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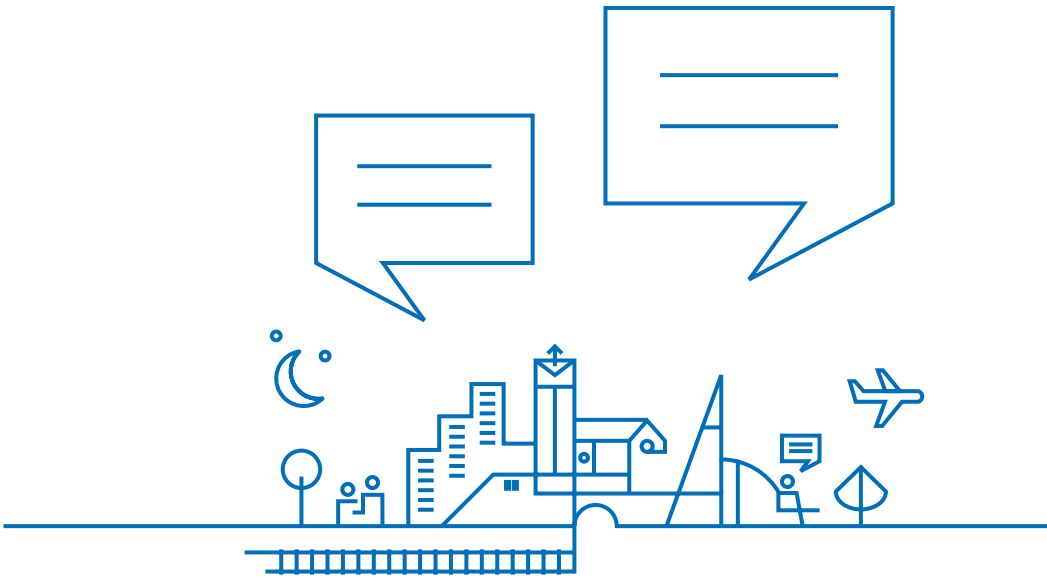
Ecology, Biodiversity Net Gain and Natural Capital in Impact Assessment

Thought pieces from UK and international practice



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GUEST EDITORIAL

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The UK has experienced significant decline in biodiversity since the 1970s, putting many species at risk of extinction. The reasons for this are complex and numerous, but a main contributor over recent decades has been construction and agricultural practices which have not prioritised biodiversity, leading to changes in land use and the distribution of habitat types. This loss of nature is staggering and fundamentally leads to harm to humans and damage to economic prosperity.

The Government has since acknowledged that there is an 'urgent transformative change required to reverse the trend of biodiversity loss'[1], which has led to increases in legislation, policy and guidance. Most recently, the Environment Act 2021[2] (Commencement No. 5 and Transitional Provisions) states that from the 1st of January 2023 public authorities are required to 'conserve and enhance biodiversity', through the exercise of their functions. This is echoed in the Environmental Improvement Plan 2023[3], which has a stated commitment, endorsed by Rishi Sunak, for action to reverse the decline in nature.

Mandatory Biodiversity Net Gain (BNG) of at least 10% (in relation to the pre-development biodiversity value) will come into force imminently in early 2024. However, before this, all development should have been adhering to the NPPF (paragraph 174), which means, 'minimising impacts on and providing net gains for biodiversity…' which has been interpreted through case studies and case law as a measurable change of ≥1%. This, combined with many local authorities establishing net gain policies and 'net gain objectives' that include examples of 10-20% BNG requirement for planning applications, carries significant weight in the planning balance, even while not mandatory. When BNG is a requirement, the balance should shift even more towards the positive for biodiversity.

The framework is now in place to enable situational change and reverse the trend of biodiversity loss. The integration of nature-based solutions, habitat creation and enhancement are now being considered within projects from the inception stage. This is to ensure policy and regulatory requirements are achieved which lead to more resilient landscapes with numerous benefits in terms of carbon sequestration, nature recovery and subsequent health and wellbeing benefits.

This is reflected in the article by Joe Whittick and colleagues who have provided a case study of the RTS, a major flood alleviation project in Surrey. They outline the importance of comprehensive ecological surveys and monitoring in advance of a major infrastructure project, to ensure that high value features are protected and informing appropriate habitat creation and enhancement.

Jon Riley then goes on to discuss Local Wildlife Sites, trying to understand the differing approaches to their designations and possible sources of additional information that can inform how they are assessed in Ecological Impact Assessment (EcIA) and through the Biodiversity Net Gain (BNG) process.

Sara Soerensen has provided an enlightening thought piece looking at the impact of BNG on carbon sequestration and how this can be measured to ensure a

1. publications.parliament.uk/pa/cm5802/cmselect/cmenvaud/136/136-summary.html
2. www.legislation.gov.uk/ukpga/2021/30/contents/enacted
3. www.gov.uk/government/publications/environmental-improvement-plan

holistic approach integrating biodiversity enhancements and carbon net zero initiatives.

Jessica Lewis provides a perspective from one of the country's largest housing developers outlining how her company has evolved their approach to use house building as a driver for nature recovery, embracing BNG to provide more resilient landscaping schemes benefitting communities.

Howard Waples talks about the integration of natural capital into impact assessment, the current disconnect between assessment approaches and the opportunities and methods for embedding natural capital.

Finally, Robert Bain and Lucas Scally discuss natural capital accounting within Regulatory Impact Assessment (RIA), discussing the advantages and the limitations of its application and its potential to account for more intended and unintended environmental impacts of policy.

