding and measurement of the benefits provided by the (natural capital of) Windsor Estate.

Business response

The CNCA framework uses a balance sheet format to report the value of natural capital (assets) and the costs of their maintenance (liabilities). Asset values include both private revenues accruing to The Crown Estate and the external value derived by the rest of the society. Unlike a conventional financial balance sheet, the framework is forward-looking as the purpose is to understand how much a business needs to invest in their natural capital assets to ensure that the value of the benefits provided by those assets continue into the future.

To develop the pilot account The Crown Estate worked with eftec and its partners to compile the underpinning financial and environmental management information for the Windsor Estate. This drew on previous research for The Crown Estate that applied GIS mapping and an external ecosystem service valuation model - from the UK National Ecosystem Assessment[14] - to assess provision of a selection of ecosystem services and their associated market and non-market benefits. The benefits captured in the natural capital account include agricultural products, timber, biomass for energy, carbon sequestration, and recreation and amenity.

Windsor Great Park © Allan Provins

[13] See: http://www.thecrownestate.co.uk/our-business/how-we-measure-value/

[14] See: Bateman *et al.* 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* **341**, 45.

Results

The pilot account reveals the significant net benefit that the Windsor Estate delivers to society. This is estimated to be approximately £4m per annum, aggregating to an asset value of almost £46m in present value terms over 100 years. In contrast, the long-term management costs amount to just £7m over the same time period. The greatest contribution to the overall net asset value is from recreation benefits, a mix of private and external (non-market) value.

For The Crown Estate, the natural capital account provides an explicit demonstration of the wider value that is generated by Windsor Estate, showing the substantial positive contribution to society and supporting its continued long-term management to sustain these benefits.

Scalability/replicability

Understanding and managing natural capital is an increasing concern for many businesses. The benefits of successfully managing natural capital are no different to good management of other types of capital. Put simply, it makes good business sense to understand the value of natural capital upon which an organisation relies and impacts.

The CNCA framework enables businesses and landowners to account for natural capital, documenting assets and liabilities in a balance sheet format that extends traditional financial reporting. By understanding how a business makes use of natural capital assets, decisions can be taken to better manage them, with potential benefits to both the business and society.

The Crown Estate is exploring further application of CNCA across its portfolio. The framework can provide information that could be useful in several ways:

- Communicating the *total* contribution of its assets;
- Contributing to budgetary discussion and allocation of resources across the organisation by taking better account of the (social *and* financial) returns to budget; and
- Assessing performance, engaging staff in different parts of the organisation, from site managers to centralised staff responsible for budgets and priority setting.

Allan Provins

Allan is an environmental economist and Director with eftec. His work mainly focuses on the valuation of environmental and cultural goods and services and the use of this evidence in socio-economic analyses, including impact assessments, cost-benefit analysis, and policy and project decision-making. He is the lead author of a number of guidance documents for UK Government agencies for valuing environmental and social impacts in project and policy analyses. His recent work involves the development of a framework for corporate natural capital accounts for the Natural Capital Committee, along with economic analysis to support investment appraisals within the UK water sector, including water company business plans, water resource planning, and implementation of the Water Framework Directive and the revised Bathing Water Directive.

eftec

ANNEX 1: Business Impact School Programme USINESS IMPACT SCHOOL PROGRAMME

DAY 1 – Wednesday 2 March

Venue: Willis Building, 51 Lime St, London, EC3M 7DQ

08:30-09:00 REGISTRATION, COFFEE

SESSION 1 – SETTING THE SCENE

09:00-09:30 Welcome & introduction to the VNP – *Michael Winter,* *Social Science / Arts & Humanities Lead, VNP Coordination Team & Professor and Director of the Centre for Rural Policy Research, University of Exeter*

An overview of the Valuing Nature Programme, which aims to to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. The Programme will fund interdisciplinary research, and the Valuing Nature Network will build links between researchers and people who make decisions that affect nature in business, policy-making and in practice.

09:30-09:40 **NERC Innovation and Business Impact Programmes – *Kay Heuser***, *Innovation Programme Officer, NERC*

Relevance of the Business Impact School to NERC's Innovation and Environmental Science Impact Programmes.

09:40-10:15 Introduction to the School, and Valuing Nature research underpinning the recommendations of the Ecosystem Markets Task Force – ***Guy Duke***, *VNP Business Champion, PI Ecosystem Markets Task Force*

A general introduction to the purpose of the school, and the relevance of business impact work, illustrated with reference to work done for the EMTF. This involved reviewing evidence in the UK National Ecosystem Assessment for, and gathering expert opinion on, business opportunities related to protecting and/or valuing nature, followed by analysis to identify most promising opportunities. This presentation will review the approach taken and the findings, which underpinned EMTF recommendations to Government in 2013.

