



VALUING NATURE PROGRAMME

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TOWARDS A NATURAL ASSETS RESEARCH AND INNOVATION AGENDA IN SUPPORT OF UK BUSINESS AND POLICY

Report on the Workshop & Conference, February 2020

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Authors: Guy Duke
Business Champion, Valuing Nature Programme Coordination Team
Peter Young
Chair, Valuing Nature Programme Business Interest Group

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EXECUTIVE SUMMARY

1. This report presents output from two closely-related Valuing Nature Programme events, which took forward thinking on an emerging Natural Assets Research and Innovation (R&I) Agenda in Support of Business and Policy:¹
 - **A cross-sector workshop** ‘Towards a Natural Assets R&I Agenda in Support of Business and Policy’ (The Royal Society, London, 12 February 2020)
 - **A conference** ‘Valuing Nature Research and Innovation in Support of Business’ (The Royal Society, London, 21 February 2020)

The two events involved a mix of invited business, academia, public and third sector representatives with business predominating.
2. This report aims to help all relevant parties – business, academia, government and third sector – to understand how the emerging Natural Assets R&I Agenda in Support of Business and Policy is forming.
3. This report provides key points from conference keynote addresses, and output from breakout sessions at the two events. These sessions:
 - Shared, validated and elaborated R&I needs previously identified;
 - Identified examples of relevant business activity and R&I;
 - Considered the pros and cons of delivery options for the R&I Agenda.
4. The two events built on considerable previous work involving three sector round tables with the infrastructure, land management and insurance / financial services sectors; an *Analysis & Options* paper; and a consultation with the policy community.²
5. The *Analysis and Options* paper identified 7 broad categories of R&I need:
 - 1) Basic research on natural assets.
 - 2) Data for business.
 - 3) Frameworks, standards, models, metrics and other tools for business.
 - 4) Pilots, demonstration, scaling of new business models and solutions.
 - 5) Developing natural asset markets, and stimulating investment in business solutions.
 - 6) Assessing risks and resilience in relation to natural assets.
 - 7) Knowledge exchange, training and capacity-building.
6. The two events demonstrated the validity of these seven categories, further elaborated the needs in each category, provided examples of relevant ongoing work (by business, academia, the policy community and third sector) and provided further reflection on the delivery options.

1 The term ‘natural assets’ is taken here to incorporate the concepts of natural capital (stocks), ecosystem services (flows) and biodiversity

2 Round Table reports, ‘Analysis and options’ paper and report on policy consultations available here: <https://valuing-nature.net/business-round-tables>

7. The two events demonstrated a very considerable strength of interest, energy and willingness to engage around the emerging *Natural Assets R&I Agenda in Support of Business and Policy*, from the business community, policy community, third sector and academia.
8. The emerging *R&I Agenda* is very timely and indeed critically urgent, in relation to the climate, biodiversity and health crises, in relation to current developments in UK and devolved policy, and in relation to growing demands on business to understand and address their risks and opportunities related to, and dependencies on, natural assets.
9. As regards delivery options, there is a strong consensus emerging around the need for a coordinating hub or platform, which can ensure the necessary coherence across the piece, cross-sector synergies, inter- and multi-disciplinarity, and avoid duplication of effort. There is also a sense that strategic programmes and focused projects will have a role to play in taking forward this R&I agenda.
10. Examples of relevant business activity and R&I provided in Section 4 of this report can usefully inform further analysis of what R&I needs are already being addressed, demonstrate considerable existing commitment to, and co-investment potential for, natural assets R&I, and underline the need for coordination across the piece.
11. There remains further work to be done to take forward the emerging *Natural Assets R&I Agenda in Support of Business and Policy* including:
 - Advance the strategic design of a suitable coordinating hub or platform to deliver this R&I Agenda efficiently and inclusively.
 - Determine priorities across the comprehensive set of R&I needs, in terms of delivering greatest benefit to both business and natural assets.
 - Divide identified priorities into meaningful packages of R&I needs.
 - Ensure that these packages take account of existing and ongoing R&I activity and output and build on these.
 - Build relevant coalitions of businesses and other key players around these packages of R&I need.
 - Explore further how industry, NERC and other parts of UKRI, Government and others (e.g. foundations) might respond to meet the identified R&I needs.

1. INTRODUCTION

1.1 Scope of this report

This report presents output from two closely-related Valuing Nature Programme events which took forward thinking on an emerging *Natural Assets Research and Innovation Agenda in Support of Business* (hereinafter, the *R&I Agenda*).³

The two events were:

- **A cross-sector workshop** ‘Towards a Natural Assets R&I Agenda in Support of Business and Policy’ (The Royal Society, London, 12 February 2020).
- **The conference** ‘Valuing Nature Research and Innovation in Support of Business’ (The Royal Society, London, 21 February 2020).

The aim of the workshop was to bring together representatives from the three business sectors previously engaged (infrastructure, land management, insurance / financial services) with academia, the public sector and third sector, to further test the opportunity for, and to articulate, the emerging *R&I Agenda*.

The aim of the conference was to showcase business impact work under the Valuing Nature Programme, share the emerging *R&I Agenda* with a broader community of businesses, public sector, third sector and academia, and further validate and elaborate the emerging *R&I Agenda*. The conference programme is available online.⁴

The workshop was an invitation-only event and the conference was largely by invitation (with a few seats made available to others expressing interest) with a view to ensuring an appropriate mix of expertise. Both events involved a mix of representatives from the business, policy, academic and third sectors, with business predominating. A list of organisations represented at the conference is available online.⁵

This report provides main themes from the conference keynote addresses, and output from breakout sessions at the two events.

Both the workshop and the conference involved breakouts on the **natural asset R&I needs** identified by business through the preceding Round Tables and the Analysis and Options paper. This involved sharing these R&I needs with a wider audience and seeking additional input and opinion on needs.

The conference breakouts additionally gathered **examples of current relevant business activity**.

³ The term ‘natural assets’ is taken here to incorporate the concepts of natural capital (stocks), ecosystem services (flows) and biodiversity

⁴ Business Impact Conference: <https://valuing-nature.net/business-impact-conference-2020>

⁵ Business Impact Conference: <https://valuing-nature.net/business-impact-conference-2020>

The workshop additionally involved a breakout on **delivery options**, in which participants considered pros and cons of the three broad options identified in the Analysis and Options paper: (1) a centre/hub; (2) strategic programmes; and (3) individual projects. These options are not necessarily mutually exclusive.

Beyond this report, other workshop and conference output is available on the Valuing Nature website⁶ as follows:

- **Presentations** – workshop and conference PowerPoint presentations.
- **Video** – videos of conference keynote addresses (Session 1) and conference presentations on Business Impact under the Valuing Nature Programme (Session 2)
- **Talking Head interviews** – a series of interviews with Conference participants.

1.2 Previous work

These events build on considerable previous work focused on the development of the emerging *Natural Assets R&I Agenda in Support of Business and Policy*, involving:

- **Three sector Round Tables**⁷ with the infrastructure, land management and insurance / financial services sectors, each of which considered:

- current activity by businesses in terms of uptake of R&I output related to natural assets in business decision-making;
- drivers for this activity;
- barriers to greater uptake;
- research and innovation needs.

- **An Analysis & Options paper**⁸ providing a cross-sector analysis of the findings of the Round Tables, exploring commonalities and differences in terms of current activity, drivers, barriers and R&I needs, reviewing current relevant R&I, and assessing delivery options for the identified R&I needs.
- **Consultation with the policy community**⁹ on:
 - the extent to which the R&I needs identified by businesses are aligned with current policy and policy direction of travel;
 - the extent to which specific categories of R&I need identified by business resonate with the policy community;
 - appetite to engage with the emerging natural assets R&I agenda.

The current report should be read in conjunction with the reports on the sector Round Tables, the cross-sector *Analysis and Options* paper and the report on consultations with the policy community.

