

Valuing our Life Support Systems 2014

Summary report



Citation

This report should be quoted as follows:

Natural Capital Initiative 2015: Valuing our Life Support Systems 2014. Summit Summary Report.

Authorship

This report has been written by Daija Angeli (Natural Capital Initiative, Society of Biology), Mike Acreman (Centre for Ecology and Hydrology), Laura Bellingan (Society of Biology), Jaqueline Caine (Society of Biology), Rosemary Hails (Centre for Ecology and Hydrology), Alison Hester (The James Hutton Institute) and Ceri Margerison (British Ecological Society).

Disclaimer

The views expressed in this report are purely those of the authors and should not be regarded as stating an official position of the organisations involved.

Photo credit

Photographs courtesy of Natural England. All photographs have been cropped.

The natural capital summit “Valuing our Life Support Systems 2014” was hosted by the Natural Capital Initiative, a partnership of the following organisations





Valuing our Life Support Systems 2014

Summary report

Table of contents

Introduction	5
Main findings	6
Key messages	7
Natural capital score card analysis	10
Appendix 1—Summary of key note speaker presentations	12
Appendix 2— Proceedings of working sessions	22
Appendix 3—Delegate List	40
References	46

ACKNOWLEDGEMENT

The Natural Capital Initiative would like to thank the sponsors of Valuing Our Life Support Systems 2014 for their generous support.



INTRODUCTION

The Natural Capital Initiative (NCI) hosted its second 'Valuing our Life Support Systems' natural capital summit in November 2014. Since our inaugural meeting in 2009, a growing number of influential activities on natural capital have emerged across all sectors – from networks to research programmes, committees to coalitions. This emerging hive of activity is testament to the traction the natural capital concept has gained with a variety of audiences including business, policy, conservation, health and research.

A key ambition of NCI is the building of substantial and durable connections between individuals and activities. These need to be reinforced if broad and robust progress is to be made at the pace demanded by our challenging times. To assess and learn from the intervening five years, we brought together 250 influencers from an expanding community engaging in natural capital including academia, policy, business and civil society. The summit exceeded its aim as a networking opportunity to stimulate us to work together on natural capital. Participants examined recent gains and future plans to further enable the valuing of natural capital in planning and decision-making based on sound science. This busy and vibrant two-day natural capital summit provided an excellent forum for inspirational presentations, thought-provoking discussion and engaging working group debates on a wide range of topics including ethical values, concepts, partnerships, tools and models, best-practice guidance, case studies, recommendations and future ideas.

Major studies both in the UK and internationally have shown the economic, social and cultural value of the natural environment. Several initiatives and collaborations have come into being over the past decade to drive forward the use of knowledge about natural capital in decision-making.

The summit marked a major step forward from raising awareness about natural capital towards a phase in which there is implementation of advanced concepts, learned lessons, and developed mechanisms. It demonstrated that the underpinning science is enabling governments and private businesses to work towards integrating the value of natural capital into their accounting systems.

In this report, we are delighted to communicate a set of essential messages to policy makers, researchers and business emerging from Valuing our Life support Systems 2014. The background presentations and discussions are documented in the appendices to this report.

The NCI is taking up and acting upon some of the pressing issues identified at the event in upcoming Dialogue Sessions. We will continue to play a vital role in bringing together business, policy and academia to promote the uptake of natural capital thinking into the mainstream.



Mike Acreman
Summit coordinator
Science Area Lead, Natural Capital
Centre for Ecology and Hydrology

On behalf of the Natural Capital Initiative



MAIN FINDINGS

Natural capital underpins our economy and our health and is of vital importance to our wellbeing.

The decline in natural capital and the increasing pressures on it that are being recorded threatens the security of future wellbeing. The valuation of natural capital enables the use of rational policy and business tools for decision-making about investments in infrastructure and is urgently needed if we are to achieve long term sustainability. This is true for both built and natural infrastructure including the network of green spaces, water and other environmental features in both urban and rural areas. Valuation provides a more holistic and accurate measurement of our wealth than purely monetary measures such as Gross Domestic Product (GDP), can identify conservation priorities and can reduce the risk that natural resources will be mismanaged.

The concept of valuation and stewardship of natural capital in planning and development is gaining traction with UK business and being incorporated into policies and strategies.

However, there is a risk that the notion of natural capital could reinforce and facilitate the treatment of nature as a commodity to be traded. Many elements of natural capital are public, social goods, and the cultural value of nature must not be underestimated. There is an urgent need for well-developed discussions about the ethics of natural capital valuation. An accepted ethical framework is needed to ensure the appropriate use of natural capital valuation to enhance fair distribution of the benefits of natural capital.

There is great interest and activity around the natural capital concept. However, to realise the potential benefit of this there is a need for robust and coherently applied concepts, terms and principles that are based on sound science.

These are necessary to facilitate effective inclusion of natural capital in policy-making and business value chains. The next challenge is to bring natural capital concepts into mainstream thought and action; its potential for benefit will only be realised when this integration is evident across government, business and the public.

KEY MESSAGES

To researchers

- Recognising and understanding the interactions between the five forms of capital – financial, manufactured, human, social and natural – is crucial. This will require cross-disciplinary working, linking the natural sciences with engineering, social science and medical research. Greater access to cross-disciplinary research funding is needed, along with the removal of bureaucratic barriers to joint working.
- Many businesses have limited understanding of the importance of natural capital in their supply chains. Researchers can improve business knowledge and subsequent action by working in partnership with businesses to improve access to research, data and measurement.
- There is a need to express the scientific results of natural capital research in language that is easily understood by businesses and land-users working with green, blue and built infrastructure.
- The UK is one of the best monitored countries in the world, and can provide considerable data and knowledge about components and functions of natural capital. Despite this, we do not have an agreed set of metrics, frameworks nor baselines with which to judge the current state, trends and future direction of natural capital in the UK and there is a lack of security of funding for some long-term monitoring programmes. Greater consistency in monitoring is needed to make the most of our wealth of information and to systematically examine the benefits that natural capital provides.
- Mapping not only provides effective communication and visualisation, but also assists land managers, environmental practitioners, local authorities and others to take natural capital into account in decision-making. Understanding where natural capital assets are located and who benefits from them enables better outcomes.
- Models are useful to estimate what we cannot measure; they are helpful in projecting the future, but their inherent uncertainty must be communicated. Greater testing and more rigorous comparison of models are needed to enable correct choice of the most appropriate for a given issue, location or spatial scale.
- Measuring cultural services is an intellectual and technical challenge; good outcomes are achievable, but techniques must take into account the differences in value assigned by different groups of people to natural capital and the services it provides.



To policy makers and planners

- We must recognise the threat from a new 'perfect storm' where the same lifestyles that are recognised as damaging to personal health and well-being are also damaging to the environment on a local and global scale. Policies to safeguard natural capital and to encourage behavioural change will result in multiple benefits.
- In 2010 the UK Government committed to "put natural capital at the heart of a green economy" in its Natural Environment White Paper. Increasingly, GDP was considered an inadequate measure of economic progress. The Office of National Statistics has a long-term programme of work on valuation and has begun to include impacts on the environment systematically in measurement of human well-being. It is imperative that this work is backed in the future by policy as well as financial resources, and that its findings are incorporated into the national accounts and influence policy decisions accordingly.
- It is essential that companies and governments use scientifically sound, appropriate, as well as ethically and socially acceptable, natural capital valuation methods.
- Natural capital accounting and market mechanisms alone will not be sufficient to protect critical natural capital and prevent the crossing of dangerous thresholds (i.e. points at which a small impact can lead to significant, even irreversible change in natural capital). Therefore, environmental regulation is needed also, to guard important natural assets and ecosystem services that cannot be substituted by manufactured, human or social capital and to police thresholds.
- The functioning of businesses as sustainable and ethical managers of natural capital is reliant upon government and civil society, to create an enabling environment and a mutual understanding of how business investment in natural resources can best be enhanced and governed. A clear and long term external policy framework is necessary.
- Environmental Profit and Loss accounting has been initiated in a small number of businesses. However, in order for natural capital accounts to be widely adopted as good practice and used, strong incentives and policy levers will be needed.
- There is a need to develop collaborative frameworks that link management of currently 'separate' domains such as catchments, coastal zones and open seas.
- The natural capital framework can also support decisions on conservation priorities. There is an urgent need to value environmental assets effectively to achieve the aspiration of the Natural Environment White Paper and move from a net loss to a net gain in biodiversity.



To business leaders

- Maintaining, restoring and improving natural assets will yield substantial economic benefits; to maximise these benefits their full value should be incorporated into decision-making.
- Despite gaps in evidence, there is an urgent need to act now to improve the state of natural capital along business value chains in order to secure the long term viability of many businesses.
- Businesses are increasingly considering the natural environment in decision-making as their awareness of the risks posed by mismanagement of natural capital increases. To realise the full potential of the approach, natural capital should be re-positioned from a perceived problem, liability and fear into a sound, as well as ethical, business opportunity for investments that bring sustainable benefits.
- Universal disclosure and reporting of impacts on natural capital along the supply chain are needed.
- There is a need for many businesses to better understand natural capital in their supply chains, particularly as many supply chains are very complex. There are benefits in taking a partnership approach with research teams and local stakeholders to identify impacts, where appropriate, as well as improving access to research, data and measurement.
- Natural capital accounting methods are the subject of ongoing debate. New frameworks and metrics are being built on a history of sustainability accounting as well as lessons learnt from current research and projects. Businesses can play an important role in assessing, influencing and shaping these evolving frameworks.
- Valuation methods should not only be based on the needs of accounting; they must also have a sound basis in science to be widely accepted and to ensure that the complexity and essential interconnectivity of the natural world are not unduly compromised.



NATURAL CAPITAL SCORE CARD ANALYSIS

Key ambitions of the summit were to capture the current state of the art of natural capital, to mark recent progress and to identify future priorities. We wanted participants to record this themselves, rather than for the organisers to infer this. We therefore asked participants to take part in a simple exercise to describe the current state of understanding and utilisation of the concept of natural capital, to chart progress in understanding, tool development, implementation and adoption of good practice. We also aimed to identify gaps in knowledge and thus define priorities for future activities.

To achieve this aim, we invited delegates to record their views on a score card, focusing on two or three of the topics most relevant to their experience or of greatest interest to them. The rows of the score card covered the majority of the topics discussed at the summit (Figure 1 and 2 - columns left to right: understanding, practical implications, tool development, implementation and adoption of good practice). The columns marked critical steps in the development of the notion of natural capital from initial conceptual thinking to mainstream adoption of good practice. Delegates used a 'traffic lights' system to assess the progress of work in their selected topics across the developmental stages covered by each column. Green dots denoted progress more or less complete; amber dots signified some progress, whilst red dots identified activities that had barely, or not yet started.



Figure 1: Natural capital score card - progress made

Note: Question to participants: How much progress have we made in the natural capital themes? red = barely started; amber = some or good progress, green = done or nearly complete

The results of this exercise (see figure 1) therefore provide a snapshot of the views of a relevant and representative sub-set of UK stakeholders. They captured a general trend that indicated completion (green rating) is limited primarily to conceptual thinking and frameworks with only some completion of practical applications and tools. Red and amber ratings across the score card columns demonstrated diversity in participants' views on the degree of overall progress that had been made. Patterns emerge more clearly for individual themes. There was general agreement that limited progress has been made in cultural services and ethics. In contrast, economics and water management were areas where recognised advances had been made. Many delegates felt that some good progress was evident in government policy and planning while others disagreed.