10:15-11:00 The business case for investing in our natural assets – ***Peter Young***, *Chair VNP Business Interest Group, Founding Director & Chair Aldersgate Group, Trustee of The Wildlife Trusts*

This presentation will cover: (1) The business case for an ambitious natural capital policy; (2) Improving natural capital through better policy integration; (3) Tackling the investment gap: a natural capital investment strategy; (4) Incorporating natural capital in policy and corporate decision making; (5) What next for institutional arrangements?

11:00-11:30 COFFEE

SESSION 2 – NATURAL CAPITAL PROTOCOL & THE WATER INDUSTRY

11:30-12:15 The Natural Capital Protocol – ***Mark Gough**, Executive Director, Natural Capital Coalition*

Companies that measure and value their impacts and dependencies on natural capital do so in a myriad of different ways. This prevents comparability, consistency and mainstream adoption of these approaches. The Natural Capital Protocol responds to this challenge. It aims to enable business to assess and better manage their direct & indirect interactions with natural capital, and will: (1) provide clear guidance on qualitative, quantitative and monetary valuation of natural capital impacts and dependencies and when to apply which level of assessment; (2) be framed for use in different business applications; (3) provide guidance on the applicability of the Protocol at different organizational levels (corporate, project, products, site) through the value chain; (4) be applicable to all business sectors across all geographies. This presentation explores how the NCP will support companies in their decision-making and can be used for a range of applications, incl. risk management, exploring new revenue streams, improving products and value chain innovation, as well as preparing for future reporting and disclosure.

12:15-13:00 Benefits and limitations of integrating NCA and ESA into water company activities: view from the water sector – ***Jonathan Dobson**, Sustainability Advisor, United Utilities*

United Kingdom Water Industry Research (UKWIR) commissioned a study in 2015 to consider the opportunities and barriers to the broad introduction of Natural Capital Accounting (NCA) and/or Ecosystem Services Assessment (ESA) into water company business planning approaches. The study identified a roadmap, flexible framework and a research agenda to facilitate the introduction of NCA and/or ESA into water company business activities. The findings of this research will be presented to give researchers an indication for where a key sector for natural capital protection and enhancement is and what it needs to know.

13:00-14:00 LUNCH

SESSION 3 – INFRASTRUCTURE & CONSTRUCTION INDUSTRIES

14:00-14:45 Net positive initiatives, Network Rail and Highways England – ***Julia Baker****, Biodiversity Team Leader, WSP Parsons Brinckerhoff*

The European Commission is rolling out development with no net loss of biodiversity. Here in the UK, our transport giants Network Rail Infrastructure Projects and Highways England have committed to Net Positive. By doing so they sent a clear message to their supply chain: get good at biodiversity because our projects are to benefit nature. But, with no formal legal or planning system in the UK on No Net Loss or Net Positive, will these efforts benefit local and national conservation priorities or will be talk without impact. This presentation examines the challenges facing industry to genuinely deliver net positive outcomes for biodiversity and lessons learnt from practical implementation.

14:45-15:30 Realising value through a natural capital approach – ***Ian Glover****, Environmental Sustainability Manager, National Grid*

Understanding and accounting for the value of nature associated with our operational and non-operational estate is helping us to manage our environmental assets in ways that deliver greatest value. As a key enabler to this programme we have developed and implemented tools to value and monetize our natural capital and ecosystem services. These tools highlight value both to our organization and to our stakeholders, support effective investment decision-making and drive new opportunities to work with partners to protect and enhance these areas and the multiple benefits they provide.

15:30-16:00 COFFEE

SESSION 4 – VALUING NATURAL CAPITAL FOR HUMAN HEALTH & INSURANCE

16:00-16:45 The Natural Health Service: adding health value to business – ***William Bird****, CEO, Intelligent Health Ltd*

This presentation will explain how the NHS can use nature to both treat and prevent disease in both primary and secondary care and how this can be translated to productivity for business. This is about converting the widespread evidence of health benefits into practice within business and the NHS.

16:45-17:30 The risk management approach to valuing natural capital – ***Olivia Darby****, Chief Operating Officer, Capital, Science & Policy Practice at Willis Towers Watson*

This session will consider how risk management techniques and approaches can be used to establish a value for a natural capital asset and for the services that a natural asset or ecosystem delivers to a business or community. This approach can help organisations to understand the role of natural capital and can incentivise them to protect it. Olivia will also cover some ways in which natural capital assets can be insured.