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River Thames Scheme
Protecting our communities
Securing our economy
Enhancing our Thames

The River Thames Scheme Ecological Impact Assessment

The River Thames Scheme (RTS) will be a major new piece of green and blue infrastructure which will cover part of the largest area of undefended, developed floodplain in England. Communities in the area have suffered major floods in the past with some 11,000 homes and 1,600 businesses at risk. Major flooding in this area can also cause severe disruption to the local and regional road network, impact drinking water supplies and threaten the electricity network.

The RTS is led by the Environment Agency (EA) and Surrey County Council (SCC) with other partners in Surrey including Runnymede, Elmbridge and Spelthorne Borough Councils. It will reduce flood risk by creating a five-mile (8 km) river channel built in two sections through the boroughs of Runnymede and Spelthorne. The channels will flow through existing lakes, intersect existing watercourses and cross under major roads. The channels will act as a new flow route for excess water when water levels in the river Thames rise too high.

One of the most important elements of the design for the project is working with nature to minimise the impacts of the scheme. WSP Binnies are currently developing the Environmental Statement for the project. The Environmental Impact Assessment (EIA) will include a comprehensive Ecological Impact Assessment (EcIA), covering potential impacts and opportunities for habitats and species resulting from the construction and operation of the RTS. The two sections of the channel will always have water in them so they fit into the landscape and provide permanent habitat for wildlife. In addition to enhancing biodiversity, the RTS will achieve other natural capital benefits, for example carbon capture through new tree planting and woodland improvement. The aim is for new habitat creation and enhancement to achieve multiple benefits wherever possible.

The scheme represents a new landscape-based approach to creating healthier, more resilient and more sustainable communities, and responds to the challenges of flooding, climate change and nature recovery. It creates more access to green open spaces and sustainable travel routes, while also encouraging inclusive economic growth. Specifically in relation to biodiversity, the RTS will ensure Biodiversity Net Gain (BNG) by proposing priority areas for habitat creation that link with existing and new wildlife corridors, improve fish passage and build on the network of existing wildlife sites. Delivering multiple benefits will require careful habitat design, allowing people opportunities to connect with nature while simultaneously creating high quality

The RTS will ensure Biodiversity Net Gain (BNG) by proposing priority areas for habitat creation that link with existing and new wildlife corridors, improve fish passage and build on the network of existing wildlife sites.

habitats in which nature can thrive. These diverse aims will need to be balanced and prioritised as part of the EIA process.

To inform the EcIA, WSP Binnies is undertaking an extensive ecological monitoring programme across the 800 hectares scheme area, work that has been ongoing since 2014. A range of habitat assessments and multiple terrestrial and aquatic species surveys have been completed using innovative survey methods including digital UKHab mapping. A variety of protected and notable species have already been identified, as well as other less well-known species. This has included the discovery of a nationally rare mayfly (*Caenis beskidensis*), which had not been recorded in the UK for 49 years and which has never been found in the river Thames. This discovery highlights the importance of completing comprehensive surveys to establish existing high value features to ensure they are protected, and to inform appropriate habitat creation and enhancement. The RTS also affects the South-West London Waterbodies Special Protection Area (SPA) and Ramsar Site and will require a Habitat Regulations Assessment (HRA).

In addition to protected species, surveys have identified a range of invasive non-native species (INNS) within the scheme area. These include terrestrial species such as Japanese knotweed (*Reynoutria japonica*), as well as aquatic species including zebra mussel (*Dreissena polymorpha*). The EcIA will assess the likely impacts of the scheme on the distribution of INNS and will propose measures to minimise the risk of the scheme causing spread of these species. WSP Binnies are developing a GIS tool which will capture key ecological constraints and mitigation throughout the scheme area, which will include the spatial distribution of INNS and proposed mitigation and management.

Given the scale of the RTS, it will inevitably have a range of ecological impacts. Where necessary, appropriate mitigation and compensation measures are being implemented, and these will balance and prioritise the requirements of multiple different species and other scheme drivers. Construction of the RTS is still some years away, and the impact assessment must account for potential changes in the baseline between now and the start of construction. The EcIA must have the capacity to adapt and change as updated survey information becomes available.

For further information on the scheme please visit www.riverthamesscheme.org.uk.

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Local Wildlife Sites: The approach to designation and how they are assessed in Ecological Impact Assessment (EcIA) and through the Biodiversity Net Gain (BNG) process

As a business, Temple has received an unusually large number of recent opportunities to bid for surveys of Local Wildlife Sites (LWS) to confirm their current status and assess the potential for biodiversity offsetting. This has led me to think again about what they represent as a nature conservation resource; the approach to designation and how they are assessed in Ecological Impact Assessment (EcIA) and through the Biodiversity Net Gain (BNG) process.

My interest in these sites started years ago through open space surveys in several London boroughs, as well making new and confirming existing designations. More recently, Temple has carried out surveys with a similar purpose in Lincolnshire, London and Wakefield. In these cases, there has been an increasing focus on the strengthened duty to enhance in the NERC Act[4] and addressing additionality (in the sense that BNG must not take account of any benefit that should be delivered through other processes) as part of BNG assessments. The approach to designating Local Sites[5] (Defra, 2006) sets out their purpose and status and some well-known principles, notably that all sites of substantive nature conservation interest should designated (in contrast to Sites of Special Scientific Interest (SSSIs) that are representative), and that the type and relative quality of what is designated should reflect the local resource and be identified through the use of 'locally-defined' criteria.

The guidance provides the broad attributes on which the criteria should be based, and states that some or all of these can inform the development of individual measurable thresholds for Local Site selection.