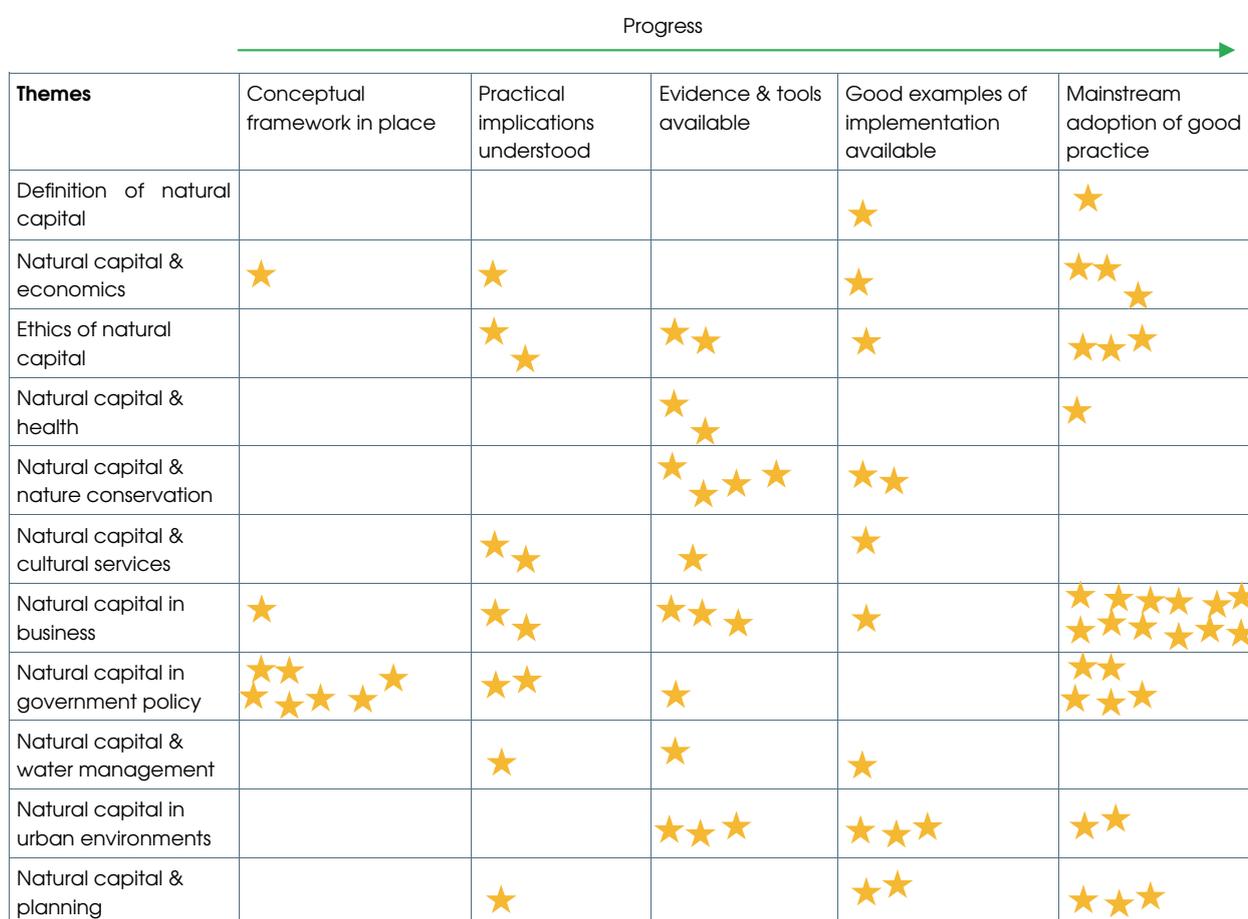


Figure 2: Natural capital score card – future priorities

Note: Each participant was give one gold star to answer the question: Where should our priorities be in developing natural capital in the future?

In a final step in the process, delegates were invited to place a gold star against areas where they felt future activity should be prioritized. Clustering of these stars suggest a need to focus on tools, good examples and mainstreaming adoption of good practice (see figure 2). Business was clearly a priority for many delegates where they indicated such activities should focus, especially mainstreaming the adoption of good practice. Delegates also saw the further development of the conceptual framework for natural capital in government policy as well as as mainstream adoption of good practice within government as a priority.

APPENDIX 1 - KEY NOTE SPEAKER PRESENTATIONS

Note: Videos of all key note speeches are available on the [NCI website](#).

PROGRESS AND CHALLENGES FOR THE NATURAL CAPITAL AGENDA

Dr Allan Watt (Science Area Lead, Ecological Processes & Resilience, Centre for Ecology & Hydrology, speaking in his capacity as Interim Chair, Natural Capital Initiative)

- The NCI's inaugural event highlighted the need to acknowledge the relevance and importance of natural capital across all sectors. Since then, the concept has gained significant traction with research, private sector, business, not-for-profit organisations and others involved in its development and implementation.
- The links between ecosystems and human wellbeing are increasingly well studied. The National Ecosystem Assessment (UK NEA), the most comprehensive sub-global ecosystem assessment to date, highlighted the status of and trends in ecosystem service delivery. The UK NEA has influenced public policy development, most notably the Natural Environment White Paper in England, the Scottish Land Use Strategy, and the "A Living Wales" Welsh framework for the environment, countryside and seas, thus demonstrating the potential power of knowledge-gathering exercises of this kind.
- Natural capital has also been incorporated into European Union Policy, for example the EU Biodiversity Strategy and the 7th EU Environmental Action Programme.
- The future challenges for natural capital thinking now lie in: setting targets for benefits to be derived from natural capital; facilitating the underpinning interdisciplinary science that links natural capital with values; implementing new financial mechanisms to enable externalities to be internalised; and linking local action to national strategy.

WHAT IS NATURAL CAPITAL?

Professor Giles Atkinson (Department of Geography and Environment, London School of Economics)

- The term 'natural capital' is attributed to E.F. Schumacher (1973) who used the term in his book, "Small is beautiful". The substantive use and popularisation of the term came from David Pearce, Anil Markandya and Edward Barbier in 'Blueprint for a Green Economy' (1989). Natural capital is thus a maturing concept.
- Accounting for natural capital is important as it tells us something about the portfolio of assets that a nation possesses or uses. It can reveal development paths in nations and indicate how they might be sustained.
- There is institutional pressure to come up with a precise, formal definition of natural capital. This definition must be defensible, practical and not too narrow. It should encompass not just ecosystems but also natural processes and functions and the underlying stock beneath the asset. It should take into account that assets can be depleted in quantity or quality. However, while there is currently a focus on finding a technical definition, to make it a useful tool we need to ensure it resonates with different audiences, including the public.

- The natural capital concept is useful because it provides a functional link between ecological production, economic production and human wellbeing. Taking natural capital into account leads to a broadening of perspective on economy and economic growth from a narrow focus on Gross Domestic Product (GDP) to a more holistic focus on human wellbeing. Growth is generated by assets in the economy as well as by technology, innovations and social institutions, and by the links between them.
- There is increasing evidence of the interactions between natural capital and wellbeing, e.g. the effects of air quality on labour market outcomes, schooling and cognitive abilities, as well as the links between natural capital and produced capital, e.g. between property value and proximity to 'nature'. Natural capital accounting will help to demonstrate the importance of natural capital to the economy and will help to correct measures of productivity and growth. However, this will need to be accompanied by policies to define and correct unsustainable use.

NATURAL CAPITAL AND KNOWLEDGE

Professor Simon Kerley (Head of Terrestrial Science, NERC)

- The Natural Environment Research Council (NERC) is the UK's leading public funder of environmental science. The NERC vision is to place environmental science at the heart of responsible management of our planet. To achieve responsible management, understanding the values we place on the natural environment is paramount. Science research helps us to understand ecosystem function and the generation of services, as well as how the natural environment interacts with the man-made environment. Correct use of this understanding can increase our resilience to natural hazards whilst motivation can come from understanding costs and mitigation strategies. The natural capital framework can help with prioritizing actions to manage environmental change.
- Challenges include:
 - * Food, water, energy and the urban environment (e.g. impacts on human health and productivity, brownfield remediation)
 - * Communication and translation: How do we translate the language of science around valuing capital and nature to communicate with the business community working with green/blue/grey infrastructure.
 - * Persuasion: Civil engineering companies see the value of green infrastructure but there is a need for evidence, valuations and acceptance of proxy values to be part of project specification.
- We also need to widen our perspectives to include international and global challenges that look very different to the challenges we face in the UK. We need to include the marine environment as well as land and freshwater. There is a need to form business partnerships between civil engineers, farmers and other users of the landscape. We need to gather support for green, blue and grey infrastructure solutions.
- Natural capital is an exciting and still emerging concept. The key to its success will be integration across research disciplines as well as in communications with Government, business and the public.

BUSINESS PERSPECTIVES ON NATURAL CAPITAL

Peter Young (Chair of the Aldersgate Group)

- The UK is a world leader in environmental science and in writing policy; it is not a world leader in taking subsequent action. The Aldersgate Group and the Ecosystems Markets Task Force have shown that the time is now right to take action. We have reached a point of environmental wisdom regarding the consequences – either business acts now or environment will harm business.
- Our natural capital debt is arguably more pressing than our financial debt. We are well aware of the fact that we live beyond the point of sustainability on the planet.
- Our ecological footprint in the UK is running at 3.5 planets. One of the major issues for businesses is managing risks, and businesses are increasingly aware of the risks posed by the mismanagement of natural capital. Businesses have already experienced massive increases in price for both commodities as well as labour.
- Recent developments in policy such as the Natural Environment White Paper and Natural Capital Committee set the scene for further action.
- On an individual level, business leaders such as Ian Cheshire (formerly Group Chief Executive, Kingfisher plc and Chair, Ecosystems Market Task Force) and Paul Polman (Chief Executive Officer, Unilever) are showing the benefits for business in using this approach. Investors are calling for green investment opportunities such as green bonds. Consumers are increasingly taking action.
- A report by the Aldersgate Group, “Pricing the Priceless” set out the business case for accounting for biodiversity.
- The Ecosystems Markets Task Force identified a >£1bn UK latent market for nature’s values. This includes biodiversity offsetting, bio-energy and anaerobic digestion on farms, local wood fuel supply chains, nature-based certifications and labelling and water cycle catchment management/payment for ecosystem services.
- Businesses manage value from capital, revenues and intangibles, such as brand image. They also have the tools to enhance natural capital, grow ecosystem services and manage its intrinsic values. However, business must have a clear ask on natural capital to be able to act to realise that value.

NATURAL CAPITAL: DEBATES AND QUERIES

Dr Richard Spencer (Head of Sustainability, ICAEW)

- Do we need to value nature to save it? The argument for natural capital accounting is that measuring nature makes its contribution to the economy and our wellbeing visible and allows for effective decision-making.
- Businesses extract an estimated \$7 trillion from the environment each year. The International Monetary Fund, as cited in the Telegraph newspaper, estimated the value of the financial crisis at \$11.9 trillion (Conway 2009). Each year, nature faces a greater crisis than this, yet receives much less attention. If we were prepared to almost bankrupt ourselves to save the economic system, then why do we not invest in the environment?

- Accounting for nature is putting a value on it; however there are several practical, conceptual and ethical challenges. Many aspects of nature simply cannot be valued, and there is a risk that valuation will lead to prioritising quantity over quality. We are in danger of not valuing the most important things.
- Capitalism in its current form is a source of environmental ill. The short term focus on profits ignores longer term environmental destruction. System change aiming towards maximum wellbeing instead of maximum growth is required.
- Ethical aspects include the question as to who should value nature? Who values nature is a question about power dynamics; the term capital itself is a term that comes from business, not conservation or science. There is a danger that in business, colonising the natural environment with its own language, we begin to see nature in a certain way. It derives value in terms of what it provides to man and separates us from the natural system rather than understanding our place in it and our dependency on it. It is a term laden with connotations of control and power and extending it to nature reinforces a notion that it is ours to do with as we will. This is very different from the view of indigenous people, who live in the most biodiverse places on earth and place high spiritual value on nature.
- How we account for things has profound implications. In doing this, we create a representation of the world that shapes perception. At its simplest, if nature is not included in our view of the world as business people, why would we take account of it? How could we? Accounts are not passive recorders of past events but shape the future decisions that are made. Done well, accounts could reset human values, with accountants as revolutionaries.