19:30 DINNER Daylesford Farm Shop & Café, 44B Pimlico Road, SW1W 8LP

DAY 2 – Thurs 3 March

Venue: Willis Building, 51 Lime St, London, EC3M 7DQ

08:30-09:00 COFFEE

SESSION 5 – VALUING NATURAL CAPITAL FOR PROFIT, & THE ROLE OF SATELLITE EARTH OBSERVATION

09:00-09:45 That's interesting but how do I make a profit out of it? – ***Mat Roberts****, Director of Sustainability, Interserve*

Knowledge is the purpose of academic research; profit is the product of successful business. Both can feed each other if the underpinning principles of each are better understood. The need for innovation to meet the challenges of climate change, biodiversity loss and increasing social disparity is well known. The speed and scale at which we can turn great ideas from academic projects to business products and services can be improved if we can improve respective understanding, communications and break down some of the stove pipes and silos that we live in.

09:45-10:30 Satellite Earth Observation: services for ecosystem valuation – ***Nick Veck****, Head of CEO Office, Satellite Applications Catapult*

Satellite Earth Observation (EO)-based services have the potential to provide objective baselines for ecosystem valuation, and are an important component of environmental monitoring systems. Importantly, the scales upon which EO services can inform are far greater than is feasible by manual survey methods. EO services are not a cost-effective replacement for in situ surveys but do facilitate a deeper level of understanding of spatial relationships between ecosystems and the human environment. This understanding is necessary to meet current challenges of sustainable growth. The objective of the presentation is to demonstrate the value of EO-based information products for the emerging sector of ecosystem services valuation.

10:30-11:00 COFFEE

SESSION 6 – THE MILK VALUE CHAIN

11:00-11:45 An integrated approach to managing impacts on nature in the milk value chain – ***Anna Turrell****, Senior Pubic Affairs Manager – Sustainability, Nestlé UK&I*

Milk is one of Nestlé's global priority resources and is used widely across the UK business and product portfolio. This presentation covers the approach being taken by Nestlé UK&I to identify the impacts and dependencies on nature associated with Nestlé's milk supply chain and using these insights to create integrated, collaborative activities to support this. It will cover examples of how Nestle is using its relationships with key research bodies to inform decision making and working collaboratively with a range of organisations and farmers to understand how it can practically deliver these opportunities.

SESSION 7 – PARTICIPANT PRESENTATIONS

11:45-13:00 Rapid presentations by Early Stage Researchers

Strictly 4 minutes max per participant! (focus on business impact related to current research activities). Brief feedback from panel.

13:00-14:00 LUNCH

SESSION 7 – PARTICIPANT PRESENTATIONS (cont.)

14:00-14:45 Rapid presentations by Early Stage Researchers

Strictly 4 minutes max per participant! (focus on business impact related to current research activities). Brief feedback from panel.

SESSION 8 – HANDS-ON SESSION

14:45-15:30 Understanding the need for evidence – ***Ece Ozdemiroglu**, Director eftec*

The first step to making your research relevant for business and policy is to understand their need for the kind of evidence you can provide. Their attitudes to uncertainty and the constraints they work under will shape this need, as well as the decisions they are being asked to make. As a group we will share tips on how to start, deliver and end a project, how to agree the scope of research and, just as importantly, how to stay within that scope as the work progresses.

15:30-16:00 COFFEE

SESSION 8 – HANDS-ON SESSION (cont.)

16:00-16:45 Communicating the evidence – ***Tim Sunderland**, Principal Specialist in Economics, Natural England*

Communicating with those who are not experts in your field is not about dumbing down the complexities. It's about making them clear and relevant. Your audience will not always be interested in the technical detail but they will be interested in the key messages. We will look at good and bad examples of communication from research providers and users alike, and agree on the principles.

SESSION 9 – WRAP UP

16:45-17:15 WRAP UP – ***Guy Duke, Ece Ozdemiroglu***

19:30 DINNER, Daylesford Farm Shop & Café, 44B Pimlico Road, SW1W 8LP

DAY 3 – Friday 4 March
FIELD TRIP

08:00-09:30 Transfer to Windsor Great Park

09:30-12:30 WINDSOR GREAT PARK – THE CROWN ESTATE

www.windsorgreatpark.co.uk

09:30-10:00 Corporate Natural Capital Accounting at Windsor Great Park –Allan Provins, eftec

10:00-13:00 Tour of the Park with Ted Green, WGP Conservation Adviser and Dan West, Assistant Forest Manager

The Crown Estate is an independent property company, which invests and manages the UK's assets and ensures that they are sustainably developed. The Crown Estate was created as an Act of Parliament (1961) and is a body established in perpetuity as a trust estate. Independent of government and the monarch, The Crown Estate's public function is to: invest in and manage certain property assets belonging to the monarch; and remit its revenue surplus each year to the Treasury.