This has led many responsible bodies (formulated as Local Sites Partnerships) to develop largely objective criteria such as habitat extent, the number of indicator species, percentage of a local species population or number of characteristic species of an assemblage, all largely in the context of local and national conservation priorities. In some areas (including London) the approach to designation relies to a greater degree on how to understand and identify locally substantive nature conservation interest, in which objective information such as extent and rarity, is considered as part of a more qualitative process. These approaches have differing merits for the practice of EcIA and BNG. The former may more readily allow assessment of impacts (for EcIA) and the degree to which a site's current condition aligns with the reasons for designation (for BNG), but this is affected by availability of verified and up-to-date information on a wide range of ecological characteristics. The latter is likely to be less amenable to external objective assessment but places emphasis on dialogue, local knowledge and professional judgment, all essential to EcIA and BNG.

4 Natural Environment and Rural Communities Act (2006). www.legislation.gov.uk/ukpga/2006/16/contents.
5 Local Sites includes LWS and Regionally Important Geological Sites (RIGS).

The Official Statistics for Nature conservation: Local Sites in positive conservation management in England, 2008-09 to 2021-22 (Defra, July 2023) show that only 43% of Local Sites are being managed, based on a response rate in 2021/22 of 46% of Local Authorities. This is the lowest it has been since its publication began and less than half what it was in 2008/09 (97%) when these data were first published. Reasons include lack of survey (that effects qualification for funding for site management), insufficient exchange of information, staff shortages and the impact of Covid 19.

Based on the responses, there has been a modest change in the number of sites in positive management with a recent 4% decline following an 11% increase. In 2018 the Wildlife Trusts reported that there were over 45,000 LWS in England that account for 5% of England's landcover as determined by a range of sources including Natural England's estimate that LWS cover 13,039,500 hectares of England's total land area. At this point, only approximately 15% of LWS had been monitored in the preceding five years.

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Without disregarding their differing purposes, practical guidance for implementing BNG,[6] identifies similarities in processes for carrying out EcIA and BNG, including an iterative approach, dialogue and consultation, and in determining compensation. It therefore follows that the work carried out to improve our knowledge of LWS for a particular project should inform both processes.

In the context of the knowledge gaps described above, the obvious approach (and especially so if field surveys are not possible) is to prioritise consultation with stakeholders to fully understand the local basis for designation of LWS; why particular sites have been designated and possible sources of additional information that can inform impact assessment and an understanding of additionality. This has worked well for a recent project with Transport for London where, through consultation with the Local Site Partnership, we gained an understanding of the reasons for designation of railside sites with poor access and a limited evidence base. This informed a BNG study but would be equally relevant to an EcIA.

Recent opportunities to resurvey LWS are welcome, given the lack of recent data, their huge importance for nature recovery and their largely unquantified environmental, social and economic value. However, because of the resources required to carry out these surveys and while emerging approaches (for example, those based on machine learning and remote sensing) are developed and tested as a partial solution, there remains a risk that LWS could be insufficiently considered in EcIA and BNG. This article is simply intended to highlight the importance of LWS individually and collectively and encourage dialogue in their assessment.

6 Baker, J., Hoskin, R. and Butterworth, T. (2019). Biodiversity net gain. Good practice principles for development (C776F). CIRIA. Available at: www.ciria.org/ItemDetail?iProductCode=C776F&Category=FREEPUBS.

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Connecting Net Gain and Net Zero: why we must design Biodiversity Net Gain to help tackle climate change

Introduction: A joint crisis

The fact that biodiversity is our greatest ally in the climate crisis is neither surprising nor revolutionary. Indeed, conservation's role in carbon sequestration often remains its most notable feature. At the same time, human-induced climate change is causing a devastating loss of biodiversity, eroding the very fabric of our living world. They are inseparable: two sides of the same coin. Using our Mott MacDonald method to estimate the impact of BNG on carbon sequestration, it is possible to make this essential link in infrastructure development.

The missing connection

Although widely recognised in political and academic language, the integration of biodiversity and climate has largely failed to translate into practice in infrastructure development. Impacts on biodiversity have been seen as vague, complex and difficult to measure, with a lack of detailed data available for comparable quantification. And so, the connection between biodiversity and net zero carbon initiatives has been reduced to qualitative assumptions or omitted entirely. In the UK, however, new legislation for biodiversity brings us to a crossroads. Either it enables this urgently needed connection or it simply reinforces the existing siloed approach.

From January 2024, Biodiversity Net Gain (BNG) will become mandatory for most projects seeking planning permission in England, requiring a detailed, standardised measurement of habitats present on site before and after development. Moreover, developers must evidence how they apply the 'mitigation hierarchy' and then how residual loss of habitats will not only be reinstated, but further enhanced at least 10% above the baseline and secured for a minimum of 30 years. With 300-450,000 planning permissions granted each year in England[7], this influx of data provides a nationwide mosaic of present and future habitats.

Similar policies to boost biodiversity through the planning system have emerged in Scotland (National Planning Framework 4 – enacted February 2023[8]) and Wales (Net Benefits for Biodiversity – principles of the forthcoming policy published October 2023[9]). The interesting distinction is that these policies place significant emphasis on the nature-climate link.

So, for infrastructure development, how can we design the creation and enhancement of habitats that are both wildlife-rich and help tackle climate change?

7 HM Government (2023). Planning applications statistics. Available at: www.gov.uk/government/collections/planning-applications-statistics.
8 Scottish Government (2023). National Planning Framework 4. Available at: http://www.gov.scot/publications/national-planning-framework-4.
9 Welsh Government (2023). Addressing the nature emergency through the planning system: update to Chapter 6 of Planning Policy Wales. Available at: www.gov.wales/addressing-nature-emergency-through-planning-system-update-chapter-6-planning-policy-wales.