6 Business Impact Conference: <https://valuing-nature.net/business-impact-conference-2020>

7 Round Table reports: <https://valuing-nature.net/business-round-tables>

8 Cross-sector 'Analysis and Options' paper 'Towards a Natural Assets Research and Innovation Agenda in Support of UK Business and Policy: Focusing on the Infrastructure, Land Management and Insurance/Financial Services Sectors': <https://valuing-nature.net/business-round-tables>

9 Report on findings from the policy consultations: <https://valuing-nature.net/business-round-tables>

This activity in developing the *R&I Agenda* has built on a substantial programme of previous business impact work under the Valuing Nature Programme (2014–2020), guided by a Business Interest Group (BIG)¹⁰ and which has included:

- A BIG report on Pathways to Impact with Business.¹¹
- 3 Business Impact Schools,¹² which brought together c.60 early career researchers with business representatives to enhance mutual understanding of valuing nature R&I for business impact.
- A *Business Impact Brokering* programme with the funded Health & Wellbeing, and Tipping Points, projects (ongoing)
- A number of *Valuing Nature Placements* hosted by business.¹³
- A number of business-relevant *Natural Capital Synthesis Reports*.¹⁴
- A number of business-relevant *Demystifying Papers*, including on Economic Valuation, Cost Benefit Analysis and Green Finance.¹⁵
- Business-relevant sessions at *Valuing Nature Conferences* – including on *Finance for Nature* at the recent 2019 Conference, and *Investing in Natural Capital* at the 2018 Conference.¹⁶

- A *Review and Comparison of Models used for Land Allocation and Nature Valuation* – including their capability to meet requirements of stakeholders including private landholders.¹⁷

- the report *Joining the Dots: Global Challenges and the Valuing Nature Agenda*, which included analysis of collaborative research between UK and developing country institutions that addresses business-relevant issues.¹⁸

Business-relevant work was also carried out under the precursor *Valuing Nature Network*¹⁹ including gathering and analyzing the evidence in support of the recommendations made by the Government's *Ecosystem Markets Task Force*.²⁰

1.3 Categories of R&I need

The *Analysis and Options* paper identified a general need for better focusing of natural assets R&I on business and policy needs. This requires:

- suitably-framed R&I funding instruments;
- increased investment in the co-creation of R&I relating to natural assets;

10 VNP Business Interest Group: <https://valuing-nature.net/business-interest-group>

11 Pathways to Impact with Business (2015): <https://valuing-nature.net/shaping-health-wellbeing-funding-call>

12 Business Impact Schools: <https://valuing-nature.net/valuing-nature-business-impact-schools>

13 Valuing Nature Placements: <https://valuing-nature.net/valuing-nature-placements>

14 Natural Capital Synthesis Reports: <https://valuing-nature.net/natural-capital-synthesis-reports-0>

15 Demystifying papers: <https://valuing-nature.net/demystifying-series>

16 Valuing Nature Conferences: <https://valuing-nature.net/valuing-nature-conferences>

17 Land Allocation Models Review: <https://valuing-nature.net/land-allocation-models-review>

18 Joining the Dots: <https://valuing-nature.net/GlobalChallenges>

19 Valuing Nature projects 2011–2013: <https://valuing-nature.net/valuing-nature-projects-2011-2013>

20 Ecosystem Markets Task Force: <https://www.gov.uk/government/groups/ecosystem-markets-task-force>

- appropriate partnership between business and academia in R&I proposals;
- appropriate representation of business and academia on proposal evaluation panels; and
- co-direction by business with academia of funded R&I programmes/projects, so outputs meet business needs and are framed through a business lens.

There is also a need to better broker interaction across academia, business and policy in this complex, multi-disciplinary, multi-sector space.

Beyond this general need, the *Analysis and Options* paper identified 7 broad categories of R&I need, which can be summarised as follows:

1. Basic research on natural assets to underpin measurement and valuation.
2. Data for business including: assessing data needs and provision; making existing data accessible and usable; filling key data gaps; data quality assurance and enhanced long-term monitoring, including through remote sensing.
3. Frameworks, standards, models, metrics and other tools for business, including: developing coherent frameworks and standards; consolidating and validating methods, metrics and tools; developing new methods, metrics and tools; and developing natural capital accounting to better define boundaries, address ecological connectivity, etc.
4. Pilots, demonstration, scaling of new business models and solutions including: scaling uptake of natural capital thinking by business, piloting and demonstrating at catchment and regional scales; meeting sector specific needs, e.g. relating to natural asset enhancement through the UK National Infrastructure and Construction Pipeline and trials for post-Brexit agri-environment payments for public goods, developing a natural assets farm advisory service, and building understanding on how to incentivise good land stewardship.
5. Developing natural asset markets, and stimulating investment in business solutions, including: regulation and policy for markets that value and enhance nature; accelerating investment in natural assets; markets for soil natural assets; linking to commercial value; leakage effect; ethics and risks of monetising and trading natural assets.
6. Assessing risks and resilience in relation to natural assets, including: materiality; linking risk with impact assessments; links between physical and transition risks; stranded assets related to natural capital; and understanding how natural assets deliver business resilience to climate change.
7. Knowledge exchange, training and capacity-building including: for academics/professionals in relation to measuring and valuing natural assets for business; knowledge exchange (including research output, practical application experience, developing a knowledge hub); and raising awareness and understanding (e.g. common language on natural assets for making business cases, and raising public awareness and shifting public opinion on the importance of natural assets).

2. CONFERENCE KEYNOTES

The main points from each of the keynote addresses are presented here. Videos of the addresses are available on the Valuing Nature website.²¹

2.1 Welcome:

Sir Duncan Wingham,
Executive Chair, NERC

- Duncan Wingham reflected on how, in an extraordinarily short period of time, we have seen a transformation in the importance of valuing nature. Now there are two substantial proposed Acts – for the Environment and for Agriculture – each completely informed by the ideas of valuing nature, together with the arrival of green finance and probably of regulation that requires businesses to place environment risk on their balance sheets.
- He observed that it is impossible to see how, without engaging centrally with the business community, we can arrive at solutions to environmental problems that can both protect the environment and allow us to enjoy the living standards that we do. Therefore it is really encouraging to see this meeting coming together and to see that among the attendees, business representatives are in the majority. This again illustrates just how centrally important the issue of valuing nature has become.

2.2 A Business Perspective:

Sir Ian Cheshire,
Chair, Barclays Bank UK plc

- This is a massive topic – and its slightly sobering to think its 7 years since we published the report of the Ecosystem Markets Task Force (EMTF) and we've only managed to get one of the Task Force recommendations (mandatory net gain) done so far.
- This protection and restoration of natural assets by businesses is a long and challenging process but absolutely essential – so I'm really pleased to see this work from the Valuing Nature Programme planning for the next phase.
- I'd like to make **four points** from a business and finance perspective.
- **First, business and finance do want to value nature, make better decisions.** They do understand they have responsibility for their environmental externalities, and more broadly for the necessary economic transition, and a sense that no longer is it someone else's job. There is still an enormous amount of confusion and uncertainty about *how* to do this, but we have moved on a lot from 10–15 years ago when CEOs said 'that's nothing to do with me'. Business gets it now

²¹ Business Impact Conference: <https://valuing-nature.net/business-impact-conference-2020>

partly due to the new cohort coming through, partly due to the recognized climate and biodiversity emergencies. So, business is very interested to know how it can value nature better, make the right decisions, and come up with a set of sustainable business models.

- **Second, business really does need help from science/research.** Business has had 500+ years of experience in double-entry book-keeping, just ‘5 minutes’ of natural capital accounting and thinking about natural assets in a different way, so it is still very early days. Measuring biodiversity is not like measuring a tonne of carbon. Business is now equipping more with the required measures, tools, systems, but still not well-practiced skills. Business needs a solid research underpinning, in particular the science/evidence, toolkit, demonstration, tests and pilots, and how to scale these would be a massive contribution. Business cannot do this alone, it is keen to come to the party, but needs help – including research funding – to help R&I teams make the necessary advances.
- **Third, business would like to see coordination amongst the various parties** so we don’t re-invent the wheel the whole time. Lots of good work is going on here and there, but there is a sense that a coordinated approach is necessary. The last thing we need, given how big this agenda is, is squabbling over the same R&I territory. We need an integrated map of the R&I agenda, who’s doing what. This requires a coming together and generosity amongst institutions to each focus on where each has comparative advantage.
- **Fourth, the other party to make this happen is the government, with regulation and incentives and direct government investment** – e.g. if building something as big as HS2, we do need to understand how this plays out in terms of natural capital. We do need to see a direct link to the policy agenda. The fact we now have an Environment Bill, high-level conversations on these issues, the opportunity in the farming sector – which we’ve been looking at through the Food, Farming and Countryside Commission (FFCC) – to think differently about how subsidies and incentives work, makes this a critical juncture. A good example of how business and regulation combine for positive effect is the Landfill Tax. So business/finance can work with effective, smart regulation, and above all, a level playing field. The GRI Task Force is working on Britain’s global footprint and is trying to set up Britain legally to stop ‘importing deforestation’ – this requires due diligence on where products are coming from. If we do this as an industry, costs are shared and affordable, and it provides a level playing field. Such smallish but clear interventions will be needed in lots of different areas.
- For the broader business and finance community, there is a massive breadth of issues, so we need to start making progress in a number of quite specific areas, all of which need research-based understanding on valuing nature. An example (coming out of the FFCC) is how to tie subsidies to a natural capital balance sheet at a farm level. The challenge is how to measure natural capital. Conceptually this is what lies behind Environmental Land Management Schemes (ELMS). We need a practical low-cost way to do this in which data is ideally automatically read-in from a variety of sources such that farmers don’t have to fill in lots of forms. Can we enable that so public money for public goods is aligned with practical and useful natural capital assessments? This is just one example – there are many other areas needing action.

- So progress requires: willingness of business and finance to do it; a real desire to find the evidence base; a real desire to collaborate; and a real need for the government/regulatory framework to be brought to bear. I'm incredibly optimistic, despite the seven years it took to get from the EMTF report to one recommendation being put into practice. We have to keep going. I'm really pleased to see the work that the Valuing Nature business impact team have done leading up to today, and thoroughly recommend it.

2.3 A Government Perspective:

Alastair Johnson,
Head of Natural Environment Economics, Defra

- My role covers national and international environment policy including the 25 Year Environment Plan (25YEP), the Environment Bill and the Green Finance Strategy. I address the challenges, progress and future opportunities, and the need for R&I support for effective policy rollout.