UK GOVERNMENT PERSPECTIVE ON NATURAL CAPITAL

Dr Ulrike Hotopp (Director Analysis and Chief Economist, Department for Environment Food and Rural Affairs (Defra))

- The government recognises the value of natural capital. The Department for Environment Food and Rural Affairs (Defra) has a long-term programme of work on valuation, and incorporating natural capital into national accounts.
- The National Ecosystem Assessment (UK NEA) raised awareness of the importance of the natural environment to human well-being and economic prosperity. This research has informed policy strategies such as the Natural Environment White Paper and the Biodiversity 2020 strategy.
- In 2012, Defra produced guidance on accounting for environmental impacts to supplement the UK Treasury's "Green Book", setting out the basic principles of project and policy assessment and evaluation. However, more work is needed to embed ecosystem service valuation in practice.
- The natural capital concept helps to reframe the debate on the importance of the natural environment to economy and society. We need to recognise the value of natural capital to the country's long-term economic growth and prosperity.

- We know that a decline in natural capital is not good for the economy. We need to do our best to avoid natural capital degradation, rather than trying to fix it later. Investing in natural capital can deliver substantial economic benefits and can often provide more cost effective and resilient solutions than grey infrastructure alone.

NATURAL CAPITAL – WHERE ARE WE NOW?

Jo Pike (Director, World Forum on Natural Capital)

- We are at a critical juncture in protecting and restoring our natural capital. Ban Ki-moon, Secretary General of the United Nations, has urged people to divest from fossil fuels. There are huge threats to and implications for natural capital and good stewardship of natural capital can help to address some of these challenges.
- Natural capital may not be the answer to everything but it does underpin everything.
- The inaugural World Forum on Natural Capital in November 2013 showed that regulation and valuation are key challenges. Protesters at the event also raised concerns about monetisation and associated risk. IUCN will lead on developing a “Natural Capital Charter” to address these concerns and develop an ethical framework which will be launched at the second World Forum on Natural Capital in November 2015.
- A survey by the Scottish Forum on Natural Capital, in collaboration with the Institute of Directors in Scotland and the Institute of Chartered Accountants of Scotland (ICAS), showed that many businesses (61% of 508 surveyed) are unfamiliar with the term natural capital (Scottish Forum on Natural Capital 2014). However, once a definition was provided, two thirds felt it was ‘important’, ‘very important’ or ‘essential’. Ninety five per cent of those asked said that a better understanding of natural capital would contribute to better outcomes for their business, environment and society.

PROTECTING THE ACHILLES HEEL OF OUR ECONOMY

Pieter van der Gaag (Interim Director, Natural Capital Coalition)

- Business is currently moving forward on natural capital valuation and accounting but private entities cannot do this alone. Business needs government, accounting and civil society to create an enabling environment, adapt standards and understand how business investment in nature can best be governed.
- Until very recently humanity did not explicitly realise its connection to and dependence on the earth’s natural systems. We have constructed our economy on the principle that we are separate unique beings from nature. Through measurement, accounting and valuation of only those things we felt belonged to us, we have come to the faulty conclusion that we have a firm grip on the economy and on the companies within it. However, we have an Achilles heel: by failing to measure, account and value natural resources, ecosystem services, and our natural environment we have exposed the foundation of our economy to degradation and depletion.
- The Millennium Ecosystem Assessment showed how loss of biodiversity, pollution, climate change and unsustainable land use are degrading the ability of ecosystems to provide us with services essential for life. The Economics of Ecosystems and Biodiversity (TEEB)

study indicated the economic costs of this. Businesses understood this and valuation and supporting methodologies were developed. Now there are so many systems that business needs help in understanding what works.

- The Natural Capital Coalition is a collaboration between business, accounting, civil society, finance, government and academia. In addition to jointly developing the business case for natural capital valuation and accounting, the coalition is also collaborating to develop a Natural Capital Protocol, which will build on the existing systems, frameworks and methodologies currently available for natural capital accounting and valuation.
- The Protocol will provide businesses with clear guidance on how to assess their impact and dependency on natural capital, and on how to manage these better. It will also help businesses navigate the range of approaches that exist, providing recommended steps to take wherever possible, as well as guidance on data needs. Importantly, it will also indicate how the results of the Protocol will be used and embedded within businesses.
- To accommodate specific sectors' natural capital priorities, sector guides will interpret the Protocol for specific contexts. The sector guidance for apparel as well as food & beverages will be developed first due to the materiality and complexity of their impact.
- However, the Protocol needs an enabling environment and this is where government is needed. Natural systems are shared by many companies, by communities and by nature itself. Only one private actor cannot adequately interact with such a system without clear and transparent involvement and guidance from government. Businesses who are leading the way on natural capital valuation plead to government to set up frameworks to help leaders in this field become successful and take the risks that are ultimately required to help safeguard our environment.
- Innovation in the accounting profession, as well as a forward movement on data that fulfils certain minimum quality criteria is needed. Finally we need fast and forward movement on the ethical discussion surrounding natural capital valuation. It is important that companies do not act on natural capital unframed by some form of societally acceptable ethical framework.

FUTURE DIRECTIONS: CONSERVATION

Glyn Davies (Executive Director of Global Programmes, WWF UK)

- The mission of the WWF is a world where humans and nature thrive. The Living Planet Report (WWF 2014) painted a different picture. The Living Planet Index (LPI) shows a 52% decline since 1970, driven by human consumption, with the greatest decline in tropical countries.
- We are living far beyond the means of our planet. The 'Global Ecological Footprint' is an estimate of the capacity of the planet to provide goods and services. An estimated one and a half planets are currently being used to support economic development.

- WWF has embraced the concept of natural capital – not all conservation charities have – and committed to invest in ecosystem services valuation and natural capital accounting in their five year strategy.
- We need to keep the idea of natural capital broad (as in the UK National Ecosystem Assessment) and include cultural and aesthetic values which are powerful influencers in decision-making.
- Case studies show how incorporating natural capital can lead to better policy decisions. Certification schemes, such as the Marine Stewardship Council’s label for sustainably sourced fish has had an impact on moving toward sustainable production. Forestry certification, such as the Forest Stewardship Council, incentivise sustainable business practice and are designed to give customers a chance to make more responsible purchasing decisions.
- Valuing nature also helps us to make important decisions about conservation priorities. The mitigation hierarchy needs to be applied. ‘No net loss’ can be viewed as a ‘race to the bottom’ and biodiversity offsets as a “license to trash”. We need to set the bar higher and aim for a net gain of biodiversity and encourage more biodiversity from the outset of a development. At the same time, defining ‘at risk’ ecosystems helps to inform priorities for investments and conservation.
- Government, businesses, investors, development agencies and communities are the actors who need to engage with natural capital decisions and must stop assuming that we can rely on an endless supply of natural resources and ecosystem services. Those communicating about natural capital should use language, particularly incorporating ‘risk’, that businesses understand. Businesses should also be encouraged to make practical changes to their behaviour to lessen their environmental footprint and report on their environmental sustainability.
- In order to incorporate natural capital considerations across many aspects of policy, we need to see a different mindset among decision-makers. Specific steps that could help include: natural capital accounting; ecosystem services valuation; incorporation into appraisal processes; incorporation into economic growth modelling, infrastructure development plans and energy policies and the adoption of a mitigation hierarchy in urban planning processes.

FUTURE DIRECTIONS: HEALTH

Professor Anthony Kessel (Public Health England and Public Health and Ethics, London School of Hygiene and Tropical Medicine

- Public health can be understood as both “*the art and science of preventing disease, promoting health, and prolonging life through organised efforts of society*” (Acheson 1988) and “*collective action in relation to the health of populations*” (Porter 1999)
- Philosophy can aid our understanding of the links between the environment and public health. Descartes’ developed philosophy on the ‘Cartesian split’ between fact (leading to developments in science and modern medicine) and value (leading to ethics, humanities and psychology). Kant’s moral philosophy shaped the categorical

imperatives; central to this is the idea that what is morally considerable are human beings. Mill was a founder of 'utilitarianism' – the concept that the act that provides the most utility is morally right. Mill considered whether animals (and the environment) are morally considerable and decided that they are if they are sentient.

- Mary Midgely argues in her book 'Science and Poetry' that our current view of the environment is shaped by the accumulation of the Descartes split from fact from value, that gave primacy to science over philosophy and ethics, alongside developments in philosophy that took the environment out of moral consideration. That is one of the reasons why we currently systematically devalue the environment, why it is not widely considered part of our moral concern.
- At best, when we think about the moral worth of the environment, we think about it in terms of what it can deliver for human well-being. The Natural Capital Committee's definition of Natural Capital has an instrumental value of the environment to human wellbeing.
- Midgely and others would say that until we consider that the natural environment has inherent and intrinsic value of its own, we will be stuck in a place where we continue to devalue and degrade it.
- There are many examples of the centrality of the environment in public health. One prominent example is antimicrobial resistance (AMR). AMR is a huge global problem but there are significant gaps in country-level surveillance. The USA and UK have released strategies to tackle this but it remains a major threat. There is a recognised link between AMR and prescribing practice and although there is a great deal of geographical variation in prescribing across the UK, these rates are higher than expected.
- In the case of antimicrobial resistance, unless we stop degrading the natural environment and our biodiversity (from which antibiotics arise), and stop using antibiotics as growth promoters in animals and its subsequent pollution of the land, leading to greater resistance, progress in the fight against AMR will be limited. Truly tackling antimicrobial resistance necessitates a reconceptualization of natural capital as having an inherent value and therein lies the future direction of public health.

FUTURE DIRECTIONS: BUSINESS AND ACCOUNTING

Will Evison (Assistant Director, PwC)

- So far, corporate natural capital accounting has been done to a very limited extent. While corporates are often excellent in accounting for natural capital as long as there is a market for it, they are not so good in those cases where there is no market. Also, while some corporate accounting mechanisms are loosely related to natural capital, none of them are really fit for purpose.
- *"The future is already here — it's just not very evenly distributed."* William Gibson (1993). There are now a few examples of natural capital accounting, most notably Puma. The company quantified and valued externalities and took a supply chain approach. Others have followed this leading example but with less publicity.

- There are lots of scientific tools. However, these will need simplification to be workable for business. The Natural Capital Committee has been engaging with the private sector and urging them to make natural capital accounting a priority. The Natural Capital Coalition is developing methods for natural and social capital valuation in business.
- The future is quantitative, value-chain oriented, spatial, dynamic and valued. The future of natural capital needs to be quantitative to achieve mainstream corporate buy in. It needs to consider the entire value chain, from the raw materials to the products' end of life. It also needs to be spatial; so far, corporate information and reporting tends to ignore place. It will also need to be dynamic and responsive to change.
- Valuation is imperative in the business world. Environmental metrics and indices are not effective in influencing corporate behaviour. It will need to be monetary in order to change business decision-making. We will need to set priorities to achieve the highest impact possible, e.g. reducing water consumption might be most useful where reduction has the most social impact, rather than where consumption is highest.

FUTURE DIRECTIONS: BUSINESS AND SUSTAINABILITY

Inder Poonaji (Nestle S.A.)

- We all know that nature can exist without us, yet we cannot exist without nature. However, nature has become invisible. Nestle is trying to make it visible within its business, based on compliance, sustainability and shared value.
- Easy wins include efficiency, such as reduced carbon emissions and water usage and an increased use of renewables. Transparency is increased through better reporting of risks and responses. Consumers increasingly want to be informed about their products; lifecycle assessments can now be read through QR codes.
- Nestle is running a pilot project in Buxton, Derbyshire to develop local communities alongside the environment. The company has generated a 'four point plan' with regard to its product, Buxton Water. The pilot shows it is key to take a landscape scale approach and collaborate with a range of partners. Nature and conservation cannot be separated from people and communities.
- The concept of natural capital is gaining real traction. It resonates with businesses. However, when businesses asked academics: 'what natural capital stocks are there in the environment and what is our effect on them as a business?' researchers respond with more questions than answers. In order to safeguard natural capital, businesses will need to be able to access more research, data and measurement. Universal disclosure and reporting measures are needed. Society also needs to "fall back in love with nature" and make it visible.