Table 1. Results from four retrospective assessments of carbon sequestration potential of BNG versus the scenario of no-BNG over 30 years, measured in tonnes of CO_2 equivalent (tCO_2e).

Project	Summary	Carbon sequestration potential of habitats over 30 years (tCO2e)		
		Baseline (No BNG)	With BNG Proposal	Change in tCO2e
Major transport scheme	More than 500 Ha of intensive arable farmland and pockets of woodland, scrub and grassland were replaced with woodland planting, and scrub and grassland creation under BNG.	2,288	17,158	+14,870
Small urban development	BNG replaced amenity grassland and urban planting with new and enhanced grassland.	7	6	-1
New treatment plant	Site for the plant consisted of arable land and areas of woodland and scrub. BNG introduced extensive woodland creation.	306	3,457	+3,151
Electric vehicle charging substation	Site location was fixed to connect to the grid and consisted of mostly low-value woodland, which was cleared and replaced by off-site woodland enhancement.	522	373	-149

Source: Mott MacDonald, 2023. Only high-level information provided due to project confidentiality.

Connecting Net Gain and Net Zero

Habitat carbon sequestration rates are undoubtedly complex and variable, depending on their characteristics and wider physical conditions governed by season, weather, climate and human interventions. However, average rates for many have been calculated through various scientific research providing data and units for measurement, typically in tonnes of CO_2 equivalent per hectare per year ($tCO_2e\ ha^{-1}\ yr^{-1}$). A collection of representative average carbon sequestration rates of England's broad semi-natural habitats and land managements can be found in Natural England's NERR09410.

The Nature Services team at Mott MacDonald has developed a method, aligned with Defra's Enabling a Natural Capital Approach (ENCA) 11 guidance and industry best-practice, to estimate the impact of BNG on carbon sequestration by inputting:

1. Habitat change under BNG (total hectares (Ha) of each habitat)
2. Equivalent carbon sequestration rates of those habitats (tCO2e Ha-1 yr-1)
3. A set period of 30-years, as per the mandatory BNG minimum requirement.

This method was trialled retrospectively on four completed projects: a major transport scheme, a small urban development, a new water treatment plant and an electric vehicle charging substation.

The purpose was two-fold. Firstly, to understand how BNG can be designed to generate net gains in ways that increase carbon sequestration rates of habitats. Secondly, to then widen the scope to look holistically at the whole development project in terms of its biodiversity and carbon outcomes.

The results were surprisingly mixed. On some projects, BNG increased carbon sequestration rates relative to a no-BNG scenario. On others, carbon sequestration rates decreased (Table 1).

10 Gregg, R., Elias, J.L., Alonso, I., Crosher, I.E., Muto, P. and Morecroft M.D. (2021). Carbon storage and sequestration by habitat: a review of the evidence (second edition). Natural England Research Report NERR094. York: Natural England. Available from: publications.naturalengland.org.uk/publication/5419124441481216.

11 DEFRA (2020). Enabling a Natural Capital Approach. Available at: www.gov.uk/guidance/enabling-a-natural-capital-approach-enca.

Comparing carbon sequestration rates of habitats under scenarios of no-BNG, and then BNG, not only gives a holistic account of a development's carbon impact but also helps evaluate whether BNG truly benefits biodiversity, as BNG designs that exacerbate climate change would contribute to biodiversity loss.

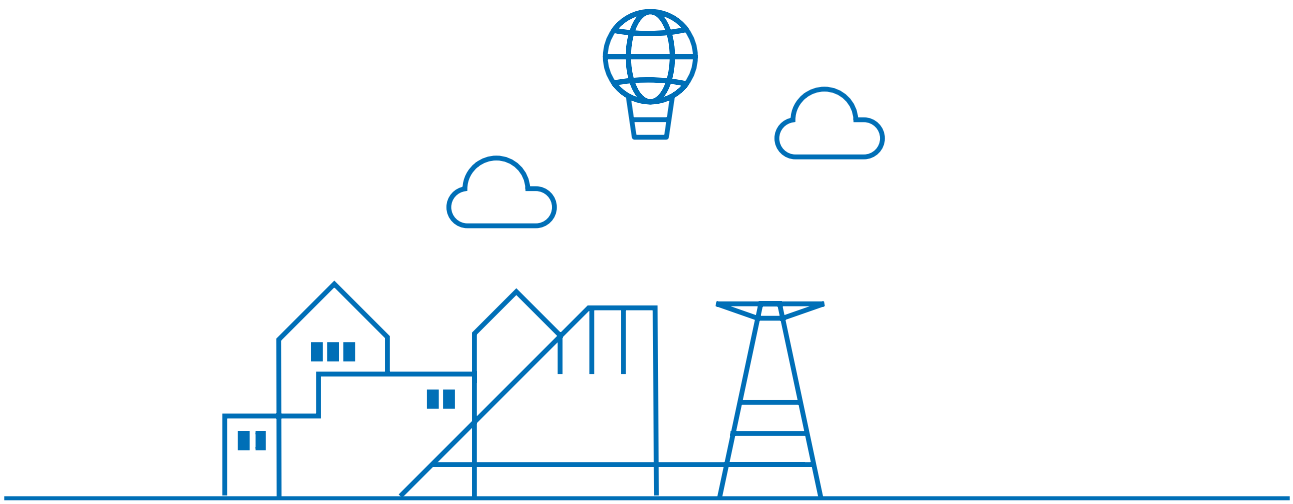
> *How can we design the creation and enhancement of habitats that are both wildlife-rich and help tackle climate change?*

This BNG/carbon assessment was specifically created to deliver a relatively quick, pragmatic approach to inform BNG designs, and solely considers the change in carbon *removed from the atmosphere over time*. A next step would be a more detailed assessment incorporating changes in the carbon stored within habitats (biomass and soils) under BNG – thereby adding to the project's carbon baseline calculation.