Challenges

- Public awareness of the environment has grown, though there is still confusion over terminology. The scale of the challenge is significant – there is a significant gap between where we want to be and where we are. Both the UK National Ecosystem Assessment and the International Panel on Biodiversity and Ecosystem Services highlight declines in natural assets.

Progress on 25YEP

- Our aim is to leave the environment in a better state than we inherited. The 25YEP looks to consumers and private sector to help deliver solutions and the Evidence Annex highlights diffuse evidence and evidence gaps.
- The Environment Bill was introduced to Parliament in January 2020. It places the 25YEP on a statutory footing. It covers environmental governance, clean air strategy, biodiversity net gain, trees, conservation covenants, extended producer responsibilities, recycling, deposit return scheme, water, and it aims to engage business, local government and citizens:
 - Waste Strategy and Clean Air Strategy – measures that change production and consumption from take-make-use-throw away to more circular model.
 - Marine – significant expansion of marine conservation zones around UK, plus 150,000 sq m no-take protected area around Ascension Islands, Fisheries White Paper and Fisheries Bill
 - Trees and nature – £50m new funding for new woodland carbon guarantee, strengthened protection for ancient woodlands and ancient trees and other irreplaceable habitats
 - Connecting people with the environment – focus on engaging children with nature.

Opportunities

- The Environment Bill gives the opportunity to embed environment at heart of government.
- Reform of CAP. ELMS shifts towards payment for public goods with public money – to help meet goals of 25YEP and carbon net zero.

- Climate change and biodiversity linkages – e.g. tree planting. There are however trade-offs to consider, e.g. expansion of solar panels can have negative consequences for biodiversity. Opportunities to re-use resources within the wider economy.
- Green Finance Strategy – Need to align financial flows with environmental ambitions. Greening finance (integrating climate and environmental factors into financial decision-making), and financing green (increasing flow of private sector finance to environmental projects) and positioning UK as global green finance hub.
- A range of Defra/industry groups, e.g. EMTF report 2013 – Government response said it shows UK can be at forefront of new markets that value, protect and enhance nature. Defra working with BEIS and Local Enterprise Partnerships (LEPs) to integrate natural capital in local industrial strategies, which is not easy.
- ENCA (Enabling a Natural Capital Approach)²² – brings together evidence, tools, and guidance to better value and account for natural capital in the UK. Highlights a number of evidence gaps so need help to expand this resource.
- In conclusion there is clear evidence of the need for action, involving input from private sector and academia. There is a need for evidence – natural, economic and social sciences. Defra looks forward to output from the emerging natural assets R&I agenda.

2.4 A Perspective from the Research Community:

Sir Charles Godfray,
Director,
Oxford Martin School

Is there an appetite in academia to engage with this agenda?

- The answer is yes. Cynically speaking, if you pay academics money, you'll get their attention. But the real reason is that there has also been a real cultural change in the academic community that mirrors that in the business community. In the academic community, there is a real enthusiasm about engaging with policy and business that wasn't there 20 years ago.

Why should business care about valuing nature?

- The Round Table reports inform us on this. Business cares because:
 - natural assets can directly **affect the bottom line** through improved profits, avoided costs and new business opportunities.
 - there is also increasing realization that it is **the right thing to do** – beyond the CSR ghetto and becoming company purpose (Mayer's book *Prosperity* reviews this).
 - companies can be **required** to think about natural assets by regulators or customers.

22 <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca>

Where can the research community contribute?

- **Benefits to the bottom line.** The research community can contribute here through: (1) better understanding of ecosystem functioning, fundamental science to create intellectual capital – this can underpin better applied science down the line; (2) developing understanding on benefits of nature-based solutions as opposed to engineered solutions – e.g. initiative led by Nat Seddon at Oxford on evidence base for nature based solutions (NBS); (3) creating new markets, incentive structures, new green financing initiatives – more research is needed to develop these tools and understand unexpected outcomes, bringing together the natural and social sciences; (4) understanding stranded natural assets, e.g. for farming – some of the assets may not have the values we think they have, especially if we are serious about net zero – this will lead to painful restructuring of agriculture in UK and elsewhere.
- **The right thing to do.** Academia can help business to do the right thing. The business Round Tables leading up to this Conference highlighted needs in particular around data and analytics. Research needs to consider how do we ensure capability for national databases. We need an integrated map of R&I needs, especially around data. Citizen science can help, has huge capacity and can be enabled to contribute more. There are also research challenges around monitoring in support of business– e.g. can use remote sensing, fixed sensors in rivers, modeling, etc. to monitor soil management and reward and provide feedback to farmers who are managing soil well?

- **Meeting regulatory/customer requirements.** Research can help with developing and applying natural capital accounting. Research can also help with smarter regulation – industry is not necessarily against regulation, but wants smart regulation, and a sufficient time period to invest and meet the goals. Research can also help understand the limits to natural capital approaches, which can be too complex – it is sometimes better to use other methods, and sometimes monetizing can lead to perverse outcomes. We also need to engage the social sciences more, think about the political economy – e.g. for restructuring the livestock industry, we need to develop a narrative between veganism and ‘meat is good’.

How can the research community be better providers of R&I in support of business?

- **Foster better interdisciplinarity** in research commissioning.
- **Improve incentive structures** in academia.
- **Ensure real pathways to impact** – these are no longer compulsory in research proposals, but should be absolutely clear if the purpose is to do R&I to support business.
- **Look at how Research Councils deliver research.** UKRI has broken down some silos, not all. UKRI capacity has declined under austerity. And funding modes need revisiting – short 3-year grants not necessarily the best way to get research done.
- **Review the role of institutions** – we have some wonderful institutions, e.g. UKCEH, Rothamsted Research, etc. – these are a crucial part of the research infrastructure – have we got the incentives right for them?

3. BREAKOUTS ON R&I NEEDS

Both the cross-sector workshop and the conference involved breakout sessions that reviewed the R&I needs identified through the previous Round Tables (Section 1.3 above). For both events, we grouped the 7 categories of need listed above into three 'topic bundles':

- A. Basic research, data for business, capacity-building (categories 1, 2 and 7)
- B. Applying/repurposing knowledge for business (including: frameworks, standards, tools, models, building capacities; assessing risks and resilience) (categories 3 and 6)
- C. Learning by doing (including piloting, demonstrating, scaling; developing new markets, stimulating investment) (categories 4 and 5)

3.1 Bundle 1: Basic research, data, capacity-building

This topic bundle addressed three of the seven categories of R&I needs identified through the three sector Round Table reports and cross-sector *Analysis and Options* paper:

- Basic research on natural assets.
- Data for business.
- Knowledge exchange, training and capacity-building.

3.1.1 Basic research on natural assets

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified needs for basic research on natural assets to underpin measurement and valuation of natural assets to inform business decision-making. This included basic research to:

- Fill knowledge gaps on what natural assets exist and what ecosystem services they supply and how these relate to economic values and existing market pricing.
- Identify which natural assets, UK-wide, are closest to critical tipping point(s) and what interventions are required to avert these tipping points.
- Improve understanding of the links between soil health and water quality.

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs and considerations in relation to basic research:

- Assessment of the current state of biodiversity and other natural assets.
- Quantification of historic reduction of loss of biodiversity, landscapes, etc.
- Establishment of baselines and targets for natural assets.
- Understanding of the links between biodiversity and other natural assets/stocks, ecosystem processes and functions, ecosystem services, and resulting benefits.
- Understanding of the capacity of ecosystems to deliver all ecosystem services in relation to ability to deliver a specific ecosystem service.
- Cause and effect relationships between business activity and natural asset values.
- Business' dependencies on natural assets, linkages between business' impacts on natural assets and business dependencies on natural assets.
- Frequency and change of natural hazards (e.g. will a town that historically flooded every 50 years start to flood every 3 years?) to inform management and trading of natural asset.
- Resilience of natural assets, role of habitat connectivity in resilience.
- Natural asset thresholds, tipping points, time lags in relation to degradation and restoration (important when seeking to determine options and trade-offs).
- Identification of 'irreplaceable' habitats (beyond those listed in the National Planning Policy Framework).

- Understanding buffer zones in relation to net gain sites – e.g. what is an appropriate buffer for newly created woodland?
- Carbon sequestration potential under differing land-use and management regimes, e.g. woodland planting vs. natural regeneration.
- Which elements of green infrastructure support which elements of health and wellbeing.
- Understanding behaviour dynamics – energy and motivation to act.
- Learning from historical R&I on productivity/yield – are there lessons that can be applied, e.g. on metrics, to other (non-provisioning) ecosystem services.
- Understanding health and wellbeing impacts of natural assets degradation (e.g. of increased flooding).
- Exploring restoration as an opportunity, including regenerative design (not just offsetting), place-making, urban treescapes.

3.1.2 Data for business

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified a range of R&I needs relating to data for business, including:

- Assessing data needs and provision.
- Making existing data accessible and usable.
- Filling key data gaps.
- Data quality assurance.
- Enhanced long-term monitoring (including through remote sensing).

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs and considerations in relation to data:

Monitoring / data gathering

- Gathering of data that is, as far as possible, real-time / up to date – e.g. annual update of UK Land Cover Map.
- Gathering of data that is context-specific.

