

Biodiversity Net Gain in England

Developing Effective
Market Mechanisms

Discussion Paper
October 2021



Foreword

Lynn Scarlett, Chief External Affairs Officer

The Nature Conservancy

Worldwide, losses of biodiversity continue at an alarming pace, jeopardizing natural systems and the benefits they provide to communities and economies. Reflecting this trend, in the UK, 15 percent of terrestrial and freshwater species face extinction. Changing this trajectory requires new policies and new rules that reverse this trend. Offsetting biodiversity losses and incentivizing investments in nature offer a 'new deal for nature.' The potential for mobilizing the power of a nature marketplace is significant, but that power requires clear goals and smart rules. This report, Biodiversity Net Gain in England, builds on experiences with biodiversity markets across the globe to help shape the UK's pathway to protecting and restoring nature.

Peter Simpson, Chief Executive Officer

Anglian Water Group

The climate and biodiversity crisis is upon us. It is for us to solve now because it will be too late if we leave it to future generations. Our region has lost a lot of its biodiversity over the last century and we must join forces with others to put it back, for its own sake but also to underpin growth and the region's economy. This welcome paper highlights challenges and issues that need to be addressed to ensure that Biodiversity Net Gain works for nature and is trusted by practitioners and stakeholders. I believe that, done right, Biodiversity Net Gain can help reverse biodiversity loss. Done right, we can help the region's beleaguered habitats and species and reap benefits for the communities we serve. And crucially, restoring biodiversity will help us both mitigate climate change and adapt to the inevitable impacts we face, such as flooding and drought.

Rosie Begg & Glenn Anderson - Landowners

Wendling Beck Exemplar Project

This timely report from TNC highlights the risks and areas needing further transparency to ensure BNG policy can deliver landscape change at scale. Both buyers and sellers need more clarity if they are to plan projects properly and engage with different markets early. From a landowner perspective, it is imperative that clear rules around the stacking and bundling of different ecosystem services are defined as quickly as possible. BNG has been key to habitat restoration and nature creation around the world and the UK can begin with strong foundations thanks to the lessons TNC share in this report.

Michael Copleston - Head of Land

RSPB England

If it's done well, biodiversity gain should be a step change for habitat creation and nature recovery in England. The conservation sector has been clear that there are a lot of potential pitfalls in how biodiversity gain is designed and implemented - Government and every other organisation involved in biodiversity gain will need to learn everything possible from international experience and academic research.

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Executive Summary

Biodiversity Net Gain in England:
Developing Effective Market Mechanisms



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The UK is in the process of establishing new policies and rules for biodiversity, substituting for those that applied under European Union policy and legislation. Following a two-year transition period, the Environment Bill (expected to receive Royal Assent in 2021) will make biodiversity net gain (BNG) mandatory for most housing and infrastructure developments, including mining. Developers subject to this requirement will need to provide a plan to deliver BNG with their applications for consent, based on the mitigation hierarchy and a prescribed habitat-based metric. For impacts that cannot be avoided, minimised or offset on site, infrastructure developers will need to compensate for these impacts off site. They may be able to achieve this through purchasing biodiversity units (BUs), thereby creating a market referred to as the BNG scheme or BNG market in this paper.

This discussion paper has been prepared to support the net gain goal for biodiversity on land and in freshwater through approaches that deliver the best outcomes at least cost. The paper seeks to support the development and implementation of England's BNG policy. It also provides a framework that can help other countries exploring biodiversity offset markets.

Establishing a well-functioning BNG scheme will involve significant effort. A well-designed regulatory framework is essential for the scheme to operate effectively. To that end, England can leverage knowledge from other countries to set up markets that work well from the start. In the United States, where biodiversity offset markets are well developed and worth approximately USD 3.9 billion a year, such rules have evolved over several decades and are now firmly rooted. England can also draw upon examples in Australia and continental Europe.