Final thoughts

Calculating the impact of BNG on carbon sequestration is a powerful first step towards integrating biodiversity enhancements and carbon net zero initiatives on development projects. It presents a significant opportunity to firmly embed this connection in practice across the UK.

Of course, the biodiversity-carbon link is not the only untapped potential within sustainability practice. Too often, we are restricted by silos rooted in our economic tradition. But nature and climate do not work like that. They are inherently holistic, interlinked, multi-directional and interdependent. If we ever hope to design in ways that are biodiversity- and climate-positive, we must implement techniques that imitate and respect the complexity of these systems.



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Berkeley Group: Our BNG Journey

The Berkeley Group's journey towards Biodiversity Net Gain (BNG) began in 2016, when we developed our approach to achieving a measurable increase in biodiversity. Our goal was to prove that homebuilding could be a driver for nature recovery and the following year we became the first developer in the country to commit to achieving an on-site BNG on all new developments, regardless of the site's former use.

Since 2017, we have put BNG into action on 54 projects, which combined will create more than 550 acres of new or measurably improved natural habitats, including 55 acres of living roofs, 235 acres of woodland and 150 acres of nature-rich grassland.

To date, all 54 sites are on course to deliver BNG on site, without the need for offsite solutions, and the average percentage gain we expecting to achieve is over 100%.

Our design and delivery approach is highly collaborative and we work in partnership with conservation bodies, such as the Wildfowl and Wetlands Trust and local Wildlife Trusts, local communities and leading landscape designers. Together, we are weaving more ambitious and beautiful natural networks through our neighbourhoods, which give wildlife the conditions to thrive and include welcoming public spaces where communities can enjoy all the benefits of nature.

Providing nature on our developments has multiple other benefits alongside biodiversity. These include helping our developments be more resilient to the effects of climate change, for example helping to reduce the urban heat island effect, managing water more sustainably and storing carbon.

Looking back on over seven years of delivery we believe the implementation of BNG has been an

overwhelmingly positive experience and it's hugely rewarding to see each natural landscape mature into a vividly beautiful and popular place. We have learnt that wilder and more varied natural landscapes are more resilient to climate change and are more engaging than traditionally-designed green open space, becoming a real source of joy and pride and a focal point for the community. We firmly believe that access to a beautiful natural open landscape can enhance people's health and wellbeing over the long term.

At times it has also been challenging as we have needed to rethink the way we design the landscape through our developments. We have had to upskill our internal teams, work with our designers and consultants and engage our customers on our approach. We have not tackled these challenges alone and have worked with some fantastic partners and experts across the industry to help us evolve our approach.

Two of our developments fully completed and implemented their BNG and landscape design this year: Courtyard Gardens, Oxted and Filmworks, Ealing.

Whilst both are relatively small sites, they were each able to achieve gains of more than 20% through incorporating a mix of habitats including living roofs and tree planting. At Kidbrooke Village we continue to work with the London Wildlife Trust and recently undertook an assessment of Cator Park North of the habitat and ecological enhancements that have been implemented. This included a habitat condition assessment which found the majority of the habitats (excluding trees) should reach their target condition within the next three years. The overall assessment concluded that Cator Park North is on target to achieve a 99% biodiversity net gain, with the overall development forecast to deliver a net biodiversity gain of more than 258% once it grows to full maturity.

We have learnt that wilder and more varied natural landscapes are more resilient to climate change and are more engaging than traditionally-designed green open space.

We are very proud to have led the industry on Biodiversity Net Gain and laid the path for it to become a national legal requirement for all developments. And we were delighted to co-host a Biodiversity Conference with Natural England and the Local Government Association earlier this year to share best practice and generate debate around the challenges and opportunities ahead.

Over the next year, we'll be working closely with our managing agents and landscaping contractors to ensure that they have the skills to maintain the habitats that we create in the long term. We will continue to engage and share knowledge with the industry to find solutions to some of the more complex challenges, as we look to regenerate 32 of the country's most challenging brownfield sites and stitch them back into their surrounding communities with access to and enhancement of nature being key.

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TETRA TECH

Integrating Natural Capital into Impact Assessment

When talking about 'natural capital', it's important to clarify what it means. The UK Government's 'Enabling a Natural Capital Approach' (updated July 2023)[12] provides a description that is consistent with the Natural Capital Protocol (2016)[13]:

- It includes certain stocks of aspects of nature that society values (e.g., forests, fisheries, rivers, biodiversity, land and minerals), which can be both living and non-living aspects of ecosystems;
- These stocks provide flows of environmental or 'ecosystem' services over time, which in combination with other forms of capital (human, produced and social) produce a wide range of benefits that have market value (such as minerals, timber, freshwater) or non-market value (such as outdoor recreation, landscape amenity);
- Non-use values (e.g., the value people place on the existence of particular habitats or species), are also important considerations.

There are a many different applications, tools and methodologies for adopting and assessing natural capital, and as the term can mean different things to different people (e.g., companies and communities) this article defines what it could mean at an Impact Assessment project level.