Data quality

- Audit / quality assurance of data, information on data quality.
- Standards/protocols for data collection, application and reporting.

Data scale/granularity

- Data that is applicable and consistent across different scales (local to national to global) and applications (e.g. product, site, supply chain, company, investment portfolio).
- Data granularity – what level of detail is needed? (e.g. big landholdings have different needs to small landholdings).

Data format

- Data formatting according to needs of each sector.
- Data formatting according to scope of business decisions to be made.
- Structuring/storage of high-resolution spatial data (to field parcel scale).

Data gaps / proxies

- Understanding of data gaps, identification of proxies / surrogates to fill gaps, e.g. low cost remote sensing data.
- Identification of proxies that work with historical records to enable long time-series assessments (for businesses that operate on long-term timescales).

Data availability/accessibility

- Enhancing open access to data, including soil data, earth observation data, citizen-science data.
- Demystification of data, including enhancing understanding on what data exists, the purpose for which it was collected, how it can be applied.
- Enhancing data platforms.
- Centralization of key datasets, e.g. on habitat extent, condition.
- Categorization and signposting of key datasets, e.g. meta-database of datasets.
- Reducing barriers (e.g. pay walls to raw data and/or commercialized data products) that affect cost/timeliness of access to data.
- Resolving/reducing data copyright constraints.
- Enhancing data sharing among businesses – protocols to deal with commercially sensitive data.
- Repurposing long-term data sets to feed into knowledge on habitats, land use, ecosystem services (e.g. C-sequestration).
- Securing longevity of databases.

- Sharing of data arising from Environmental Land Management Schemes (ELMS).
- Building on NERC Digital Environment activities.²³

Data application

- Guidance on how to use key datasets, appropriate data applications, pros and cons of datasets.
- Dealing with uncertainty in the data, making decisions in data-poor environments.
- Tools for data mining, integration, analysis.
- Translating data for unskilled project developers/landowners.

Specific datasets

- Baseline biodiversity /natural capital data covering corporate supply chains.
- Data that supports valuation and enables outcome monitoring.
- Biodiversity data – Government tends to monitor and measure only what is required for compliance – but we need to frame our ambition for biodiversity and gather data in relation to that.
- Habitat data – extent, condition, connectivity, ecosystem service flows.
- Data on protected species and their habitats (beyond protected areas).

- Master maps – OS, habitats, green space, protected areas, canopy cover, etc. – to allow assessment of how much of each asset at any particular location.
- National, high-resolution data on soil depth and quality.
- Data on carbon sequestration in different habitats/soils under different land uses.
- Enhancements in gathering/structuring of biodiversity data.
- Maps of all ancient woodlands (including smaller sites).
- UK tree canopy cover map.
- Maps of suitable sites for woodland creation.
- Improved mammal population data.
- Guidance on combining biodiversity data with monetary data.
- Earth observation data – greater detail across habitats / land use types (e.g. for natural capital assessments), biodiversity and carbon/biomass measures from EO data.
- National registration of beekeepers, regular pollinator abundance data.
- Microclimate data, e.g. for key infrastructure types, urban areas, wooded areas.
- Locally relevant data for locally tailored, adaptive decision-making, including citizen-science data.
- Geological data – land management decisions need to take account of subsurface.

²³ NERC Digital Environment: <https://nerc.ukri.org/innovation/activities/environmentaldata/>

3.1.3 Knowledge exchange, training and capacity-building

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified needs for knowledge exchange, training and capacity-building, including:

- Knowledge exchange, including of research output, of practical application experience, developing a knowledge hub.
- Training/capacity-building for academics/professionals in relation to measuring and valuing natural assets for business.
- Raising awareness and understanding, e.g. common language on natural assets for making business cases, and raising public awareness and shifting public opinion on the importance of natural assets.

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs and considerations in relation to knowledge exchange, training and capacity-building:

Knowledge exchange

- Consideration of a one-stop shop for businesses to access R&I output, building on existing knowledge hubs, e.g. Ecosystems Knowledge Network (EKN), Capitals Coalition.
- Translating research-generated knowledge/concepts into business language.
- Enhancing businesses' understanding of the potential of existing knowledge and data, e.g. arising from earth observation, citizen science, etc.

- Translating relevant legacy research output for business uptake.
- Development/operation of safe spaces for sharing of knowledge among businesses – e.g. Cambridge Institute for Sustainability Leadership's Natural Capital Impact Group provides safe space to share knowledge, learn from failure, co-create solutions.
- Bridging the disconnect between policy ambition and businesses' practical capabilities and capacities.
- Finding ways to get local knowledge into the right forums – e.g. to landowners, rangers...

Training/capacity-building

- Addressing the gap in skills needed in order to build a pipeline of scalable/investable actions.
- Enhanced knowledge exchange on natural capital accounting for farmers/ landowners – and how this relates to payment for public goods.
- Building capacities at Local Planning Authority level – in order to provide the necessary advice to developers.
- Develop skills in handling large environmental datasets.
- Develop businesses skills in handling qualitative as well as financial data in making decisions.
- Develop farmer/landowner knowledge/skills to enable shift from food production to ecosystem services provision – including understanding of trade-offs – how expert do farmers need to be, role of advisers, peer-to-peer networks.

Raising awareness/ understanding

- Clarification/standardization of language/terminology relating to natural assets / natural capital / biodiversity / natural resources, etc.

3.2 Bundle 2: Applying/repurposing knowledge for business

This topic bundle addressed two of the seven categories of R&I needs identified through the three sector Round Table reports and cross-sector *Analysis and Options* paper:

- Frameworks, standards, models, metrics and other tools for business.
- Assessing risks and resilience in relation to natural assets.

3.2.1 Frameworks, standards, models, metrics and other tools for business,

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified R&I needs relating to frameworks, standards, models, metrics and other tools for business, including:

- Developing coherent frameworks and standards.
- Consolidating and validating methods, metrics and tools.
- Developing new methods, metrics and tools.
- Developing natural capital accounting to better define boundaries, address ecological connectivity, etc.

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs and considerations in relation to frameworks, standards, models, metrics and other tools for business.

General

- Work to date has identified the need for coherent frameworks, standards, models – but these need sufficient flexibility to be relevant across all sectors.
- Businesses do not yet have material liability for impacts on natural assets – so degradation of natural assets does not yet hit the bottom line – if governments first regulate for the liabilities, this will then drive innovation on frameworks, standards, metrics, tools, etc.
- There is a need for clarity of direction (from Government) and a clear roadmap to enable effective boardroom discussion on natural assets/environment – e.g. plans to make biodiversity net gain mandatory (through the Environment Bill) are useful – this could in due course be expanded to environmental net gain.
- Need to consider monetary and non-monetary aspects of valuing nature – how to bring qualitative information into decision-making, otherwise it is an ‘add on’, often with limited influence.
- Development of common/shared objectives for natural assets, and of widespread understanding of these objectives – what is good and what does achievement of good look like?

- Don't mix scaling and zooming – scaling gives new information, zooming gives granularity but not the interconnections.
- Need tools for natural capital/biodiversity/system science not just climate change/carbon.
- Addressing computational challenges in running global models at finer scales relevant to business.
- Should we be modeling benefits to natural assets, or to businesses, or to both?

Standards

- Standards may be useful, but some variability is necessary. Allow first for innovation, testing of solutions, then consolidate and standardize. Standardizing too early stymies innovation and risks creating monopolies.
- Make clear what is coming over the horizon, set timeframe, provide certainty for industry to adapt, innovate, consolidate, standardize.
- Industry needs to know which is the right/best/proportionate way to do things – how much assessment is sufficient, and what tools should be used.
- Standards are needed, inter alia, for:
 - Natural asset baselines.
 - Corporate natural capital assessments;
 - Corporate natural capital accounting and reporting.
- Models needed include:
 - Scalable models of health and wellbeing benefits of nature.
 - Predictive models of long-term implications of an action – how to handle slow processes?
 - Models/maps showing where there is greatest potential for biodiversity uplift.
- Building on the UKRI Strategic Priorities Fund Landscape Decisions programme²⁴ to address this Natural Assets R&I agenda.

Metrics

- Biodiversity net gain – further development/assessment of the Defra metric – results of using the metric in terms of avoidance/mitigation/compensation actions, biodiversity outcomes, outcomes for other natural assets (e.g. soil C)
- Nationally recognized indicators/metrics for health and wellbeing benefits of nature.
- Woodland connectivity metric – does increase in connectivity lead to increase in value?
- Other nationally-recognised metrics.

Models

- Models are negotiation tools, not prescriptive. Update of model output depends on societal values.
- Models at the right scales and with the right interfaces for business decision-makers.

²⁴ Landscape Decisions programme: <https://nerc.ukri.org/research/funded/programmes/landscape/>

Other tools/methods

- There is a plethora of tools/methods – need for consolidation and validation – which are fit for purpose?
- Decision-making grids – covering environmental, social, financial, employment, etc. questions – no monetisation involved (e.g. as used by Crown Estate Scotland).
- May need to revisit some particular tools e.g. Environment Agency's Natural Capital Calculator – how it delivers uplift – assess the regulatory outcome versus the outcome for natural capital.