THE FUTURE OF NATURAL CAPITAL

Professor Georgina Mace (UCL, Centre for Biodiversity & Environment Research)

- Natural capital provides an inclusive framework for environmental sustainability, i.e. maintaining life support systems for the overall wellbeing of society. It becomes established at many levels – in government, business, NGOs and communities. But what do we need to do in order to embed the ideas in practice and ensure they deliver what we intend?
- We need a more common understanding of concepts, terms and principles. Natural capital is used in many different ways; we need coherence to ensure correct delivery. Natural capital is a stock from which people derive benefits. How we value these benefits varies in time and space.
- Natural capital is centred around people, not ecosystems – the environment will survive without us. We need to agree not only what natural capital is but also how we measure it and its benefits. Monetary and non-monetary approaches will be necessary. Setting targets for benefits from peoples' needs and wants. Equity and fairness are important issues in the debate – who decides how natural capital is used and who receives what, where and when.
- As natural capital arose from the natural sciences we tend to view it from the supply side (in ecosystems). However, it is also important to think about the demand side (in society).
- Ecology matters: We rely on processes. Ecology can help to understand thresholds and inform targets. Location matters – much natural capital and ecosystem services cannot be transferred across time and space. We will need a multifunctional approach to landscapes. There are different scales of space and time and scaling is a challenge in relation to both the natural and the social science.
- Almost all benefits from natural capital are co-produced by people, with other capitals.
- There are many unresolved issues around valuation and how it relates to intrinsic values. Should we account for natural capital or for ecosystem service benefits? Valuation has not yet lead to better decision-making. We will need to identify both risks and opportunities – and seize the opportunity to change the world into a better place for people and for nature.

APPENDIX 2 - PROCEEDINGS OF WORKING SESSIONS

Note: Working sessions differed in style from panel sessions, participant Q & A to more interactive sessions which is reflected in the reporting of the sessions in the following. For those session speakers using power point slides, these are available to download on the [NCI website](#).

ECONOMIC AND ECOLOGICAL PRINCIPLES

Chair: Ece Ozdemiroglu (effec - economics for the environment consultancy and Natural Capital Initiative Steering Group)

Speakers: Dr Drew Purves, Matthew Agarwala, Ian Dickie

Session summary: *The session investigated whether socio-ecological systems can self-organise and find what the 'value' of natural capital is. Barriers and value judgements are more important for socio-ecosystem than for "ecological systems" but they are not insurmountable as long as they are made explicit.*

Summary of speaker presentations:

Dr Drew Purves (Microsoft Research)

- Economics is not just about money. It is possible to solve a problem with an economic approach without using monetary valuation. Institutions and laws lead to economies. For example, people's investments in capital are guided by laws and institutions. How can we put a similar system in place for natural capital? And do we need to work out how much natural capital we need or are there systems that can do this for us?
- There is a huge shortage of data on the interactions between ecology and economics, because it is difficult to collect this data.
- We need to value nature in some sense in order to be able to protect it but we can question whether this valuation needs to be financial. There is a danger in using money in that it becomes hard not to compare it to other things also valued in monetary terms, thus leading to nature becoming tradable.

Matthew Agarwala (University of East Anglia and London School of Economics and Political Science)

- Ecosystem services and natural capital are not the same. The difference between these concepts is much greater than some recognise. Natural capital is the stock of assets, both biotic and abiotic. This stock generates a flow of environmental goods and services from which people benefit.
- Decisions on land use may impact upon crop yields and emissions of greenhouse gases, for example, in different directions. Allowing decision-makers to compare and select from policy options requires a common unit.
- This unit needs to be: easy to understand by different sectors; Distinguish between superior, inferior and equal benefits; Be used to compare across decisions. Money is the only unit that meets these criteria.

- Ecosystem valuation values marginal changes in the benefits derived from ecosystem goods and services. For Example, policy would consider changing part of a forest into urban development, rather than converting the entire forest. This is a marginal change (versus changing the entire stock of the world's forests into an urban development). Valuing natural capital is much more challenging and methods need to be adapted to deal with aspects such as discounting, non- marginal changes, inconsistent preferences and the level of substitutability of natural assets.

Ian Dickie (effec)

- The Natural Capital Asset Check considered what the natural capital assets were and their trends.
- Barriers to assessing natural capital include both data problems (lack or limited availability of data) as well as public scepticism to undertake valuation.
- However, uncertainty isn't an excuse to ignore natural capital. Businesses have a value chain and their own business models. We should ask businesses: 'Across your business value chain, where does your reliance on natural capital have the most impact? Where are these interactions most significant for the value of your business model?' Business could adopt natural capital valuation and (ecologically inspired) frameworks such as cradle to cradle.
- We need to recognise that money is the best commensurate unit at present but that a negative aspect is that it is being used as a measure of human welfare. We need to recognise the flaw in using monetary valuation in that people will adapt their behaviour to meet these targets (money causes changes in behaviour).

LINKING NATURAL CAPITAL AND OTHER CAPITAL

Chair: Dr Jawed Khan (Office for National Statistics (ONS))

Speakers: Dr Dorothy Maxwell, Professor Tim O'Riordan, Carlota Garcia-Manas

Session summary: *Recognising the connections between the different capitals is crucial. Local communities and investors could drive social change that results in enhanced recognition of natural capital and the need for its careful management. If we invest in building social capital this will bring benefits in terms of natural capital.*

Summary of speaker presentations:

Dr Dorothy Maxwell (The Sustainable Business Group)

- There is an increasing interest from business in valuing natural capital and its contribution to society. However, the approach is far from common or mainstream.
- Integrated reporting should look at six forms of capital – financial, manufactured, intellectual, human, social, relational and natural capital. Most progress has been made on reporting on natural capital, some on social capital but none on integrating the different forms of capital.
- Each sector has different motivations to include different forms of capital into their accounts; however, we need to establish common ground as the myriad of initiatives on natural capital is confusing for business.

Professor Tim O’Riordan (University of East Anglia)

- There is an essential connection between social and natural capital.
- For large groups of undermined individuals (young, unemployed) they are systematically undervalued: their social capital is practically zero and their awareness of natural capital is zero.
- The business world needs incentives such as tax incentives, to invest in social capital which will lead to investment in natural capital.

Carlota Garcia-Manas (EIRIS)

- Investors are a major driver of change; EIRIS research shows that some industrialists are leaders in the field of natural capital. However extractive industries (oil, gas, mining and food) are not leaders in natural capital but can be for social and human capitals.
- Industry bodies, voluntary, regulation, the stock exchange, and Sustainable and Responsible Investment (SRI) are the main drivers influencing businesses to change their behaviour.

HOW GOOD IS OUR KNOWLEDGE?

Chair: Professor Bill Sutherland (University of Cambridge and President of the British Ecological Society)

Speakers: Dr Tom Oliver, Dr Felix Eigenbrod

Session summary: *We have a great deal of knowledge about natural capital but are often unclear about how to use and apply it. This limits the capacity of this knowledge to inform land management decisions. It is not always clear how established knowledge can be used either comparatively or in terms of scaling; this is also a limitation on use and represents a research gap. Databases of ecosystems services and maps are improving. Models are useful for what we cannot measure, they are helpful but their inherent uncertainty must be addressed in validation studies. The value assigned to ecosystem services varies between different groups of people.*

Summary of speaker presentations:

Dr Tom Oliver (Centre for Ecology and Hydrology)

- There are now several models with different strengths and weaknesses. Choosing the most appropriate will be a ‘horses for courses’ rather than a ‘one size fits all’ approach.
- Ecosystem services often need to be measured by proxy; models help us to develop a better estimate of services; validating models and estimates is important especially at larger spatial and temporal scales. There are three different types of ecosystem service models: benefit transfer models (e.g. EcoServ-GIS); statistical correlative models (e.g. ECOMAPS); and process based models (e.g. InVEST).
- Integrated ecosystem service modelling relies on data (integrated environmental datasets), models (expertise in ecosystem service models), validation (empirical data for essential model testing) and application (evidence based advice on land use impacts).

- More validation of ecosystem service models is needed and so is a more rigorous comparison of models to pick the most appropriate for a given region or spatial scale. Mapping the supply of ecosystem services is only one side of the coin – managing demand is critical.

Dr Felix Eigenbrod (University of Southampton)

- Linking ecosystem services to the benefits accruing to people is a difficult task as there are a range of different human beneficiaries and benefits for each aspect of nature. There is a need to disaggregate beneficiaries, perhaps by socioeconomic criteria, gender etc.. Something that is not currently done in modelling.
- Not all ecosystem services are quantifiable. Research has shown that we tend to only map a relatively low number of ecosystem services which are relatively easy to assess.
- Perceived values are spatially and economically variable. There is variation within service receiving communities dependent on actors interests (e.g. fishermen vs government officials). In the UK, benefits are also unevenly distributed, for example users of SSSIs tend to be rich, white and male.
- One approach is to start with beneficiaries and “go backwards”, focusing on the services that can be managed. We also should identify conflicts in perceived values as well as gaps in knowledge.

NATURAL CAPITAL AND SUSTAINABLE GROWTH

Session host: Aldersgate Group

Chair: Peter Young (Aldersgate Group)

Speakers: Rowland Hill, Stephanie Hime, Mike Sewell, Karen Ellis

Session summary: *The business community has a willingness to change the way they account for natural capital. This builds on a long history of trying to develop effective sustainability accounting that has informed and can inform decisions. However, natural capital accounting is complex and the “how to” still up for debate. Developing frameworks and metrics around natural capital is a work in progress that feeds off projects and lessons learned in these. In addition, there is a case for educating consumers and the investment community about how we view and could view economic progress, and extend this to include wellbeing.*

Summary of speaker presentations:

Rowland Hill (Kier)

- The principle “invest, construct, maintain & renew” guides Kier’s business case.
- Natural capital accounting must be more than coming up with a number. In order to effectively inform decision-making, methods allowing true and readily communicable consideration of natural capital values will be needed (or must become widespread).

Stephanie Hime (KPMG)

- The attitude of the business community has changed due to shocks and the realisation of risks due to resource scarcity. Businesses are now interested in taking natural capital into account in the future and show a willingness to change current practices. The “how” is very complex and still subject to debate.
- It is also important to not limit the debate to natural capital but include other forms of capital as well.

Mike Sewell (Marks and Spencer)

- There is a long history of eco-accounting, life cycle assessment and other exercises that attempt to measure things outside of traditional accounts. A “whole parallel world” to natural capital accounting exists, which includes product foot-printing, sustainability consortia, etc.
- While carbon footprints are relatively easy to measure and manage, biodiversity and social issues will require the guarding of minimum standards. Measuring these will identify risks and “hotspots” where (or at which) production can be influenced to ensure sustainability. A number (in terms of valuation or assessment) in itself is not necessarily helpful but tracking progress of services and values is. For example, Marks and Spencer (M&S) invests in a number of best practice schemes in certain areas (fish, oil palms, wood products); this provides insurance and is the responsible thing to do but it does not necessarily mitigate risk.
- Collaboration between disciplines is required to implement thinking and practice that takes natural capital into account and manages it effectively. Support by policy and regulation will also be necessary for this.
- Despite recognising the importance of managing natural capital sustainably it is challenging to implement necessary strategies to achieve the objective, often due to complicated supply chains.
- Using resources wisely, recycling and reusing, always makes sense from a business perspective as it ultimately leads to cost savings.

Karen Ellis (WWF UK)

- WWF welcomes the adoption of priorities relating to natural capital - not all conservation organisations do. The charity works with a range of partners in different countries. Corporations now see how deteriorating natural capital leads to economic costs and conflicts over resources are becoming more pronounced. The only way to achieve sustainable development is by incorporating natural capital into decision-making.
- We need to value nature better than we do now. Focussing our efforts on showing the reliance of business on the environment requires a more sophisticated analysis of our dependencies.
- It is not just businesses that rely on natural capital but also others in the community. Identifying collective solutions in which businesses are responsible partners would be a useful approach. Transparency would be beneficial.