Impact Assessment practitioners will note that the EIA and SEA Directives (2014/52/EU and 2001/42/EC) don't specifically mention natural capital, and therefore it follows that UK legislation hasn't transposed it. Furthermore, given that recent major updates to the EIA Regulations happened in 2017 and it wasn't until 2018 that the Government's 25 Year Environment Plan was published (which called for 'Environmental Net Gain' (ENG) based on natural capital), there's a clear disconnect between assessment approaches.

The benefits of adopting an ENG approach in Impact Assessment are that it allows a more values-based approach to considering 'the environment', including the dynamic processes that take place. It also facilitates a more holistic way of looking at the trade-offs in ecosystem service functions that are often not considered.

Strengths and weaknesses of natural capital in current Impact Assessment practice

The good news is that Impact Assessments such as EIA, SEA, Habitats Regulations Assessment and Health Impact Assessment do already take into account natural capital and the underpinning ecosystem services (to an extent).

For instance, in EIA, the following provides examples of how typical topics already consider natural capital stocks, but don't always assess the impacts in terms of changes to flows of ecosystem services.

The benefits of adopting an ENG approach in Impact Assessment are that it allows a more values-based approach to considering 'the environment', including the dynamic processes that take place. It also facilitates a

12 www.gov.uk/guidance/enabling-a-natural-capital-approach-enca.
13 naturalcapitalcoalition.org/wp-content/uploads/2018/05/NCC_Protocol_WEB_2016-07-12-1.pdf.

EIA topic	Natural capital stocks	Change to flows of (category of) ecosystem services
Landscape and visual amenity	Designations (e.g., AONB, Conservation Areas)	Enjoyment/appreciation (cultural).
Air quality	Clean breathable air	Amelioration of air pollutants by vegetation (regulating, supporting).
Water resources/ flood risk	Ground water, surface water, flood plain, intertidal zone	Ability of ecosystems to purify water (regulating, supporting). Ability to store water (regulating, supporting).
Socio-economic	Open and green spaces	Quality and accessibility for the population (cultural).
Ground conditions (including soils, minerals, agriculture)	Soil depth and quality. Types and quantities of mineral deposits. Productive land.	Ability of soils to cleanse pollution (regulating, supporting). Number of resources to be abstracted (provisioning). Ability to produce food (provisioning).
Ecology and biodiversity	Quantity and condition of habitats and species.	Access to nature (cultural). Amount of pollination/natural pest control (regulating). Species genetics pool (supporting).
Climate change mitigation and adaptation	Global atmosphere. Tree cover, floodplain and intertidal extents.	Carbon sequestration from soils and vegetation (regulating). Flood risk and erosion (regulating). Urban heat island (regulating).

more holistic way of looking at the trade-offs in ecosystem service functions that are often not considered.

There are barriers to its implementation largely because:

- Regulations require consideration of biodiversity, land, soil, water, air, climate, material assets, cultural heritage, landscape and the interaction between them, but doesn't stipulate ecosystem services and natural capital specifically, and therefore there are no legislative/policy drivers;
- Competing focuses and methodologies of synergistic assessment (such as human health, amenity and in-combination climate impacts) can add to the burden of Impact Assessment practitioners; and
- Lack of technical capacity and consistent/accepted guidance across both IAs and decision-makers to standardise approaches.

Opportunities and methods for embedding natural capital into Impact Assessment

The examples above show that the building blocks for integrating a natural capital and ecosystem services approach are already largely in place. Typically, on larger infrastructure projects, there has also been the emergence of supporting natural capital assessments, for instance that use Natural England's Environmental Benefits of Nature tool. However, whilst this can be a useful way to evidence sustainable design and present trade-offs and positive outcomes, the provision of both consistent standards and the ability for outcomes to be translated into EIA terminology and mitigation commitments are both key opportunities.

The future of EIA/SEA may be subject to significant change, due to the prospect of Environmental Outcomes Reports (EOR) (proposed under the Levelling

up and Regeneration Bill) which would focus on a more narrow set of environmental targets and indicators arguably better suited to the natural capital approach. Whilst the timing of this is uncertain, in the meantime there is an opportunity to better integrate natural capital in Impact Assessment by:

- Expanding the focus of existing Impact Assessment topics to consider their baseline and impacts through a natural capital lens;
- Expanding the cumulative effects assessments (or producing a new ES chapter) to present a transparent framework that sets out a range of natural capital and ecosystem services consistently and comparably, in terms of:
    - existing baseline capacity (at a site and wider spatial level);
    - current and future demand for ecosystem services;
    - net change in value with the project in place;
    - how mitigation and monitoring will be secured.
- Growing capacity among Impact Assessment professionals and decision makers to allow a consistent measure of ENG to be a material consideration in consenting decisions.

To align with the approach and objectives set out in the Government's 25 Year Environment Plan, subsequent Environmental Improvement Plans, a natural capital and ecosystem services approach should be encouraged in Impact Assessment. Whether this be through supplementing the current EIA/SEA approach, or embedding within EORs, remains to be seen.

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Putting a price on nature? The role of natural capital accounting in Regulatory Impact Assessment

What is natural capital?

This article discusses natural capital accounting within Regulatory Impact Assessment (RIA). We at Zero Waste Scotland provide Business and Regulatory Impact Assessments (BRIAs)[14] for the Scottish Government, such as for the Circular Economy Bill[15]. Natural capital is defined as the planet's stocks and flows of natural renewable and non-renewable assets[16]. These can be, broadly, split into:

- Provisioning services which create food, water and timber;
- Regulating services such as the carbon cycle and natural flood defences;
- Cultural services such as the recreational use of nature or inspiration for medical and mechanical innovations; and
- Supporting services such as nutrient cycling, soil formation and photosynthesis.