The Crown Estate is also involved with commercial partners and interested parties such as developers and industry, and the public, NGOs and regulators. They have the powers of an outright owner, which enables them to actively manage assets in a commercial and sustainable way, to maintain and enhance their value and the financial return they deliver.

The Crown Estate's rural portfolio, including the Windsor Estate, is around 146,000 hectares covering agriculture, forestry, minerals and property.

The Crown Estate took part in development of pilot corporate natural capital accounts for Windsor Great Park, for the Natural Capital Committee. The aim of their involvement in the pilot was to investigate a framework that would enable them to understand the total contribution of the non-financial benefits they deliver alongside financial costs and benefits in an accounting framework. The Crown Estate can use the information reported in the corporate natural capital account (CNCA) to demonstrate the important wider role that its assets play in maintaining natural capital for society.

The Windsor Estate provided an opportunity to pilot the framework on a site that is managed with a view to long-term benefits, and which has high environmental and cultural value that is not fully reflected in the financial accounts. Application of the framework across The Crown Estate's whole portfolio would involve numerous sites with considerable resource implications. For this reason, a top-down approach using detailed GIS mapping and an external ecosystem service valuation model (from the UK National Ecosystem Assessment), developed by Bateman et al. (2013), was chosen and applied for The Crown Estate by their consultants Route2Sustainability. The spatially explicit model estimates a selection of market and non-market ecosystem services.

13:00-14:15 NETWORKING LUNCH, Leith's at the Savill Garden, Windsor Great Park.

14:15-15:00 Transfer to Uxbridge

15:00-16:30 IVER ENVIRONMENT CENTRE – NATIONAL GRID

www.ivernature.com

15:00-15:30 Valuing nature-based educational services at Iver – Ian Glover, National Grid

15:30-16:30 Tour of the Centre with Debra Frankiewizc, Centre Manager

The Iver Environment Centre is part of National Grid's network of four environmental education centres, which are located on land adjacent to our substations at Iver, Bishops Wood, Skelton Grange and West Boldon. They are centres of excellence for environmental and sustainability education and have been developed in partnership with local authorities and environmental charities, demonstrating how industry and the environment can co-exist to the benefit of all. The centres help to meet National Grid's commitment to operating as a socially and environmentally responsible business, through mitigating the impact of substations on rural environments. They also help by improving the environmental status and biodiversity of the land on which they operate and demonstrating community investment by providing work for staff and volunteers. Set in 2.5 acres of land in Iver Heath Buckinghamshire, Iver offers a safe, contained site with a range of facilities and activities. The centre promotes awareness and enjoyment of the natural environment and encourages people of all ages and abilities to explore and discover nature and food growing.

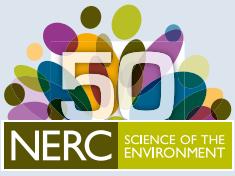
16:30-17:30 Transfer to Central London

School participants at Windsor Great Park

ANNEX 2: Business Impact School Attendees

1	Prue Addison	NERC Knowledge Exchange Fellow	University of Oxford
2	Luis Carrasco Tornero	Research Associate	NERC Centre for Ecology & Hydrology
3	Laura Crossley	PhD	University of Southampton
4	Helen Davies	PhD	University of Southampton
5	Sian de Bell	PhD	University of York
6	Lucien Georgeson	PhD	University College London
7	Arjan Gosal	Research Assistant	Bournemouth University
8	Gemma Jerome	Green infrastructure project manager	University of West England, Bristol / Gloucestershire Wildlife Trust
9	Munire Nazli Koseoglu	PhD	Edinburgh University
10	Anja Helena Liski	PhD	University of Edinburgh
11	Veronica Lee Love	PhD	University of Sheffield
12	Rosa Mato Amboage	PhD & Teaching Fellow	University of York
13	Andrea Perz	PhD student	University of Salford/ Mersey Gateway Crossings Board
14	Olivia Rendon	Research Fellow	University of Leeds
15	Relena Ribbons	PhD	Bangor University
16	Olivia Richardson	PhD	University of Sheffield
17	Helen Roberts	PhD	University of Birmingham
18	Mike Rogerson	Research Officer	University of Essex
19	Catherine Scott	Research Fellow & Research Network Co-ordinator	University of Leeds
20	Rachel Seary	PhD	University of Cambridge/ UNEP-WCMC
21	Philipp Siegel	PhD	University of Essex
22	Katherine Simpson	Research assistant	University of Stirling
23	Eleanor Tew	PhD	University of Cambridge and Forestry Commission
24	Warwick Wainwright	PhD	University of Edinburgh / SRUC
25	Cheryl Willis	Post-Doc Researcher	University of Exeter

VALUING NATURE PROGRAMME



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