ETHICS OF NATURAL CAPITAL

Chair: Dr Richard Spencer (Institute of Chartered Accountants in England and Wales (ICAEW))

Speakers: Professor Victor Anderson, Dr Camilla Toulmin, Nick Dearden

Session summary: *There are many open questions regarding the ethical dimensions, power relations and ideologies regarding natural capital and how these interact with scientific analyses. There is a risk that the concept of natural capital reinforces and facilitates the marketization and commoditisation of nature whereas it is at heart a public, social good. Market mechanisms must be supported by institutions, regulation and processes.*

Summary of speaker presentations:

Nick Dearden (World Development Movement)

- The creation of an economy based on self-interest, price and markets has so far been a disaster for the environment and for much of society. While the good intentions around natural capital are entirely understandable, reinforcing the idea that everything has a price will not engender the ability to treat the natural world differently. This does not only apply to the environment, but also more generally to introducing market terms into the sphere of public goods.
- The term natural capital is a defeat for those arguing that parts of our society should remain beyond markets. The concept of natural capital could be a potential nail in the coffin for those aspects of the environment that don't provide a service, or economically benefit people. The emergence of private financial markets in biodiversity offsetting moves the emphasis from stopping damage to "making it OK" provided something is done elsewhere.
- Overcoming the invisibility of nature would be better rectified through taxation, regulation and government intervention. There should be a focus on challenging power and the overreach of markets in order to push towards different forms of ownership that encompass managing the commons - this works effectively in many parts of the world.

Dr Camilla Toulmin (International Institute for Environment and Development (IIED))

- Pragmatically, we should and must put a price on environmental goods and services. Putting a price on things does not necessarily lead to markets and commoditisation. Economic actors need to understand their dependence on nature; nature's invisibility leads to it being trashed.
- We cannot escape our market based system and will need to work on fixing the problems within it, rather than developing parallel systems. Capital markets are powerful and if we get the signals right we can move flows of finance towards a sustainable world.
- Economic valuation does not rule out appreciation of nature's intrinsic value. In addition to market measures, there is a need for strong institutions to secure or limit rights e.g. tropical forest schemes need to support local rights, as well as the sound science to understand natural systems.
- To strike a balance between markets and public goods, there is a need to address inequities of power. Currently in some areas, for example in the fossil fuels and energy

sectors, we have an oligopoly rather than a true market economy. In the future, we must challenge corporate power and revive public discourse and collective action. Governance, institutions, rights and markets must all work together to overcome short termism and reinstate the idea of public goods.

Professor Victor Anderson (Global Sustainability Institute (GSI), Anglia Ruskin University)

- The concept of natural capital has become like sustainable development; it is ambiguous and can be used for both good and bad means.
- We should be conscious of the key difference between natural capital and more traditionally understood forms of capital.
- There are six key differences between natural capital and other forms of capital:
 - i) Ordinary capital, e.g. money, is infinitely divisible - ecology tells us that nature is not because it relies upon interdependencies;
 - ii) Ordinary capital discounts future returns - this approach would be disastrous for natural capital;
 - iii) Pieces of capital have specific prices - natural capital does not have an accepted price but many competing valuations instead;
 - iv) Capital ownership is closely aligned with wealth and power - in natural capital valuation, poorer people will name a lower price for nature, reflecting this bias;
 - v) The value of ordinary capital depends on consumer preferences - natural capital value depends on science;
 - vi) Capital is interchangeable, e.g. money, buildings etc, whereas natural capital is locally specific and not interchangeable.
- All of these issues must be overcome if natural capital is to work as a marketable concept: while natural capital may work as a general term, it does not yet work at a detailed level.

NATURAL CAPITAL AND HEALTH

Chair: Dr David Pencheon (Director at Sustainable Development Unit working across NHS England and Public Health England)

Speakers: Dr Mathew White (European Centre for Environment and Human Health), Dr Sari Kovats (London School of Hygiene and Tropical Medicine), Professor Hilary Graham (University of York).

Key messages:

- There is a perfect storm approaching where the lifestyles that are damaging the planet are also damaging health.
- Emotional engagement is key to decision taking and behaviour changes in relation to natural capital and health.

Supporting points:

This topic cannot be adequately explored without consideration of and engagement with the public. However, behaviour change research shows that simply 'telling people' about the

problems does not shift behaviour. Emotional engagement is needed - both positive and negative emotions. This links to the generational issue that people are motivated on behalf of their children and grandchildren, and social capital is often grounded in children. The current framing of natural capital discussions focuses too much on the short term and not enough upon the generational timescale.

Interdisciplinary research and practice, linking health and natural capital, is needed. However there are few interdisciplinary funding opportunities and there are many actors. In addition, multiple bureaucracies hinder joint working. Responsive mode funding from the UK Research Councils are largely 'siloed'. However ESPA (a seven year research programme funded by DFID, ESRC and NERC to provide new knowledge demonstrating how ecosystem services can reduce poverty and enhance well-being for the world's poor) has several funded projects that show good examples of relevant interdisciplinary work.

The UK's public health strategy white paper (HM Government 2010) includes reference to green space access, quality of the environment and the challenges of climate change, and includes mention of the Campaign for Greener Healthcare. Public health objectives and local decision-making are an opportunity to act. However, there is disjunction between policy and practice. There is currently a crisis in public parks management, with many UK councils considering selling green spaces.

CULTURAL AND ECOSYSTEM SERVICES

Chair: Professor Steve Albon (James Hutton Institute)

Speakers: Professor Andrew Church, Dr Rob Fish

Session summary: *The natural environment provides us with spaces we value culturally and where we can do things that allow us to flourish. Cultural ecosystem services are not life-saving but life enriching and enhancing. While measuring cultural ecosystem services provides an intellectual and technical challenge it can be done.*

Summary of speaker presentation:

Professor Andrew Church (University of Brighton) and Dr Rob Fish (University of Exeter) (joint presentation)

- In the context of the UK National Ecosystem Assessment (UK NEA) and its follow on (NEAFO), the concept of cultural ecosystem services provides a distinctive way of thinking about values or benefits and conveys how ecosystems enrich our lives as individuals, family members or communities. They are non-material/intangible and non-economic benefits that provide cultural identity, heritage value, spiritual experience etc.. They may result in differentially valued goods (e.g. food and drink of local provenance) or can be reflected in practices.
- Cultural ecosystem services are not awaiting discovery by people; they are constructed by the interactions of people and environments. This is also true for other ecosystem services but this fact is often overlooked.
- Measurement of cultural ecosystem services can be facilitated by using the NEAFO framework, i.e. measuring the size and quality of an environmental space and number of

people using it, as well as tranquillity maps and sense of place. This can be combined with participatory discussions about perceptions of cultural ecosystem services.

- Scenarios and future options can be considered, and Cultural Ecosystem Services can be incorporated in the models developed in NEAFO. Cultural Ecosystem Services are increasingly considered in land use planning, e.g. National Park Management Plans.
- Challenges in the measurement of cultural ecosystem services are: capturing ephemerality; capturing interactions between ecosystem services and dynamics such as social changes and changes in preferences.

NATURAL CAPITAL MAPPING

Chair: Nick Dales (Natural England)

Speakers: Dr John Watkins, Dr Jonathan Winn

Session summary: *The existence of maps and web-based mapping tools and their value needs to be communicated to practitioners e.g. through the Ecosystems Knowledge Network. Maps are excellent communication and visualisation tools and can communicate complex information effectively to a wide audience. To assist those Mapping Natural Capital and practitioners using them, it would be helpful if there was greater standardisation of data sources/types. There is a trade-off between the desire for accuracy and the resources available to produce maps. Understanding uncertainty is important, especially if/when they are made available to a large number of interested people. At the local level, use of citizen science for ecosystem service and natural capital data collection could help reduce uncertainty.*

Summary of speaker presentations:

Nick Dales (Natural England)

- Maintaining and improving natural assets has substantial economic benefits; these will be maximised if their full value is incorporated into decision-making. Thus far, some assets are currently not being used sustainably and the benefits we derive from them are at risk.
- Understanding where natural capital assets are located and who benefits from them enables targeted efforts in the right places. Mapping does not only provide effective communication and visualisation tools, but also assists land managers, environmental practitioners, local authorities and others to take natural capital into account in decision-making (Dales et al 2014).
- Though there are now many examples of mapping ecosystem services, many challenges remain.

Dr John Watkins (Centre for Ecology and Hydrology)

- Ecosystem service valuation leads to a demand for informational products that work across scales, using site-based, earth observation and modelled data. Natural capital mapping requires access to comprehensive site-level data as well as national coverage data sets.
- Metrics for natural capital and extrapolation models have been developed to produce scalable national maps.

- These maps need to be investigated to understand the variability and power of the underlying predictions. The ECOMAPS application has been developed to enable researchers to produce and explore models and maps in this way (Henry 2014).

Dr Jonathan Winn (Scottish Wildlife Trust)

- We need to map natural capital because in order to include it in decision-making we need to know where it is. The EcoServ-GIS model was developed for the Wildlife Trusts to save time and money to show where natural capital delivers benefits to people. This includes the general countryside (non-designated sites), the local planning and green infrastructure context; cultural services are included in the model.
- EcoServ-GIS models compile the best available information and as much “surveyed” information data as possible on natural capital in one place. The natural capital stock (BaseMap) is then linked to ecosystem service attributes, including ecosystem services capacity, service demand areas and service benefitting areas (Bellamy & Winn 2013).
- Maps can be used to publicise and promote the importance of natural capital and raise awareness of the areas we already know are important to the general public as well as grant bodies. They can also help to better understand the value of non-designated sites and identify areas for targeted habitat creating and restoration to benefit people.

NATURAL CAPITAL - THE NEXT 25 YEARS

Chair: Professor Rosie Hails (Centre for Ecology and Hydrology and NCI Chair)

Speakers: Dr Julian Harlow, Professor Georgina Mace, Professor Giles Atkinson, Ian Dickie

Session summary: *There is a growing appreciation in government and policy circles on the importance of economic valuation of the environment, as well as the impact and influence of the environment on human wellbeing. The session summarised the work of the Natural Capital Committee (NCC) an independent advisory body that provides advice to the government on how to protect and improve England’s natural capital.*

Summary of speaker presentations:

Dr Julian Harlow (Department for Environment, Food and Rural Affairs)

- The Natural Capital Committee (NCC) has been set up to address the challenges in assessing and valuing natural capital. The role of the NCC is to:
 - * Provide advice on when, where and how natural assets are being used unsustainably, for example in a way that takes us beyond some acceptable limits or non-linearity thresholds, or in a way that diminishes some measure of comprehensive wealth;
 - * Advise the Government on how it should prioritise action to protect and improve natural capital, so that public and private activity is focused where it will have greatest impact in improving wellbeing in society. This will include advising the Government on tools and methodologies, to ensure that the value of natural capital is fully taken into account in policy decisions and in economic planning; and,
 - * Advise the Government on research priorities to improve future advice and decisions on protecting and enhancing natural capital. The Committee’s advice in this area will reflect consultations with the Research Councils and the academic community.

- The Committee has started work to develop metrics to measure natural capital and a risk register of natural capital assets. It has also published two state of natural capital reports; the third, due to be published in January 2015, will present a long-term investment framework which will outline some potential priority investments in natural assets (Natural Capital Committee 2015).

Professor Georgina Mace (University College London (UCL))

- The NCC has developed a risk register, which lists all possible risks to the benefits derived from natural capital, along with an indication of their likelihood and potential impact as well as responsibilities for addressing these risks.
- Within the register, a target level has been defined for the benefits from natural capital. The register examines whether the current level of benefits is above or below this level.
- The work has identified a number of benefits at high risk including: clean water from uplands, wildlife across most areas, wild fisheries, air quality, carbon storage in upland habitats and outdoor recreation linked to the provision of urban green spaces.