Technologies

- Innovative devices for citizen-science (weather, biodiversity, air quality, noise, etc.).
- Affordable technological solutions for local, geospatial, ecosystem services monitoring.
- Smart technology (e.g. to capture health and wellbeing values of nature).
- Artificial intelligence (AI) / block-chain applications for natural assets.

3.2.2 Assessing risks and resilience in relation to natural assets

The Round Table reports and *Analysis and Options* paper identified R&I needs relating to assessing risks and resilience in relation to natural assets, including: materiality; linking risk with impact assessments; links between physical and transition risks; stranded assets related to natural capital; and understanding how natural assets deliver business resilience to climate change.

Breakouts at the workshop and conference identified a number of other needs within this category of assessing risks and resilience in relation to natural assets, including:

- How to link risk and impact assessment.
- Fiscal risks versus adaptation/ transformation risks, e.g. in agricultural land use changes.
- Timescales for risk assessment – what is the risk horizon? – need to encourage thinking over longer time horizons – this is already happening for some sectors in relation to climate risk (e.g. energy sector, major infrastructure).
- Need to develop understanding of risks (at scale and the short- and longer-term components).
- Task Force on Climate-related Financial Disclosures (TCFD) has raised awareness among investors of climate risk – could have similar disclosure requirements for natural assets to raise awareness to natural asset-related risks.

3.3 Bundle 3: Learning by doing

This topic bundle addressed two of the seven categories of R&I needs identified through the three sector Round Table reports and cross-sector *Analysis and Options* paper:

- Pilots, demonstration, scaling of new business models and solutions.
- Developing natural asset markets, and stimulating investment in business solutions.

3.3.1 Pilots, demonstration, scaling of new business models and solutions

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified R&I needs relating to pilots, demonstration, scaling of new business models and solutions, including:

- Scaling uptake of natural capital thinking by business.
- Piloting and demonstrating at catchment and regional scales.
- Meeting sector specific needs:
 - e.g. relating to natural asset enhancement through the UK National Infrastructure and Construction Pipeline.
 - e.g. trials for post-Brexit agri-environment payments for public goods.
- Developing a natural assets farm advisory service.
- Building understanding on how to incentivise good land stewardship.

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs in relation to pilots, demonstration, scaling of new business models and solutions.

Pilots/demos

- Pilots/demonstrations with first movers, identification/support of followers, to overcome inertia in key sectors.
- Extending pilots/demonstrations beyond catchment/land management, e.g. to piloting business and financial models.
- Building trust in systems that reward good natural assets management – e.g. get payments flowing early, ensure timely payments (learn from issues with Rural Payments Agency and countryside stewardship).
- Learning how to bring landowners together within a catchment, including working with existing groups, ‘agglomeration’ of actions/payments (e.g. building on Natural England facilitation at catchment scale, Soil Association’s farmers programme).
- Understanding and disaggregating costs and benefits at catchment scale – identifying suppliers of natural assets, beneficiaries, breaking down silos.
- Piloting/demonstrating systems approach (water-food-energy) to infrastructure (e.g. sustainable cities, sustainable drainage).
- Expanding water industry pilots/demonstrations for catchment management – e.g. development of financial mechanisms, behavioural insights to encouraging farmer uptake.

Scaling new business models and solutions

- How to scale when dealing with large numbers of small projects/investments.
- Role of food groups in scaling, e.g. companies such as ABP and ARLA.
- Role of public funding in scaling (e.g. ELMS, blended finance).
- Understanding drivers of business behaviour, e.g. incentives, regulation, standards, dependencies, customer demand.
- Scaling application of the Landscape Enterprise Networks (LENs) approach – building the picture through scientific assessment and modeling to feed back to business, enable replication.
- Scaling more sustainable overseas supply chains for UK businesses:
 - Food supply chains – leveraging improved land management practices (e.g. avoiding deforestation) – how to reward farmers / suppliers.
 - Other supply chains, e.g. wind farm components, steel.
- Learning from land abandonment in the EU where farming became unprofitable – how/ where to maintain land stewardship or re-wild.
- Natural capital assessment/accounting
 - Clarification of steps – e.g. screening/ scoping step.
 - How do these relate to / complement EIA?
- Linkages between land management interventions and delivery of multiple natural assets.
- Developing sector road maps – providing direction for pioneers and followers.
- R&I on outcome-oriented rather than activity-oriented methods to underpin public payment for public goods and incentivise farmer behaviour.
- Environment Land Management Scheme (ELMS) – public payment for public goods:
 - How to make context specific, how to determine optimum management for each land parcel in terms of optimum outcomes for natural assets.
 - How to monitor outcomes (e.g. extent and condition of soil, trees, hedgerows, etc), what data to use, what level of granularity required, who monitors, to what extent can proxies (e.g. soil condition) be used.
 - How to optimize habitat connectivity, e.g. through collaboration among neighbouring farmers/landowners – how to incentivize landscape-level action.
 - Potential for agro-forestry (e.g. willow increases productivity within a certain radius).
 - How to collate and share farm-level data on natural assets.
- Scalable practices that restore soil carbon stock.
- Impact pathways – integrating evidence along the pathway – biophysical, social and economic.
- Tree planting – where to plant, how to integrate with transport, neighbourhood plans, employment plans, etc.
- How can the NC approach help existing frameworks for EIA address new priorities like climate, multiple values, opportunities and solutions, bigger scale interventions and investment?

- Understanding risk of failure, how businesses own risk and failure
- Understanding appropriate spatial and temporal scales of pilots and make-up of pilot teams to deliver transferable findings.
- Understanding social return on investment in natural assets.
- Difference between risk-based and natural capital assessment of success/failure.
- Transferable research findings from one sector to another – is failure equal across sectors?
- Developing scalable solutions is key to effective findings – what level of detail is appropriate to enable scaling?
- Understanding the dynamics of transition, e.g. how are farm businesses adjusting to post-Brexit conditions.

3.3.2 Developing natural asset markets, and stimulating investment in business solutions

The three sector Round Table reports and cross-sector *Analysis and Options* paper identified R&I needs relating to developing natural asset markets, and stimulating investment in business solutions, including:

- Regulation and policy for markets that value and enhance nature.
- Accelerating investment in natural assets.
- Markets for soil natural assets.
- Linking to commercial value.
- Leakage effect.

- Ethics and risks of monetising and trading natural assets.

Breakouts at the workshop and conference largely validated these needs and provided further elaboration, highlighting the following needs in relation to developing natural asset markets, and stimulating investment in business solutions.

Framing natural asset markets

- Developing national strategy on land use – e.g. supporting farmers to move away from beef and lamb, expanding urban farming.
- How to provide supply side (landowners/managers) with sufficient assurance for development of natural asset markets, e.g. through development of carbon codes (for soil, grasslands, hedgerows, etc.), natural asset registries, approved trading processes, approved methods to deliver uplift in natural assets, accredited brokers/intermediaries/aggregators, certification of outcomes...
- Developing effective brokerage systems to link supply and demand, e.g. packaging supply of natural assets for urban/downstream beneficiaries.
- Assessing the role of accreditation in providing confidence for buyers and sellers.
- How much confidence do buyers and sellers need to make markets work (e.g. in Landscape Enterprise Networks / Payment for Ecosystem Services schemes) and what generates that confidence.
- Understanding the role of brokers in creating a pipeline of investment opportunities.
- Developing/incentivizing corporate natural capital accounting as a tool to underpin offset markets for corporate impacts on natural assets and finance natural assets restoration.

- Assessing whether players will game the system and how to mitigate this risk.
- Addressing how to assure net gain in natural assets over the long-term / in perpetuity – and defining what is meant by long-term / in perpetuity.
- Understanding/building social capital for sustainable markets in natural assets.
- Developing affordable approaches/methods to measure natural asset outcomes.
- What are the best levers for transformation? Regulation, shareholders/investors, philanthropy...?
- Can finance act as carrot? – e.g. lower borrowing costs if meet environmental targets.

Understanding supply and demand

- Supply side – understanding the capacity to create new natural assets (e.g. hedgerows).
- Demand side – assessment of urban centres as a potential market for natural assets.

Developing new natural asset markets

- Developing markets for carbon sequestration in habitats other than peatlands and woodlands (e.g. grasslands, salt marshes) through new carbon codes.
- Developing markets for better approaches to soil management?

- Expanding natural assets markets beyond carbon to other natural asset classes.
- Developing mechanisms for stacking of natural asset classes.
- Identifying ecosystem services beneficiaries/clients beyond usual suspects (water utilities, etc.), creating markets for these ecosystem services.

Making a business case

- Understanding motives and processes for behavioural change by businesses, how to de-risk transition.
- Developing business cases for both the supply side (ecosystem services provider) and demand side (ecosystem service beneficiary).
- Identifying how to generate return on investment in natural assets, verifying the investment value of natural assets, developing clear financial incentives for land managers/landowners.
- Understanding revenue requirements to maintain natural assets.
- Disaggregating winners and losers from differing approaches.

Role of public sector

- Designing optimal public sector financial mechanisms to complement private sector investment in natural assets.
- Understanding the role of the public sector in risk-sharing for investment in natural assets.

Insurance

- Assessment of the insurance value of natural assets at risk from climate change, how to sustain/enhance this insurance value.
- What part of the financial risk in developing natural asset markets should be taken by the insurance industry and what part by the government?