Lessons from international experience, reflected in this paper, suggest that 20 critical components are essential to underpin effective BNG markets (see Table 3-1 in the main report for more details). These components can be grouped into three categories:

What

BNG foundations and ground rules

set out the rules that all market actors must follow for overall positive outcomes for biodiversity

Who

BU delivery mechanisms and roles

define rules for the use of each mechanism and roles and responsibilities for all stakeholders

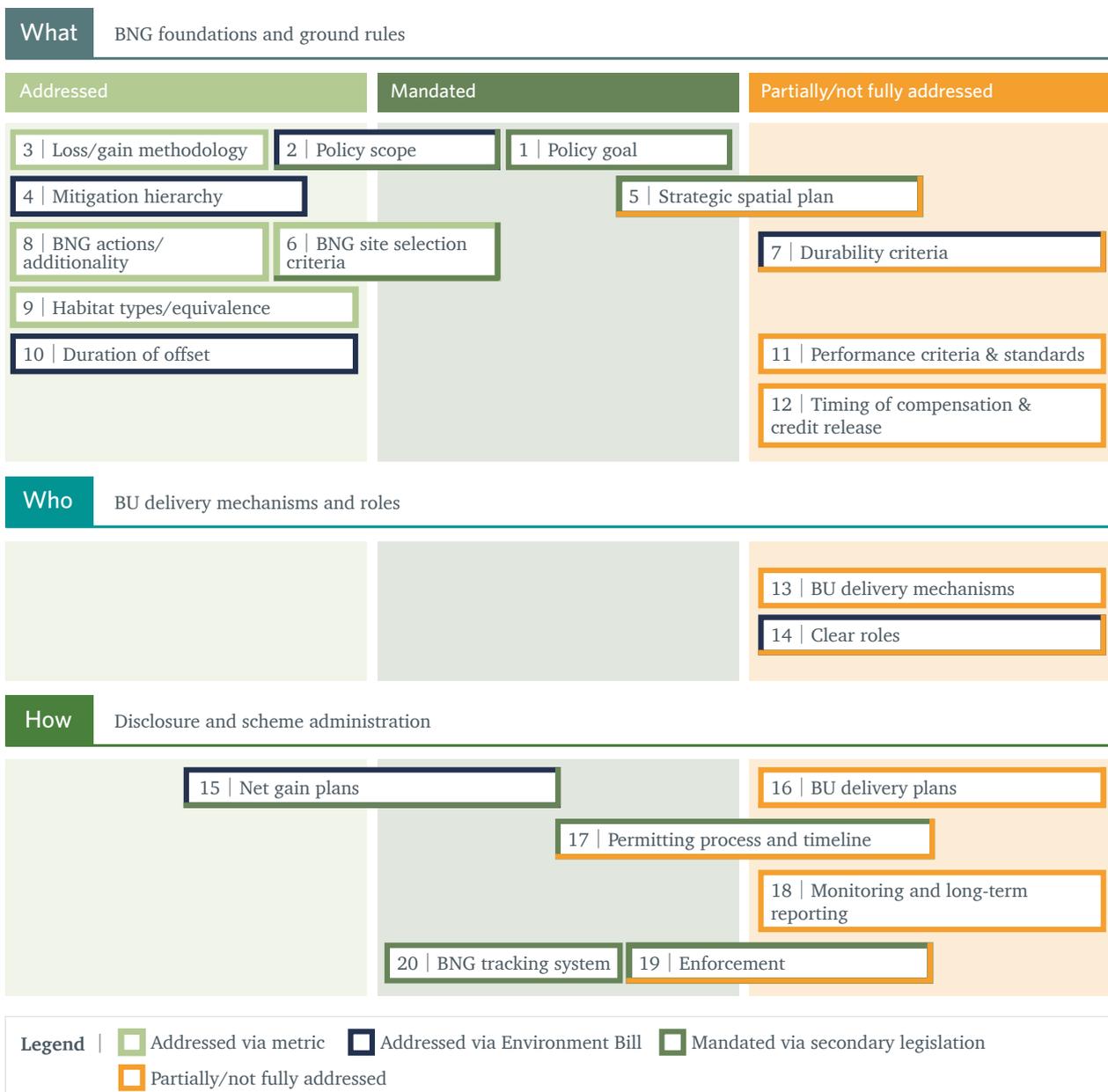
How

Disclosure and scheme administration

provide the basis for ensuring that market actors comply with the underlying rules.