Giles Atkinson (LSE)

- The Committee, working with the Office for National Statistics (ONS) and Defra, has also helped progress the development of National Natural Capital Accounts which is complementary to the risk register. This has been developed based on the United Nations' System of Environmental-Economic Accounts.
- An established organising framework will deliver consistency, replicability and transparency. Natural capital accounts can be linked to national accounts, such as income and product accounts and balance sheets.

Ian Dickie (economics for the environment consultancy (efftec))

- Good case studies are available that show examples of where investments in natural capital have been made in the form of protection or improvement measures that have provided positive returns.
- This is true for both returns on investment in the conventional sense - e.g. restoring fish stocks has proven beneficial for the UK economy, as well as in non-market terms - such as bog restoration - which is difficult to measure in economic terms.
- However, scaling up is a complex issue and as some benefits might change significantly based on scale, it is difficult to forecast potential returns.

Discussion:

- It was clarified that the focus of the NCC is England; however, there are definite implications of the conclusions in the Committee's report for our consumption patterns as well as our decisions regarding land use and natural capital in other countries.
- The NCC advises government on a strategic level but in order to safeguard natural capital, local level implementation will be necessary.
- There was a call for opportunity mapping and prioritisation. Proposed natural capital investment initiatives will make the case for priorities in investment to maximise benefits.

PARTNERSHIPS FOR LAND AND WATER MANAGEMENT

Chair: Professor Ed Maltby (University of Liverpool)

Speakers: Alistair Maltby, Professor Ed Maltby, Natasha Barker Bradshaw

Panellists: Dominic Martin (Environment Agency), Helen Dunn (Department for Environment, Food and Rural Affairs), Steve Fletcher (Plymouth University)

Session summary: *Partnerships can be driven by legislation but this is not a necessity to guarantee success. Partnerships can work, and seeing and understanding the value of the partnership can motivate sustained participation. However, understanding when to take a partnership approach – and how - requires further research. Planning and management on a large scale – e.g. catchment, coastal zones, seas – relies on good data, both scientific findings and evidence provided by local stakeholders. There is additional value to be gained from working together and sharing data.*

Summary of speaker presentations:

Alistair Maltby (Rivers Trust)

- Since Defra introduced a catchment based approach in November 2013, working in partnerships between NGOs, statutory bodies, water companies, business & industries and communities has become the norm in water management.
- Working in partnership requires good data on the causes of underlying environmental problems and ways to fix it. Effective partnerships can also help to gather good data.
- Examples of successful partnerships include United Utilities Catchment Wise Pilots, the Wandle / South East Rivers Trust (SERT) monitoring and implementation of sustainable drainage systems and the Action for River Kennet project.

Professor Ed Maltby (University of Liverpool)

- Experience from the Devon Maritime Forums shows partnership working provides a channel for effective communication, influence and action.
- Partnerships need to encapsulate different views from a broad and balanced membership reflecting all interests. A “forum voice” needs to condense findings in order to make recommendations to government.
- Evidence from local stakeholders need to be recognise alongside scientific findings (Devon Maritime Forum, 2014)

Natasha Barker Bradshaw (Celtic Seas Partnership, WWF-UK)

- The Celtic Seas Partnership aims to support the delivery of a Good Environmental Status in the Celtic Seas by facilitating engagement between sectors and across borders to ensure the long term future of the environment, while safeguarding people’s livelihoods and the communities that have a relationship with the sea (Celtic Seas Partnership, 2015).
- The project develops resources such as a data portal, established guidelines and held workshops and engagement activities.
- Experience and mechanism in the marine environment are limited. Questions remain on how voluntary partnerships can be maintained. Ideas include: using an ecosystem approach, allowing participation and co-construction of assessments and solutions.

MANAGING LAND FOR THE BENEFIT OF SOCIETY

Chair: Dr Ruth Waters (Natural England)

Speakers: Professor Richard Brazier, Lewis Jones, Dr Tom Nisbet

Session summary: *Large organisations like water companies can take long-a term view and also see value of funding actions that produce multiple benefits (including but also beyond effects on water). Very long-term monitoring is needed in order to understand effects of interventions/restoration – especially on flood risk. Considering innovations e.g. carbon credits may help encourage organisations to contribute to these types of actions. The effects of water management actions cannot always be quantified, but that should not stop us from taking actions to restore water/catchment systems.*

Summary of speaker presentations:

Professor Richard Brazier (University of Exeter) & Lewis Jones (South West Water) (joint presentation)

- The Mires-on-the-Moors project in the river Exe catchment shows that moorland restoration can be valuable from a water company perspective in terms of water storage and water quality, so the overall costs and benefits of asset management. However, understanding the value of carbon storage, agricultural productivity, the historic environment and the cultural value shows that a holistic understanding / evidence is most compelling.
- The project shows that the moorland restoration does not only lead to environmental benefits such as enhanced water storage, improved water quality, less CO₂ emissions and increased biodiversity, but also potential socio-economic benefits, such as reduced water treatment costs and benefits from carbon sequestration in cooperation with land managers.
- With little loss in agricultural productivity, the economic value of moorland restoration to South West Water amounts to £78.5/ha, i.e. £157,000 per year for 2000 hectares restored post 2015.

Dr Tom Nisbet (Forest Research)

- There is strong evidence to support woodland creation in appropriate locations to deliver water and other ecosystem services (Nisbet et al 2011).
- Targeted woodland creation (the right tree in the right place) can be an effective measure for reducing flood risk, tackling diffuse pollution and alleviating thermal stress.
- There is a strong case for woodland solutions to be delivered through catchment level planning supported by opportunity mapping and appropriate incentives/payments.

CORPORATE STEWARDSHIP

Chair: Stuart Poore (WWF-UK)

Speakers: Dr Gemma Cranston (Cambridge Institute for Sustainability Leadership), David Norman (SAB Miller)

Session summary:

Businesses can draw benefit from an understanding of their natural capital impacts and value at risk in their supply chains. Good regulation that succeeds in levelling standards is important.

Supporting points:

- There is a need for standard repeatable methodologies.
- Companies depending on natural capital assets welcome good joined-up regulation. Those with complex supply chains are interested in the resilience of these supply chains.
- Budget holders within companies are better convinced by the value of risk analysis than by valuation of natural capital in itself.

NATURAL CAPITAL AND FOOD SECURITY

Chair: Dr Peter Costigan (Independent Consultant)

Speakers: Dr Tara Garnett, Environmental Change Institute; Professor Allan Buckwell, Institute for European Environmental Policy (IEEP); Dr Andrew Clark, National Farmers Union (NFU).

Key message:

Progress in sustainable food production is needed but is currently insufficient. An appropriate marketplace that values natural capital and environmental stewardship, incentivising producers and consumers to provide and buy food for optimal nutrition, within a set carbon budget is needed.

Supporting points:

- The food security challenge should be redefined as the search for optimal nutrition within a carbon budget, taking into account yields, waste and future diets.
- There have been some successes in agri-environment schemes and pesticide stewardship. It will be possible to build on these; providing conservation with guaranteed income is a way out of the volatility of traditional farming.
- The next generation of farmers is more aware of food security and wider environmental issues. However, they require an appropriate marketplace in which to work.
- Barriers include insufficient will, the slow pace of legislative change and the administrative feasibility of policies such as the Common Agricultural Policy.
- The variation in performance of 'sustainable' intensification represents the huge scope of potential food systems.

NATURAL CAPITAL IN THE METROPOLIS

Chair: Peter Johnson (Kier)

Speakers: Nick Grayson, Euan Hall

Session summary: *Cities are the places where most of the UK population live and work. As such, they can be powerful drivers and agents of change. There is mounting evidence, for example, that urban green spaces provide both a wide range of benefits including improving people's health.*

Summary of speaker presentations:

Nick Grayson (Birmingham City Council)

- The 2009 Copenhagen Climate Change Summit marked a point where cities began to see themselves as major agents of change in the quest for sustainable development. In the UK, Birmingham has taken a pioneering approach and Birmingham City Council, working with Birmingham City University, has built a climate model up to 2021 for different areas of the city.
- Birmingham became the first city in the UK to conduct an ecosystem assessment for the city, based on the National Ecosystem Assessment (UK NEA) methodology. Birmingham used a geographic information system (GIS) to create a 'multi- challenge map' showing the local population's dependence on natural capital. This can be laid next to a map of 'excess years of life lost'. This is a 'coincidence map', with close alignment between the two. The natural capital maps now inform planning development in the city.
- There is a need to move from "business-as-usual" and to demonstrate the multiple benefits and financial added value from development, rather than the traditional approach of showing the environment as a cost on balance sheets. Retrofitting cities and 'greening' is the next challenge and will require a global movement.

Euan Hall (The Land Trust)

- Derelict land can be taken over by antisocial elements when society withdraws from these spaces. There is evidence for the effect of isolation from nature and green space on mental health.
- The Land Trust restores and manages derelict land which translates into improvements in wellbeing, as well as into property values. Case studies show that these improvements also result in economic gains; the transformation of Hickleton Colliery into Phoenix Park had an impact on residential property value of approximately £50 million. In the case of the Beam Parklands, innovative approaches to flood risk management have led to £1 million in health benefits, identified through a study by ARUP for the Environment Agency.
- There is a need to assess and quantify health benefits. The Land Trust is part of the 'Natural Health Service' in the north of England. This provides structured health activities that have reached over 40,000 adults, with over 30,000 children taking part in educational activities. Over 53,000 people have attended community events. Around Doncaster, employees of the Land Trust have been speaking to GPs to see if this programme has translated into fewer GP visits from patients.

FINDING THE COMMON GROUND

Chair: Jo Pike (World Forum on Natural Capital)

Speakers: Bruce Wilson, Mike Elm, Mary Christie

Session summary: *There is a requirement for many agencies and actors to work together to improve the natural environment as a national asset to support sustainable economic growth. In Scotland, involving all public bodies in this collaboration creates a more integrated and holistic approach to develop a shared agenda.*

Summary of speaker presentations:

Bruce Wilson & Mike Elm (Scottish Wildlife Trust) (joint presentation)

- The Scottish Forum on Natural Capital was launched by the First Minister for Scotland at the World Forum for Natural Capital in 2013. It aims to enable business and policy makers to make informed decisions about the natural environment and takes a leadership role beyond Scotland. Bringing together more than 60 member organisations including business, finance, NGOs and government, the Scottish Forum concentrates on five areas of work: peatlands, green infrastructure, seas, circular economy and land management.

Mary Christie (Scottish Natural Heritage)

- The Scottish Government integrates natural capital in the following policies: economic strategy (recognising the importance of environment for Scotland's economy), national planning framework, land use strategy and the Biodiversity 2020 strategy.
- The Scottish Natural Capital Asset Index measures changes in natural capital. No monetary values are attached, but the Index is weighted according to the level of ecosystem services delivered by different habitats. It is a measure of sustainability which hopefully will eventually be included in government national performance measures.

NATURAL CAPITAL AND STORYTELLING

An interactive workshop session hosted by the Surrey Wildlife Trust in collaboration with Surrey Connects explored the evolution of environmental management in the UK using the Participatory Narrative Inquiry (PNI) method.

PNI is an approach in which groups work to construct stories of personal experience and knowledge of a topic in order to make sense of complex evolved situations to help with improved decision-making for the future. Sessions are designed to deepen emotional engagement which provides participants not only with reasons but also with motivation to create their chosen change. The goal of the session was to draw out participants' understanding of the topic as well as establishing a collective vision for the future of natural capital management.

Workshop participants were divided six random groups each with six participants. Each constructed their own version of the story of 'natural capital' to date by creating a timeline of the development of the concept, working backwards to identify causative steps. By noting observations starting with where we are in terms of natural capital thinking and implementation, a description of the past was constructed by working backwards from today. An ideal future (or 'heaven') was described (representing the idealised future in two years')

time 'if everything that could go right, does go right') and then steps to be taken from today to reach this future were plotted. After collecting notes from participants within the groups, a nominated 'storyteller' recounted the events as noted.