Internalising nature-related risk

- Nature-related risks are not currently priced into markets – can Task Force on Climate-related Financial Disclosures (TCFD)-style disclosure on natural assets stimulate internalization of these risks?

4. BREAKOUTS ON CURRENT R&I ACTIVITY

Conference breakouts gathered examples of current R&I activity relating to the three bundles of R&I needs. These examples are listed below.

The examples of relevant business activity and R&I provided here can usefully inform further analysis of what R&I needs are already being addressed, and what activity the emerging R&I Agenda needs to be cognizant of and build on.

The wide-ranging scope of this existing activity demonstrates a considerable existing commitment to and co-investment potential for natural assets R&I.

At the same time, this wide-ranging activity serves to further underline the risk of underperformance of R&I investment in the absence of agreement on collective outcomes and priorities, and to further underline the need for coordination across the piece and the bringing together of knowledge and lessons learned in support of scaling.

4.1 Bundle 1:

Basic research, data, capacity-building

Examples of current R&I activity relating to basic research, data for business, and knowledge exchange, training and capacity building, included the following.

Basic research on natural assets

- UKRI programmes; those mentioned included the Landscape Decisions programme,²⁵ the Future of UK Treescapes programme,²⁶ and the Clean Air: Analysis & Solutions programme.²⁷
- tt21c.org – environmental science led by Unilever, open to the public.

25 <https://nerc.ukri.org/research/funded/programmes/landscape/>

26 <https://nerc.ukri.org/research/funded/programmes/future-of-uk-treescapes/>

27 <https://nerc.ukri.org/research/funded/programmes/clean-air/>

Data for business

- IBAT – International Biodiversity Assessment Tool (WCMC) – compilation of three databases, developed in partnership with oil and gas industry, now expanding to other sectors.
- AXA, BNP and Mirova – seeking biodiversity data from ESG data companies
- Defra remote sensing centre.
- ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) tool (Natural Capital Finance Alliance) – biodiversity data for the financial sector.
- EU Sustainable Finance Taxonomy.
- UK Environmental Observation Framework – enables collaboration between UK environmental monitoring groups.
- InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) tool (Stanford University).
- Nature Recovery Network mapping.
- Office for National Statistics, national natural capital accounts are increasingly granular and usable at lower scales.
- NGO-driven biodiversity monitoring – e.g. bird index, butterfly index, bat index.
- Local Authority biodiversity registers.
- BirdLife TESSA tool (Toolkit for Ecosystem Service Site-based Assessment).
- British Ecological Society / Imperial College London Open-Air Laboratory project (OPAL) – a citizen-science initiative on ecology and biodiversity.

- UKCRIC (UK Collaboration for Research on Infrastructure and Cities) – network of urban observatories across the UK, open access data, equipment available for others to join.
- Natural England ‘Living Maps’ project – producing detailed habitat maps from satellite data.

Capacity-building, training, knowledge exchange

- Thames Valley Pesticide Awareness Initiative.
- Existing hubs – Ecosystems Knowledge Network, Oppla, Natural Capital Initiative, Capitals Coalition...
- Defra – ENCA (Enabling a Natural Capital Approach).

4.2 Bundle 2: Applying/repurposing knowledge for business

Examples of current R&I activity included the following.

Frameworks, standards, models, metrics and other tools

- National Trust – Wimpole Farm natural capital accounts – led to shift from intensive to organic agriculture to enhance soil quality.
- The Crown Estate – Windsor Great Park natural capital accounts.
- Peatland Carbon Code – provides assurance for investors.
- Biodiversity Net Gain metrics.

- The Economics of Ecosystems and Biodiversity's framework.
- Organic Research Centre – public goods tool (spreadsheet based, very data-intensive).
- Farm carbon calculator.
- Natural Resources Wales – using NC approach incorporating habitat condition, extent, connectivity, resilience for place-based approach to implementing natural resources policy – feeds in to statutory State of Nature reporting.
- SENCE tool (Spatial Evidence for Natural Capital Evaluation) – helps understand impact of land management on ecosystem services.
- University of Aberdeen – land management review using land allocation models (excel and GIS based) – phase 1 (review models), phase 2 case studies trialing simple and complex models.
- UAE Ministry of Climate Change & Environment (MoCCA) – SmartMap of Natural Capital – using InVEST tool – to inform decisions on where to put development.
- Lancaster University – modeling soil systems (N, C), future stocks in relation to land use, climate change.
- Natural England – National Nature Reserves natural capital accounting – reviewing data gaps, developing integrated tool...
- Strutt Parker – working with individual estate owners and landowners to assess natural capital.
- University of Manchester GHIA EXTRACT tool – maps green and blue cover to help prioritise new investments in GBI.
- Liverpool John Moores University – EcoServe model to understand net gain, and scenario modeling for new Environmental Land Management System (ELMS).
- Highways England – biodiversity net gain – using Defra metric beta v2.0 excel spreadsheet – scoring is difficult – needs to be more transparent and easy to use – the effort should not be disproportionate to the gain.
- Co\$ting Nature tool – developed by Kings College London, Ambiotek and WCMC – web-based, using satellite data – maps 13 ecosystem services – used by 3000 institutions globally – threats to ecosystem services are analysed – free for 2 resolutions, data updated annually.
- NEVO (Natural Environment Valuation Online Tool) and various other approaches/tools for natural capital assessment – e.g. Environment Agency, National Trust – all have differing natural capital calculators, all excel-based.
- BSI BS8683 Biodiversity Net Gain standard – will specify characteristics of net gain calculators – not prescriptive but advisory.
- BSI on Natural Capital Accounting Standards for Organisations – in preparation (led by Ece Ozdemiroglu, etec).
- BS42020 Biodiversity: Code of Practice for Planning and Development.
- Suez – mostly around planning of waste and water facilities – capping landfills, land restoration.
- IEMA/CIEEM/CIRIA net gain guidance for construction industry.
- Building with Nature – accreditation standards for home-building.
- Carbon credits for agricultural land – e.g. Green Alliance / National Trust report 'New routes to decarbonise land use with Natural Infrastructure Schemes'.

- Streamlined Energy and Carbon Reporting – 11,000 businesses required to report (BEIS mandatory requirement).
- UNDP ‘Finance for Nature’ global summit 2019 (hosted by Baillie Gifford, Edinburgh).

Assessing risks and resilience

- A number of the models and tools also address issues of risk and resilience, e.g.
 - SENCE tool (Spatial Evidence for Natural Capital Evaluation).
 - University of Aberdeen land allocation models.
 - UAE MoCCA SmartMap of NaturalCapital.
 - Lancaster University soil systems modeling.

4.3 Bundle 3: Learning by doing

Examples of current R&I activity included the following.

Pilots, demonstration, scaling of new business models and solutions

- Water companies – restoring and rewetting peatlands – cheaper to restore wetlands than remove pollutants – e.g. SCAMP rewetting uplands around Sheffield and Manchester.
- Water companies are trying to understand wider catchment management issues – catchment managers working to manage nitrates run-off, restoration of upland ecosystems, etc.

- OxCam Arc – Environment Agency natural capital team working on natural infrastructure in context of major developments (1m homes, HS2, East-West rail) – ecosystem services mapping, natural capital accounting.
- Somerset levels – community-based flood council supporting farmers to plant appropriately for pollution reduction.
- Coastal Partnerships Network – landscaped approach, 50 partnerships around UK, covering most of UK coast, poly-centric governance, bottom-up – how can this be packaged to be of relevance to business?
- Floodplain Meadows Partnership – provides advice, looks at impact on hydrology, etc.
- Unilever – has researchers looking at biodiversity footprint of products.
- Scotland Rural College – deploying sensors for natural capital accounting.
- Other countries, e.g. Canada, knowledge on C measurement.
- Pasture-fed Livestock Association – promoting regenerative farming, no till.
- Tesco – influenced by TCFD and consumer opinion – aiming to halve shopping-basket CO₂ footprint, developing data-led schemes.
- MacDonalds investment in regenerative agriculture.
- Kelloggs soil management.
- Groundswell – annual event for regenerative/ Conservation agriculture.
- Scottish Government carbon accounting.
- Green prescribing, e.g. RSPB Shetland.
- Knepp rewilding.

- National Forest scheme – planting 200 square miles of forest in the Midlands.
- Environment Agency NatureBid trading platform.
- Tree planting schemes, e.g. Treetime (Edinburgh), Plant your Postcode (Brighton) – businesses and local communities pay for planting to derive benefits.
- Spanish Energy Companies collaborating to apply Natural Capital Protocol for natural capital assessments.
- Water Resource Management Plans – statutory requirement for water utilities to produce every 5 years – plan for 80 year period – incorporate natural capital assessment and EIA.
- KR Capital – aiming for 60% timber-build in new developments.
- Retrofitting of homes – delivering at scale.
- Banking and insurance sector – NatWest, Lloyds, etc. – commitment to net zero, has effect on supply chains.
- Trust for Oxfordshire Environment – looking to pool offset funds for strategic compensation investments (cf US Nature Conservancy).
- Crown Estate Scotland / Scottish Forum for Natural Capital – trialing of NCP for land-based businesses.
- Greater Manchester Combined Authority (GMCA) – 5-Year Environment Plan and Natural Capital Investment Plan.
- Local Enterprise Partnerships (LEPs) – e.g. Yorkshire.
- Water industry 2030 net zero target.
- National Farmers Union/agri-industry 2040 net zero target.
- Swedish companies setting ‘climate positive’ targets.
- TEEBAgriFood.
- Various initiatives to advance a Task Force on Nature Related Financial Disclosures (cf TCFD).
- Lancaster Centre for Global Eco-Innovation – SME role in managing natural assets, learning by doing, urban farming pilot and effects on natural assets and health .
- One Planet Business for Biodiversity (OP2B) (focus on agriculture).
- Natural Resources Wales – looking at how to link natural assets to resource value, social benefits, implications for procurement, investment.
- ARUP – aligning with SDGs, recognition of climate emergency, regenerative design (not just offsetting), significant R&D investment.