Annually, the Scottish Government publish the Scottish Natural Capital Accounts[17], currently valued at £230 billion (13% of the UK total). Provisioning services make up 89%, 86% of which being oil and gas. A more detailed, internationally recognised classification of ecosystem services has been produced by the European Environmental Agency (EEA)[18] and this classification is used in the United Nations System of Environmental-Economic Accounting (SEEA).

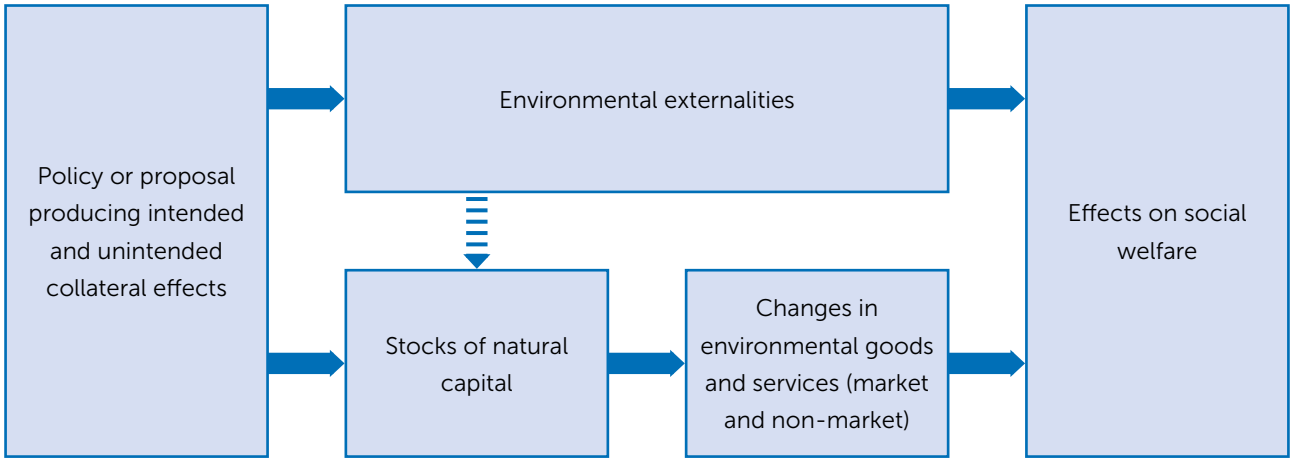
Natural capital accounting in RIA

The UK Government's 'Enabling a Natural Capital Approach',[19] is recommended by the HM Treasury's Green Book[20]. In this, a policy can have intended or unintended effects causing environmental externalities (impacts not captured within market transactions), and influences on the stocks and flows of natural capital, with both impacting social welfare. Figure 1 illustrates this process.

Some externalities are quantified within a BRIA, such as carbon emissions and the visual disamenity of litter. These do not however consider the economically efficient use of natural assets such as watercourses, soil, land-use and specific habitats such as peat bogs. Upcoming policies such as Extended Producer Responsibility (EPR) for packaging, Waste Electronics

14 www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/11/business-regulatory-impact-assessments-toolkit/documents/business-regulatory-impact-assessment-toolkit/business-regulatory-impact-assessment-toolkit/govscot%3Adocument.
15 www.parliament.scot/bills-and-laws/bills/circular-economy-scotland-bill.
16 seea.un.org/content/natural-capital-and-ecosystem-services-faq.
17 www.gov.scot/publications/scottish-natural-capital-accounts-2023/.
18 Common International Classification of Ecosystem Services (CICES). cices.eu/.
19 www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance.
20 www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent.

Figure 1: HMT Green Book (2022)



and Electrical Equipment (WEEE) and batteries cannot account for the Full Net Cost Recovery (FNCR) of the environmental and social impacts of a product's full lifecycle. A recent Zero Waste Scotland publication[21] has recommended that more costs associated with economic crises should be internalised within EPR schemes where producers aren't meeting performance requirements. Still, to incorporate some would require acceptance of greater uncertainty in outputs. Traditionally, it is 'waste management' costs which are used for the calculation of FNCR for producers, which is only part of the total social and environmental costs of consumer products placed on the market.

Advantages and limitations of application

The most obvious advantage is facilitating a more comprehensive assessment of the impacts of a given policy by incorporating environmental and social values. Another is the ability to compare the trade-offs between economic, environmental, and social values. And finally, valuation also allows and facilitates the identification of whether the costs or benefits of a policy are disproportionately borne to a small group of stakeholders by allowing for an accounting of stocks and flows of natural capital.

A key limitation in applying a natural capital approach to RIA is that they do not consider costs and benefits beyond national borders, where these ecosystem impacts often occur. For example, a policy which reduces domestic meat consumption produced via foreign deforestation could underplay or even omit the overall environmental impact of the policy.

There is an implied fungibility to maintain an 'optimal' level of social welfare from natural resources and services. This is problematic when much valuation remains uncertain particularly over the long term[22], costs and benefits are unevenly distributed, and scientific understanding of natural systems is incomplete. This could open the door to undue marketisation of the natural environment, leading to further over-exploitation due to imperfect markets where externalities are still not accounted for[23,24]. Looking to the future poses issues too. As resources will become increasingly scarce,

21 cdn.zerowastescotland.org.uk/managed-downloads/mf-es8gnm1w-1697117783d.
22 Spash, C.L. (2008). How much is that ecosystem in the window? The one with the bio-diverse trail. *Environmental values, 17*(2), pp.259-284.
23 Daly, H.E. (2007). *Ecological economics and sustainable development*. Edward Elgar.
24 Costanza, R., De Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S. and Grasso, M. (2017). Twenty years of ecosystem services: how far have we come and how far do we still need to go?. *Ecosystem services, 28*, pp.1-16.

their present valuation may be an underestimation[25]. It takes time and effort to update valuations and some stakeholders may prefer older, cheaper valuations for economic or political gain[26]. This creates lock-in and path dependency exemplified by the fact that carbon emission discount rates calculated in 1991[27,28] are still being used for decision-making today[29].