Subsequently, similarities, differences and surprises within the stories created and heard were discussed. This helped participants to integrate their knowledge of the past, increase awareness of the present and start to look for a vision for the future of natural capital. There was agreement that, despite high and long-standing awareness of the challenges and objectives of conserving natural capital, there were historic barriers and a dearth of incentives, particularly for land-owners and farmers.

The workshop was designed to serve as a trial; similar sessions could be run with groups who know very little about the subject and serve as a way to engage groups of local businesses, stakeholders, decision-makers, members of the public, schools, education establishments and others to engage them with natural capital and build a collective vision for its future.

The session hosts, Surrey Wildlife Trust and Surrey Connects, prepared a summary report of the workshop. This full report of the session is available online: <http://www.naturalcapitalinitiative.org.uk/wp-content/uploads/2014/11/VoLSS2014-Storytelling-session-report.pdf>

DEVELOPING NATURAL CAPITAL FOR INVESTORS

Chair: Dr Sarah Kemmitt (Bank of England and Treasurer, Natural Capital Initiative)

Speakers: Stephanie Maier, Jamie Butterworth, Anders Nordheim

Additional panellist: Justin Atkinson (Alliance Trust)

Session summary: *The natural capital approach is gaining traction in the financial sector. Certain companies and investors are finding value in the natural capital concept; its application assists in identifying and reducing business risks and creating sustainable business models. However, policy and regulation is needed to mainstream the approach and align short term and long term benefits.*

Summary of speaker presentation:

Jamie Butterworth (Ellen MacArthur Foundation)

- The circular economy refers to an industrial economy that is restorative by intention. A circular economy aims to: rely on renewable energy, eradicate waste through careful design and minimise, track, and ideally eliminate the use of toxic chemicals.
- Case studies demonstrate companies which already see the economic benefits of reusing materials; taking a natural capital approach can decouple growth from resource constraints.
- Experimental new business models are arising, whereby customers pay for access to a service or benefit which was traditionally provided via direct ownership of a product. For example, a car manufacturer retains ownership of a vehicle which is leased by the consumer; this enables the car manufacturer to reuse components and ensure externalities are internalised.

- New business and product opportunities emerge from circular economy thinking (e.g. mushroom-based consumable packaging, which may replace polystyrene).
- Scaling-up these opportunities is the next challenge in expanding the circular economy. Companies that apply these principles may be attractive to investors, which take a longer term view, such as pension funds and insurance firms.

Stephanie Maier (Aviva Investors)

- Stephanie addressed the questions 'How does the incorporation of social and environmental considerations help companies to make better investment decisions?' and 'How can the natural capital approach add value?'
- Companies are increasingly appreciating that their business models rely on natural capital. However, identifying the ecosystem products and services on which they are dependent can be a complex task. Often, companies which have very long supply chains fail to understand or oversee them well and this presents risks to their business.
- Sound natural capital stewardship requires focussed policy and regulation to prevent companies gaining a competitive advantage in the short term by ignoring their negative impacts on natural capital. Internalising key externalities will only be done by companies when they are required to comply with requirements for environmental and social reporting. Compilation and disclosure of this data will enable it to be integrated into the decision-making processes of both the company and its investors.

Anders Nordheim (United Nations Environment Programme-Finance Initiative, Natural Capital Declaration)

- The UNEP Finance Initiative was founded in 1992 to connect the United Nations with the financial sector and act as a catalyst for system change that would contribute to a more sustainable world.
- Natural capital has increasingly gained attention in the financial sector. The Natural Capital Declaration, launched in 2012, requires signatory corporations, investors and governments to commit to the integration of natural capital considerations into private sector reporting, accounting and decision-making by 2020.
- The Natural Capital Declaration (Mulder et al. 2013) is working to develop tools:
 - i) for financial institutions to facilitate natural capital accounting and valuation becoming more mainstream;
 - ii) to incorporate water risk into corporate bond valuation and credit ratings;
 - iii) to develop a roadmap for policy makers on how to set up capital markets that are fit for purpose; and
 - iv) to incorporate environmental risk into sovereign debt credit ratings. This aims to improve analysts' understanding of sovereign credit risk resulting from links between natural resource degradation, economic productive capacity and consumption levels.

APPENDIX 3—DELEGATE LIST

Name	Organisation
Mike Acreman	Natural Capital Initiative
Matthew Agarwala	London School of Economics
Phil Aspden	Arup
Sadia Ahmed	Microsoft Reserach
Steve Albon	James Hutton Institute
John Allan	King's College London
Irma Allen	
Maricon Alojado	Natural Environment Research Council (NERC)
Victor Anderson	Global Sustainability Institute, Anglia Ruskin University
Daija Angeli	Natural Capital Initiative
Steve Arnold	Environment Agency
Nick Atkinson	The Woodland Trust
Justin Atkinson	Alliance Trust
Giles Atkinson	London Scool of Economics
Julia Baker	Parsons Brinckerhoff
Chris Baldock	Trucost
Martin Ballard	Willmott Dixon Group
Natasha Barker Bradshaw	Celtic Seas Partnership, WWF-UK
Tatsiana Barychka	University College London
Leyla Basacik	CDP
Laura Bellingan	Natural Capital Initiative
Emma Berry	Surrey Wildlife Trust
Olivia Bertham	
Luke Blower	Climate Disclosure Standards Board
Philip Bowsher	The Parks Trust
Richard Bradbury	RSPB
Richard Brazier	University of Exeter
Allan Buckwell	Institute for European Environmental Policy (IEEP)
Ged Buffee	LIFE Institute (LIFE Biodiversity Certification)
Paul Burgess	Cranfield University
Bill Butcher	eCountability
Charlie Butt	BirdLife International
Dominique Butt	Natural Environment Research Council (NERC)
Jamie Butterworth	Ellen MacArthur Foundation
Jackie Caine	Natural Capital Initiative
Rory Canavan	Arup
Richard Carden	St George's House, Windsor
Melanie Challis	Environment Agency
Joanne Chamberlain	NERC Centre for Ecology & Hydrology
Sandra Charity	WWF
Sarah Jane Chimbwandira	Surrey Wildlife Trust
Mary Christie	Scottish Natural Heritage
Andrew Church	University of Brighton

Name	Organisation
Andrew Clark	National Farmers' Union (NFU)
Andy Clements	British Trust for Ornithology
James Cole	Cambridge Institute for Sustainability Leadership
Bruce Collinson	East Hampshire District Council
Ben Connor	British Ecological Society
Nigel Scott Cooper	Anglia Ruskin University
Graham Cooper	Environmental Finance
Peter Costigan	Independent Consultant
Adrian Court	Delphi International Ltd
Gemma Cranston	University of Cambridge Institute for Sustainability Leadership (CISL)
Phil Cryle	effec
Nick Dales	Natural England
Glyn Davies	WWF-UK
Helen Davies	ADAS UK Ltd
Nick Dearden	World Development Movement
Ian Dickie	effec
Robin Dickinson	
Daniela Diefenbacher	Society of Biology
Joep Dirx	Wageningen UR
Lynne Donald	Maersk Drilling
Ron Donaldson	Ecology of Knowledge Ltd
Deanna Donovan	Joint Nature Conservation Committee
Mark Downs	Society of Biology
Alex Duffy	Natural Environment Research Council (NERC)
Helen Dunn	Defra
Jane Durney	BRE
Sally Eaton	Royal Botanic Garden Edinburgh
Catherine Early	The Environmentalist
Felix Eigenbrod	University of Southampton
Karen Ellis	WWF
Mike Elm	Scottish Forum on Natural Capital
Bridget Emmett	Centre for Ecology & Hydrology
David Entwisle	British Geological Survey
Vanessa Evans	Fauna & Flora International
Will Evison	Natural Capital Initiative Steering Group / PwC
Akhmad Fauzi	Dept. of Resource & Environmental Economics, Bogor Agricultural University
Joe Ferris	BMT Cordah
Rob Fish	University of Exeter
Zomo Fisher	Accenture Sustainability Services
Penny Fletcher	Society of Biology
Steve Fletcher	University of Plymouth
Carlota Garcia-Manas	EIRIS
Sarah Gardner	Natural Capital Initiative Steering Group & Gardner Lobo Associates
Tara Garnett	Food Climate Research Network
Marcus Gilleard	National Trust

Name	Organisation
Alessandro Gimona	The James Hutton Institute
Peter Giovannini	RBG Kew
Rosalind Goodrich	International Institute for Environment and Development (IIED)
Iain James Gordon	James Hutton Institute
Mark Gough	The Crown Estate
Hilary Graham	University of York
Nick Grayson	Birmingham City Council
Jonathan Green	Institute for Sustainability Leadership, University of Cambridge
Andy Griffiths	Nestle UK
Rosie Hails	Natural Capital Initiative
Euan Hall	The Land Trust
Emma Harding	Environment Agency
Richie Hardwicke	Trucost
Serene Hargreaves	Royal Botanic Gardens, Kew
Julian Harlow	Department for Environment, Food and Rural Affairs (Defra)
Jim Harris	Cranfield University
Barnabas Harrison	Accenture Sustainability Services
Genevieve Hayes	BirdLife International
Karen Haysom	Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT)
Prof Louise Heathwaite	Lancaster University
James Hepburne Scott	Forest Carbon Ltd
Fiona Hesselden	Uni. of Huddersfield, Centre for Sustainable & Resilient Communities
Alison Hester	Natural Capital Initiative
Rowland Hill	M&S
Stephanie Hime	KPMG
David Hodd	Natural Capital Initiative
Zoe Holden	Cranfield University
Stacey Hopkins	ARGANS
Ulrike Hotopp	Department for Environment, Food and Rural Affairs (Defra)
Bruce Howard	Ecosystems Knowledge Network
Alex Hudson	Royal Botanic Gardens, Kew
Mike Image	ADAS UK Ltd
Serena Jarvis	
Peter Johnson	Kier Group
Lewis Jones	South West Water
Roly Keating	British Library
Sarah Kemmitt	Natural Capital Initiative Steering Group & Bank of England
Robert Kenward	IUCN Sustainable Use and Livelihoods Specialist Group
Simon Kerley	Natural Environment Research Council (NERC)
Anthony Kessel	Public Health England
Jawed Khan	Office for National Statistics
Johanna Kieniewicz	Natural Capital Initiative Steering Group & British Library
Steven King	UNEP World Conservation Monitoring Centre (UNEP-WCMC)
David Kipling	Marine Conservation Society
Sari Kovats	London School of Hygiene and Tropical Medicine

Name	Organisation
Sarah Krisht	effec
Alex Learmont	Surrey Wildlife Trust
Paul Leonard	Natural Capital Initiative Steering Group
Les Levidow	The Open University
James Luger	Ofgem
Tiziana Luisetti	Cefas
Jane Lusardi	Natural England
David Lyon	Irbaris LLP
Georgina Mace	University College London
Gareth Maer	Heritage Lottery Fund
Stephanie Maier	Aviva Investors
Edward Maltby	Devon Maritime Forum
Alistair Maltby	The Rivers Trust
Ceri Margerison	Natural Capital Initiative
Supatra Tharinee Marsh	Society of Biology
Dominic Martyn	Environment Agency
Lindsay Maskell	Centre for Ecology & Hydrology
Dorothy Maxwell	Global View Sustainability Services
Linda May	Centre for Ecology & Hydrology
Cllr Melissa Maynard	East Hampshire District Council
Holly McCain	University of Nottingham
Emily McKenzie	WWF-UK
Ehsan Masood	Research Fortnight
Angus Middleton	Landmark Information Group
William Milliken	Royal Botanical Gardens, Kew
Diane Mitchell	National Farmers' Union
Paul Morling	RSPB
Sian Morse-Jones	Fauna & Flora International
Sarah Mukherjee	Water UK
Tom Nisbet	Forest Research
Anders Nordheim	Natural Capital Declaration
Hazel J Norman	British Ecological Society
David Norman	SABMiller
Lisa Norton	Centre for Ecology & Hydrology
Tom Oliver	Centre for Ecology & Hydrology
Tim O'Riordan	University of East Anglia
Steve Ormerod	Cardiff University and RSPB Council
Lynne Osgathorpe	RSPB
Stuart Otway	Defence Infrastructure Organisation
Roger Peter Owen	
Ece Ozdemiroglu	Natural Capital Initiative Steering Group & effec
Alexandra Panait	Rewilding Europe
Eleni Papathanasopoulou	Plymouth Marine Laboratory
Neil Parker	Environment Systems
Karen Patel	Society of Biology