Developing natural asset markets, and stimulating investment in business solutions

- Landscape Enterprise Networks (LENs) – Nestle / 3Keel – e.g. River Eden catchment – working with farmers for healthy soils.
- Woodland Carbon Guarantee – government scheme to promote planting.
- Wessex Water/EnTrade – online marketplace to tackle nitrate pollution, e.g. Poole Harbour.
- Municipal green bonds – models elsewhere in Europe – allow for catchment scale schemes – bonds issued by local authorities.
- Icebreaker One – developing standards-based marketplace for financial and environmental data for banks/insurers.
- Catchment initiatives in other countries – e.g. Catskills/New York.

5. BREAKOUTS ON DELIVERY OPTIONS

The *Analysis and Options* paper outlined three delivery options to address the identified R&I needs:

1. A **centre/hub/catalyst** to coordinate and catalyse UK R&I investment and knowledge exchange on natural assets
2. Addressing bundles of R&I needs through targeted **programmes**
3. Addressing specific R&I needs individually through targeted **projects**.
The pros and cons of these options are outlined in the report.

These three options were discussed in breakout sessions at the workshop. Key observations on the three options are reported here.

General observations

A number of general observations were made consistently during both the workshop and conference that any delivery option(s):

- The chosen delivery option(s) should match the R&I challenge – the natural assets R&I agenda would need to be business-led or at least more closely integrate business.
- Must enable co-design and co-delivery between business and academia with a focus on R&I needs of business.
- Needs to facilitate business engagement – businesses are not used to writing long R&I proposal, are less clear who to partner with, don't always have internal support, etc.
- Needs to involve business, academia, policy and third sector in the selection process – consideration should be given to weighting scoring in favour of strong evidence of co-design / co-delivery with business (e.g. R&I that is clearly nested in a business environment).
- Should support funding of research, innovation and incubation of viable market solutions, with an emphasis on close-to-market R&I – e.g. focus on learning by doing.
- Needs to retain sight of societal needs in relation to natural assets – possibly easier for a hub/center than programmes or projects – more strategic research with less immediate outcomes for business can proceed in parallel.

- Needs to allow for agility and adaptability – businesses require a fail fast approach, the ability to flex and change direction (e.g. in response to a changing business environment).
- Needs to balance the need for transparency/ accountability with businesses need for a safe space in which to conduct R&I.
- Hub/centre governance structure should be agile, responsive to business needs, adaptive, light touch – take care to avoid over-complicating /empire-building.
- Hub/centre would need to engage with key players and networks – business, academia, trade bodies, policy-makers, third sector – and their roles defined.

Hub/centre

- Hub/centre would be easier to engage and interact with than a programme – maintaining contact with a large number of programmes is much more challenging.
- Longer timeframe of a hub/centre would potentially be more suited to building and continuing the level of consistent engagement required for transition.
- Hub/centre would need to be co-created by business and academia to ensure appropriate ownership of the R&I activity.
- Hub/centre would require a clear mandate and set of KPIs, e.g.: coordinating natural assets R&I for business impact; stimulating engagement and brokering partnerships between business, academia, policy and third sector; seeking funding (which will come from different sources over time); knowledge exchange – including through Knowledge Exchange (KE) fellows, placements, etc.
- Hub/centre would require clear governance structure – including a board with responsibility for strategy, representation, with high-level representation of key players from business (key sectors), academia, policy, third sector, plus a well-resourced secretariat.
- Policy engagement is critical and would need thought and budget allocated – hub might have these engagement skills.
- Hub/centre should not be at a single centre/location, but virtual and distributed (across regions) – it might build on existing organisations, but would need to be independent of organizational motivations.
- Hub/centre could perform multiple functions – programme/project. coordination, engagement, training/capacity-building, etc.
- Hub/centre approach may be best fitted to addressing the bigger challenges, e.g. around data.
- Hub/centre could play a training/capacity-building role – helping to ensure that researchers/innovators are equipped to work with industry.
- Hub/centre funding could come from a variety of sources – UKRI, government departments, industry, foundations...
- A Catapult-type structure could risk funding its own activity rather than funding outwards – though can also bring funding together to coordinate large new activity.

- Funding needs to be long-term allowing time to carry through R&I into market development, and focused in support of a clear, coordinated vision around business protection and restoration of natural assets
- Lessons to be learned from business-oriented sustainability hubs and what has and has not worked – e.g. Capitals Coalition, World Business Council for Sustainable Development (WBCSD), World Economic Forum (WEF) (though these are not R&I oriented)
- UK Energy Research Centre (UKERC) is an example of a responsive hub.

Strategic Programmes

- Strategic programmes are generally more time-bound than a hub/centre, which could be a drawback unless self-funding mechanisms from users can be developed over time.
- UKRI-level (e.g.: Strategic Priorities Fund) activity is more appropriate than individual Research Council activity – the R&I needs identified incorporate a significant amount of natural and social sciences as well as other disciplines.
- A core central function with coordination and outreach roles would be required for any strategic programme(s) – including coordinating work across business, academia, policy and third sector.

Projects

- How are these monitored and scaled?
- Projects might work for more focused issues, e.g. woodland restoration.

6. CONCLUSIONS AND NEXT STEPS

6.1 Conclusions

The cross-sector workshop and conference have validated the seven categories of R&I needs identified through previous work (the sector round tables and cross-sector analysis). They have moreover elaborated further these R&I needs, provided examples of relevant ongoing work (by business, academia, the policy community and third sector) and provided further reflection on the delivery options.

The two events have reinforced the sense that there is very considerable strength of interest and energy around the emerging *Natural Assets R&I Agenda in Support of Business and Policy*, in particular from the business community. Representatives from over 200 organisations have now been involved in elaborating the emerging *R&I Agenda*, predominantly from business. The emerging *R&I Agenda* thus offers an outstanding opportunity for co-creation of research with business. At the same time, the two events have reinforced the sense that this emerging agenda is strongly aligned with the interests of the policy community, third sector and academia.

It is moreover clear that the emerging *R&I Agenda* is very timely and indeed critically urgent, in relation to the climate and biodiversity crises, current developments in UK and devolved policy and recent demands on business to understand and address their risks, opportunities and dependencies on natural assets.

The R&I Agenda is also of relevance to the current Coronavirus crisis. Emerging infectious diseases have been linked to the degradation of nature, and natural assets deliver a wide range of benefits, including economic and health and wellbeing benefits, that will underpin recovery from this crisis.²⁸

As regards delivery options, there is a strong consensus emerging around the need for a coordinating hub or platform, which can ensure the necessary coherence across the piece, cross-sector synergies, inter- and multi-disciplinarily, and avoid duplication of effort. There may well need to be innovation in the way this coordinating hub or platform is designed. There is a sense that what is required is an agile governance structure and lean executive, co-led by business and academia, with representation from the public and third sectors, empowered to steer further development and implementation of the *R&I Agenda*, stimulate engagement, raise and allocate resources, and share knowledge. There is also a sense that something along the lines of a hub and spoke model may be appropriate, to avoid undue centralization and ensure business and other players are engaged across the UK.

The examples of relevant business activity and R&I provided in Section 4 of this report can usefully inform further analysis of what R&I needs are already being addressed, and what activity the emerging *R&I Agenda* needs to be cognizant of and build on. The wide-ranging scope of this existing activity demonstrates a considerable existing commitment to and co-investment potential for natural assets R&I. At the same time, this diverse and extensive activity serves to further underline the risk of underperformance of R&I investment in the absence of agreement on collective outcomes and priorities, and to further underline the need for coordination across the piece, and the bringing together of knowledge and lessons learned in support of scaling.

28 Club of Rome – Open Letter to Global Leaders – A Healthy Planet for Healthy People:
<https://clubofrome.org/impact-hubs/climate-emergency/open-letter-to-global-leaders-a-healthy-planet-for-healthy-people>

The Round Table reports, *Analysis and Options* paper, and the current report together provide considerable detail on the broad scope of needs within each of the seven categories of R&I needs. However, there is clearly further work to be done to:

- Further develop the strategic design of a suitable coordinating hub or platform to deliver this R&I Agenda efficiently and inclusively.
- Determine priorities across this comprehensive set of R&I needs, in terms of delivering greatest benefit to both business and natural assets.
- Divide identified priorities into meaningful packages of R&I needs.
- Ensure that these packages take account of existing and ongoing R&I activity and output and build on these.
- Build relevant coalitions of businesses and other key players around these packages of R&I need.
- Secure resources for these packages of R&I need, including from industry, UKRI, Government and third sector (e.g. foundations)

While there is a clear demand for a coordinating hub or platform, there is also a sense that strategic programmes and focused projects will also have a role to play in taking forward this R&I agenda.