Conclusion

Incorporating natural capital into RIA has the potential to account for more intended and unintended environmental impacts of policy. This would foster greater accountability among stakeholders and an evolving evidence base for future development and investment plans. The domestic nature of RIA however constrains accounting where policy affects imports and exports. Additionally, legitimate concerns stand over the substitutability between natural resources and services, unwarranted marketisation of nature leading to further overexploitation, and the accuracy of commonly utilised accounts influenced by economic and political interests. Nevertheless, the general principle of greater transparency and accountability within environmental policy lends itself to the further investigation of natural capital along with related topics such as biodiversity loss and intergenerational equity.

25 Howarth, R.B. and Norgaard, R.B. (2017). Environmental valuation under sustainable development. In *The Economics of Sustainability*. Routledge. pp. 193-197.

26 De Groot, R., Fisher, B., Christie, M., Aronson, J., Braat, L., Gowdy, J., Haines-Young, R., Maltby, E., Neuville, A., Polasky, S. and Portela, R. (2012). Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In *The economics of ecosystems and biodiversity: Ecological and economic foundations*. Routledge. pp. 9-40.

27 Nordhaus, W.D. (1991). To Slow or Not to Slow: The Economics of The Greenhouse Effect. *The Economic Journal, 101*(407), pp.920–37. doi. org/10.2307/2233864.

28 Masini, F. (2021). William Nordhaus: A disputable Nobel [Prize]? Externalities, climate change, and governmental action. *The European Journal of the History of Economic Thought, 28*(6), pp.985-1004. DOI: 10.1080/09672567.2021.1963798.

29 www.vox.com/future-perfect/22643358/social-cost-of-carbon-mortality-biden-discounting.

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Summary

I have a positive outlook that the necessary framework is in place to promote and encourage nature recovery. With BNG being embedded in national and local policy and a mandatory BNG requirement coming into force early 2024, we should start to see positive outcomes in terms of nature recovery.

The examples expressed in this journal alone demonstrate a change in perspective from developers acknowledging the wide-ranging benefits of appropriate habitat creation and enhancement from carbon sequestration to health and wellbeing, hopefully driving a step change moving forward.

The role of Impact Assessment is essential in recognising and valuing the importance of existing habitats to enable their integration into the design process, not just conserving habitats though providing the appropriate framework for enhancement and significant net gain. The upcoming changes to the Environmental Impact Assessment process through the Levelling Up and Regeneration Act (LURA)[30] and the implementation of Environmental Outcome Reports (EOR) should strengthen this approach. It is intended that the assessment process will be streamlined to put a greater focus on delivering environmental ambitions in line with the government targets outlined in their 25 Year Environment Plan[31]. As a result, there will be a clear emphasis on monitoring to ensure relevant mitigation and enhancement are appropriately implemented and the outcomes measured to enable the process to be adapted so that reported positive outcomes are achieved, or when not, compensated for. How natural capital and ecosystem services will be embedded in this process remains to be seen though what is clear is that a holistic approach will be vital in delivering on the government's environmental ambitions.

I would like to conclude by thanking all of the contributors for giving up their valuable time and unique insights into a range of interesting subjects. I hope you have found this journal as informative and enjoyable to read as I have to collate.

30 Levelling-up and Regeneration Act (2023). Parliamentary Bills. Available at: bills.parliament.uk/bills/3155.

31 25 Year Environment Plan (2018, updated 2023). Available at: www.gov.uk/government/publications/25-year-environment-plan.

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IEMA's EIA Quality Mark: A scheme operated by the Institute allowing organisations (both developers and consultancies) that lead the co-ordination of statutory EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed. Founded in 2011, the EIA Quality Mark is a voluntary scheme, with organisations free to choose whether they are ready to operate to its seven EIA Commitments: EIA Management; EIA Team Capabilities; EIA Regulatory Compliance; EIA Context & Influence; EIA Content; EIA Presentation; and Improving EIA practice.

Ecology, Biodiversity Net Gain and Natural Capital in Impact Assessment

This nineteenth edition of the Impact Assessment Outlook Journal provides a series of thought pieces on the River Thames Flood Alleviation Scheme, Biodiversity Net Gain, Ecological Impact Assessment and Natural Capital in EIA and Regulatory Impact Assessment. In this edition, the Guest Editor, James Sanders, has selected six articles produced by IEMA professionals and EIA experts. The result is a valuable yet quick read across some of the different aspects of UK and international practice exploring Ecology in Impact Assessment.

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James Sanders has over 18 years' experience in Impact Assessment delivering and reviewing EIAs for the retail, residential, commercial, industrial and infrastructure sectors with particular focus on urban regeneration schemes. He is currently a Senior Director running the EIA Property team at Temple Group and sits on the IEMA IA Steering Group.

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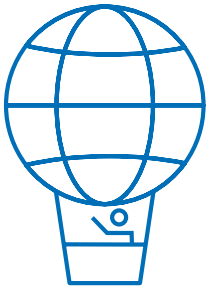

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