Name	Organisation
Mark Pearson	Surrey Connects
Kelvin Peh	University of Southampton
David Pencheon	NHS England
Mark Phillips	Natural England
Jo Pike	World Forum on Natural Capital
John Pinel	States of Jersey
Inder Poonaji	Nestle S.A.
Stuart Poore	WWF
Emma Powell	Ofgem
Drew Purves	Microsoft Research
Dan Rapson	The National Trust
Susanne Raum	Imperial College London
Mark Robbins	Edgioc Consulting
Ellie Robinson	National Trust
Jim Rouquette	University of Northampton
Toby Roxburgh	WWF-UK
Alexander Royan	British Ecological Society
Duncan Royle	eftec
Arjan Ruijs	PBL Netherlands Environmental Assessment Agency
Erica Russell	BSK CiC (Business Support Kent Community Interest Company)
Filipa Saldanha	Calouste Gulbenkian Foundation
Rachel Salvidge	ENDS
Alex Saponja	Interserve Construction Ltd
Ingo Schuder	Wild Oxfordshire LNP
Nathalie Seddon	Biodiversity Institute, University of Oxford
Anita Sedgewick	Society of Biology
Charlotte Selvey	Zoological Society of London
Mike Sewell	Kier Group
Ravi Sharma	UN Convention for Biological Diversity
Alison Smith	Environmental Change Institute, University of Oxford
Matt Smith	Joint Nature Conservation Committee (UK)
Richard Smithers	Ricardo-AEA
Dr Pat Snowdon	Forestry Commission
Richard Spencer	Institute of Chartered Accountants in England and Wales
James Spurgeon	Sustain Value
Eleanor Stewart	Sir Robert McAlpine
Rosemary Stewart	URS
Tim Sunderland	Natural England
William Sutherland	University of Cambridge
Julie Swain	Defence Infrastructure Organisation
Sally Thomas	The Scottish Government
Camilla Toulmin	IIED—International Institute for Environment and Development
Ramsay Urquhart	Alliance Trust
Gregory Valatin	Forest Research
Christina van Breugel	COWI A/S

Name	Organisation
Pieter van der Gaag	Natural Capital Coalition
James Vause	Department for Environment, Food and Rural Affairs (Defra)
Steve Venton	Independent Consultant
Juliet Vickery	RSPB
Max Volpi	NERC
Ruth Waters	Natural England
John Watkins	Centre for Ecology and Hydrology (CEH)
Paul Watkinson	Scottish Natural Heritage
Allan Watt	Natural Capital Initiative
William Watts	Independent Consultant
Kerry Waylen	The James Hutton Institute
Anita Weatherby	Centre for Ecology & Hydrology
Jim Wharfe	UKWRIP
Piran White	University of York
Mathew White	European Centre for Environment & Human Health, University of Exeter
John Whitfield	Research Fortnight
Charlotte Whitham	Beijing Forestry University & University of Oxford
Paul Wickham	Surrey Wildlife Trust
Paul Wilkinson	The Wildlife Trusts
Linda Wilkinson	Interserve Construction Limited
Bronwen Williams	Centre for Ecology & Hydrology
Bruce Wilson	Scottish Wildlife Trust
Neil Andrew Windett	
Jonathan Winn	Scottish Wildlife Trust
Tom Wood	WSP Parsons Brinckerhoff
Weigang Yan	Centre for Ecology & Hydrology
Peter Young	Aldersgate Group
Jonathan Wentworth	Parliamentary Office of Science and Technology

REFERENCES

Acheson, D., 1988. Committee of Inquiry into the Future Development of the Public Health Function. Public health in England. London: HMSO.

Aldersgate Group, 2011. Pricing the Priceless. The business case for action on biodiversity. Available from <http://www.aldersgategroup.org.uk/asset/download/472/Business%20and%20Biodiversity.pdf>

Bellamy, C. & Winn, J., 2013. EcoServ-GIS Version 1: A Wildlife Trust toolkit for mapping multiple ecosystem services. Durham Wildlife Trust. Available from <http://www.durhamwt.com/wp-content/uploads/2012/06/EcoServ-GIS-Executive-Summary-Only-WildNET-Jan-2013-9-pages.pdf>

Celtic Seas Partnership, 2015. Celtic Seas Partnership Project (Accessed 26 February 2015). Available from <http://celticseaspartnership.eu>

Conway E. 2009. The Telegraph. Telegraph Media Group, London; IMF Puts Total Cost of Crisis at £7.1 Trillion.

Dales, N. P., Brown, N.J., & Lusardi, J., 2014. Assessing the potential for mapping ecosystem services in England based on existing habitats. Natural England Research Reports, Number 056. Available from <http://publications.naturalengland.org.uk/publication/5280919459987456?category=7005>

Devon Maritime Forum, 2014. Holding the Line? Reviewing the impacts, responses and resilience of people and places in Devon to the winter storms of 2013/2014. Summary Report from the Devon Maritime Forum. (Accessed 26 February 2015). Available from <http://www.devonmaritimeforum.org.uk/images/stories/DMFdocuments/DMFmeetingArchives/2014Autumn/DMF%20Storms%2013-14%20Summary%20Report.pdf>

HM Government, 2010. Healthy Lives, Healthy People: our strategy for public health in England. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216096/dh_127424.pdf

Mulder, I., Mitchell A.W., Peirao, P., Habtegaber, K., Cruickshank, P., Scott, G., Meneses, L., 2013. The NCD Roadmap: implementing the four commitments of the Natural Capital Declaration, UNEP Finance Initiative, Geneva; and Global Canopy Programme, Oxford. Available from http://www.naturalcapitaldeclaration.org/wp-content/uploads/2013/05/ncd_roadmap.pdf

Natural Capital Committee, 2015. The State of Natural Capital: Protecting and Improving Natural Capital for Prosperity and Wellbeing. Third report to the Economic Affairs Committee. Available from <https://nebula.wsimg.com/272833c20f4e7f67e2799595a7f06088?AccessKeyId=68F83A8E994328D64D3D&disposition=0&alloworigin=1>

Natural Environment White Paper, 2011. The Natural Choice: Securing the value of nature. DEFRA, UK. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228842/8082.pdf

Nisbet, T., Silgram, M., Shah, N., Morrow, K., and Broadmeadow, S., 2011. Woodland for Water: Woodland measures for meeting Water Framework Directive objectives. Forest Research Monograph, 4, Forest Research, Surrey. Available from [http://www.forestry.gov.uk/pdf/FRMG004_Woodland4Water.pdf/\\$FILE/FRMG004_Woodland4Water.pdf](http://www.forestry.gov.uk/pdf/FRMG004_Woodland4Water.pdf/$FILE/FRMG004_Woodland4Water.pdf)

Porter, D., 1999. Health, civilization and the state: a history of public health from ancient to modern times. London: Routledge.

Scottish Forum on Natural Capital, 2014. Scottish Natural Capital Survey 2014. Edinburgh, UK. (Accessed 26 February 2015). Available from <http://naturalcapitalscotland.com/article/business-leaders-believe-urgent-action-is-necessary-for-scotlandrsquos-natural-environment/>

WWF, 2014. Living Planet Report 2014: species and spaces, people and places. (McLellan, R., Iyengar, L., Jeffries, B. and N. Oerlemans (Eds)). WWF, Gland, Switzerland. Available from http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/

Natural Capital Initiative: Partner Organisations

Society of Biology



www.societyofbiology.org

The Society of Biology is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of individuals, learned societies and other organisations.

Individual members include practising scientists, students at all levels, professionals in academia, industry and education, and non-professionals with an interest in biology.

Our vision is of a world that understands the true value of biology and how it can contribute to improving life for all.

Our mission is to be the unifying voice for biology, to facilitate the promotion of new discoveries in biological science for national and international benefit, and to engage the wider public with our work.

Centre for Ecology and Hydrology



www.ceh.ac.uk

The Centre for Ecology & Hydrology (CEH) is the UK's Centre of Excellence for integrated research in terrestrial and freshwater ecosystems and their interaction with the atmosphere.

As part of the Natural Environment Research Council, we provide National Capability based on innovative, independent and interdisciplinary science and long-term environmental monitoring, forming an integral part of NERC's vision and strategy.

Working in partnership with the research community, policy-makers, industry and society, we deliver world-class solutions to the most complex environmental challenges facing humankind. CEH is a member of PEER (the Partnership for European Environmental Research).

British Ecological Society



www.britishecologicalsociety.org

The vision of the British Ecological Society is to advance ecology and make it count.

Ecology is the scientific study of the distribution, abundance and dynamics of organisms, their interactions with other organisms and with their physical environment. At a time when finite natural resources are being used at increasing rates, it has never been more important for human society to understand its impact on ecological systems and their importance in maintaining human health.

The BES's many activities include the publication of a range of scientific literature, including five internationally renowned journals, the organisation and sponsorship of a wide variety of meetings, the funding of numerous grant schemes, education work and policy work. The Society also runs supporting initiatives such as the gratis book scheme which aims to make ecology publications available to those who couldn't otherwise obtain them.

The Society was established in 1913 and has approximately 5,000 members worldwide, and membership is open to all with an interest in ecology. There is a small membership fee, with discounts for students and those from low income countries.

The Society is funded through income from subscriptions, publications and its investment portfolio. It is an independent organisation that receives little outside funding.

James Hutton Institute



www.hutton.ac.uk

The James Hutton Institute brought together the Macaulay Land Use Research Institute and SCRI on 1 April 2011.

The new organisation combines existing strengths in crops, soils and land use and environmental research, and will make major, new contributions to the understanding of key global issues, such as food, energy and environmental security, and developing and promoting effective technological and management solutions to these.

The James Hutton Institute is an internationally networked organisation and operates from multiple sites, including two main ones in Scotland at Aberdeen and Dundee. It employs more than 600 scientists and support staff, making it one of the biggest research centres in the UK and the first of its type in Europe. The institute is one of the Scottish Government's main research providers in environmental, crop and food science and will have a major role in the Scottish knowledge economy.

James Hutton (1726 – 1797) was a leading figure of the Scottish Enlightenment, an eighteenth century golden age of intellectual and scientific achievements centred on Edinburgh. He is internationally regarded as the founder of modern geology and one of the first scientists to describe the Earth as a living system. His thinking on natural selection influenced Charles Darwin in developing his theory of evolution.

About the Natural Capital Initiative (NCI)

Our Mission

The Natural Capital Initiative's mission is to support decision-making that results in the sustainable management of our natural capital based on sound science. We aim to do this by: Initiating and facilitating dialogue between people from academia, policy, business and civil society who make or influence decisions to find shared solutions and approaches; and communicating independent, authoritative synthesis and evaluation of the scientific evidence base.

Our Aim

To be the UK's leading forum through which decision-makers from academia, business, civil society and policy can engage in meaningful cross-disciplinary and cross-sectorial dialogue on how to embed natural capital thinking in policy and practice, based on the best available evidence from across the natural and social sciences.

Our Values

The Natural Capital Initiative champions:

- Policy- and decision-making based on scientific evidence.
- Interdisciplinary, cross-sector engagement.
- A whole-systems perspective that seeks to develop our resilience to change.
- A positive approach that aims to identify pragmatic solutions.

Contact Us

Web: www.naturalcapitalinitiative.org.uk

Email: secretariat@naturalcapitalinitiative.org.uk

Twitter: @NCI_NatCap