6.2 Next steps

One avenue by which the Valuing Nature community is following up on this work is by preparing a case to NERC, to be submitted within the context of the current NERC *Call for ideas for potential Strategic Priority Fund Programmes*.²⁹

The use of this particular channel to submit the emerging R&I Agenda to NERC should not be taken to imply that strategic programmes are necessarily the preferred option for delivery of the identified R&I needs, nor that NERC is the only research council of relevance, nor that UKRI is the only body from which resources might be sought. As outlined in section 5 of this report, there are several possible delivery options, including but not limited to strategic programmes. It is moreover clear that the breadth of R&I needs would suggest possible interest to a number of Research Councils, for example including ESRC, BBSRC, AHRC and Innovate UK. It is also the intention that funding is explored from non-UKRI sources, including central Government and devolved administrations, industry itself, and the third sector (e.g. foundations). Notwithstanding these provisos, the NERC *Call for Ideas* represents a timely opportunity to log the emerging *R&I Agenda* with UKRI, to allow NERC/UKRI to consider whether and how to respond to this emerging agenda.

More broadly, this report has been drawn up with a view to helping all relevant parties (business, academia, government and third sector) understand how the emerging *Natural Assets R&I Agenda in Support of Business and Policy* is forming. We trust this will prove useful for all parties in taking forward their own thinking and action for natural assets R&I. And we hope it will stimulate further dialogue, across the Valuing Nature community, with a view to further refining the *R&I Agenda*, further clarifying optimal delivery option(s), identifying priority packages of R&I needs, building coalitions for co-creation of prioritized R&I, and seeking resource commitments in order to start implementation.

²⁹ <https://nerc.ukri.org/research/portfolio/strategic/ideas-spf/>

ANNEX 1 – Contributing organisations

The following organisations have been represented in developing the emerging *Natural Assets R&I Agenda in Support of Business and Policy*.

1. Organisations attending the Conference, 21 February 2020, The Royal Society, London

Aldersgate Group, AmbioTEK CIC, ARUP, Barclays UK, Bee Watch, Berkshire, Buckinghamshire & Oxfordshire Wildlife Trust, Big Sky Science, Black & Veatch, BNP Paribas Real Estate, British Standards Institution (BSI), Building with Nature, Cambridge Institute for Sustainability Leadership, City Hive, ClimateCare, Conservation Capital, Construction Industry Research and Information Association (CIRIA), Country Land & Business Association (CLA), Department for Business, Energy and Industrial Strategy (BEIS), Department for Food, Environment and Rural Affairs (Defra), Economic and Social Research Council (ESRC), Ecosystems Knowledge Network, eftec, Environment Agency, Environmental Finance, Environmental Policy Consulting, Forest Research, Forest Stewardship Council UK, Forestry England, GD NatCap, Global Garden, Grantham Research Institute, Green Economy Coalition, Green Party Executive, Green Party of England and Wales, Green Purposes Company, Hampton Estate, HM Treasury, Impax Asset Management, Imperial College London, Institute of Chartered Accountants in England and Wales (ICAEW), Institute of Environmental Management & Assessment (IEMA), Intelligent Health, Joint Nature Conservation Committee (JNCC), Kier Highways, KR Capital, Lancaster University, Little Blue Research, Liverpool John Moores University, Manchester Metropolitan University, Marine Management Organisation, Middlemarch Environmental, Mott MacDonald, National Forest Garden Scheme, National Grid, Natural England, Natural Environment Research Council (NERC), Natural Resources Wales, Nestlé UK&I, Robert

O'Connor Ecology, Office for National Statistics, Norfolk County Council, Open University, Oxford Brookes University, Oxford Martin School, Parliamentary Office for Science & Technology, Plantlife International, Queen Mary University of London, Royal Botanic Gardens Kew Satellite Applications Catapult, Savills, Scotland's Rural College (SRUC), Scottish Natural Heritage, Suez UK, Suffolk Marine Pioneer, Surrey Wildlife Trust, Sustain Value, Thames Water, The Crown Estate, The Geology Trusts, The Parks Alliance, The Wildlife Trusts, The Woodland Trust, Transport for London (TFL), UK Centre for Ecology & Hydrology (UK CEH), Unilever, United Utilities, University College London, University of Aberdeen, University of Hull, University of Lincoln, University of Manchester, University of Stirling, Vivid Economics, Willis Towers Watson, WSP.

2. Organisations attending the workshop, 12 February 2020, The Royal Society, London

3Keel, Arup, Atkins, Bangor University, Cambridge Institute for Sustainability Leadership, Construction Industry Research and Information Association (CIRIA), Country Land and Business Association (CLA), Department for Business, Ecosystem Assets, Energy & Industrial Strategy (BEIS), GD NatCap, Green Purposes Company, HS2, Joint Nature Conservation Committee (JNCC), Lancaster University, National Farmers Union (NFU), National Grid, Natural England, Natural Resources Wales, Plymouth Marine Laboratory, Royal Agricultural University, Satellite Applications Catapult, Scottish Forestry, Soil Association, SP Energy Networks, Thames Water, UK Centre for Ecology & Hydrology, Unilever, University of Aberdeen, University of Exeter, UKRI-NERC, Vivid Economics, Willis Towers Watson, Woodland Trust, WSP, WWF-UK.

3. Organisations involved in the policy consultation, January 2020

Cambridge Institute for Sustainability Leadership, Capitals Coalition, Climate Change Adaptation Sub-Committee, Commission for Food, Farming & Countryside, Department for Environment, Food & Rural Affairs (Defra), Environment Agency, Green Finance Institute, HM Treasury, Infrastructure Commission, Joint Nature Conservation Committee, Ministry of Housing, Communities & Local Government (MHCLG), Natural Capital Committee, Natural England, Natural Resources Wales, Office for National Statistics (ONS), Scottish Government, Scottish Natural Heritage, UK Water Industry Research, Welsh Government.

4. Organisations attending the sector Round Table ‘Valuing and Measuring Natural Assets for Insurance / Financial Services’, Prince Philip House, London, 17 January 2019

Aldersgate Group, Barclays, Cambridge Institute for Sustainability Leadership, Centre for Ecology & Hydrology (CEH), Climate Bonds Initiative, European Investment Bank, GD NatCap, Green Purposes Company, HSBC Global Asset Management, Natural Environment Research Council (NERC), S&P Trucost, Spains Hall Estate, Surrey Nature Partnership, UBS, UK Sustainable Investment Forum (UKSIF), UN Principles for Responsible Investment (UNPRI), Vivid Economics, Willis Towers Watson.

5. Organisations attending the sector Round Table ‘Valuing and Measuring Natural Assets for Land Management’, Prince Philip House, London, 21 November 2018

3Keel, Anglian Water, Berkshire, Buckinghamshire & Oxfordshire Wildlife Trust, Buccleuch Estates, Centre for Ecology & Hydrology (CEH), Clinton Devon Estates, Crown Estate Scotland, Environment Systems, GD NatCap, Green Purposes Company, Hampton Estate, Joint Nature Conservation Committee (JNCC), National Farmers Union (NFU), National Grid, National Trust, Natural England, Natural Environment Research Council (NERC), Sainsbury’s, Savills, Scottish Environmental Protection Agency, Scottish Water, Soil Association, The Crown Estate, United Utilities, Wessex Water, Woodland Trust.

6. Organisations attending the sector Round Table ‘Valuing and Measuring Natural Assets for Infrastructure’, Prince Philip House, London, 26 June 2018

ARUP, Atkins, Barratt, Centre for Ecology & Hydrology (CEH), Construction Industry Research and Information Association (CIRIA), Chartered Institute of Wastes Management (CIWM), EDF Energy, Environmental Services Association, GD NatCap, Green Purposes Company, Highways England, HS2, Kier Utilities, London Underground, National Grid, Natural Environment Research Council (NERC), Network Rail, Suez, Temple Group, UK Water Industry Research (UKWIR), United Utilities, Willis Towers Watson, WSP.

7. Organisations involved in the Valuing Nature Programme's Business Interest Group

Balfour Beatty, Capitals Coalition, Country Land and Business Association (CLA), Ecosystem Assets, GD NatCap, Green Purposes Company, Highways England, Intelligent Health, National Grid, Nestlé UK&I, Satellite Applications Catapult, Suez, United Utilities, Wessex Water, Willis Towers Watson, Willmott Dixon, Welsh Water.



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The Valuing Nature Programme is a 5 year £7M research programme which aims to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. It funds interdisciplinary research and builds links between researchers and people who make decisions that affect nature in business, policy-making and in practice. See www.valuing-nature.net

The Valuing Nature Programme is funded by the Natural Environment Research Council, the Economic and Social Research Council, the Biotechnology and Biological Sciences Research Council, the Arts and Humanities Research Council, and the Department for Environment, Food and Rural Affairs.

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info@valuing-nature.net
[@ValuingN](https://twitter.com/ValuingN)

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