Some essential building blocks are already in place in England, and others are under development, but a number of critical components require further clarity to achieve the best possible outcomes for biodiversity (as shown on figure ES-1 and Table 3-2 in the main report).

Figure ES-1. England’s progress towards establishing effective BNG markets



A metric for calculating biodiversity losses and gains is in place in England but is not without its limitations.

Its application and effectiveness will need to be assessed through careful monitoring. Recognising that certain losses are traded for uncertain gains where a habitat proxy is used, we recommend development of mechanisms to ensure the maintenance of existing high-distinctiveness habitats that are not designated or protected, but which require ongoing maintenance management. The costs of maintaining existing high-distinctiveness habitats are not always covered in the current system. If the focus of the BNG scheme is mostly on creating new habitats, this introduces a genuine risk that existing habitats will not be prioritised or maintained.

Mechanisms for delivering gains in the form of BUs need to be clarified, along with transparent rules for setting up habitat banks that guarantee parity between on-site and off-site compensation. Experience from the US wetland and stream mitigation scheme has shown that a non-level playing field between on- and off-site compensation (for example, laxer monitoring and enforcement) can lead to a preference for on-site compensation despite poor ecological success. Studies on ecological impact assessments (EclAs) in England have also identified poor effectiveness of on-site ecological mitigation. Balanced rules for on- and off-site BNG delivery are expected to increase demand for off-site habitat banking, which may generate better biodiversity outcomes and boost market liquidity.

Landowners need clear rules for stacking and bundling. This will make it easier to assess whether they can sell multiple environmental services (including biodiversity) emanating from land use changes and how to do so. In the short term, a period of market design and learning through trials will enable the development of adequate rules for the BNG market.

To become established, the market will need additional support. Measures can feed robust and predictable demand, stimulate supply and smooth transactional aspects of the market, such as market transparency. Demand guarantees provided by government and pre-purchase allowances are interventions that ensure robust and predictable demand for BUs. Interventions that stimulate supply of BUs vary widely: greater flexibility in trading between adjacent



and non-adjacent local planning authorities (LPAs), supporting production of BUs in advance of transactions ('habitat banking'), measures to de-risk BU supply, and financial incentives, such as governmental grants and tax relief.

International good practice is to maintain conservation assets in perpetuity, in accordance with no net loss or net gain policy. Thirty years could prove to be insufficient time to achieve lasting gains, particularly for some habitats that take a long time to reach maturity and become fully colonised by thriving populations of associated species. We recommend that greater consideration be given to the need to maintain some high-distinctiveness habitats beyond 30 years, to allow time for them to reach maturity and to ensure that benefits are sustained over time.

Secondary legislation and guidance accompanying the Environment Bill must provide clarity. To deliver policy efficiently and ensure clear market rules, it must include defined governmental roles and sufficient regulatory capacity. Multiple government roles in the market could result in perverse outcomes and conflicts of interest. Government core functions are to regulate BNG for individual planning developments and to monitor policy outcomes over time. Another important aspect is ensuring sufficient regulatory capacity. BNG places an additional burden on authorities already operating beyond capacity, and many LPAs lack ecological expertise.

In its current form, the BNG scheme in England could generate GBP 100 to 300 million annually. The market size prediction is based on market modelling assuming an average price per BU of GBP 20,000, a loss of up to 15,000 BUs per year and a 50 to 100 percent off-site compensation delivery rate (in line with the US wetlands and streams market, where approximately 80 percent of impacts were compensated for offsite in 2017). This would give landowners acting as BU suppliers access to a predictable funding source for sustainable land use change. However, some funds would go to cover transaction costs. This means that funding for net additions to biodiversity (over and above compensation) would be relatively insignificant, below GBP 10 to 30 million per year. Some possible additions to the scheme (such as permitting stacking of biodiversity and other environmental credits) could also have high transactional costs that need to be accounted for. It is critical that the costs of setting up the scheme do not outweigh the potential benefits and additional revenues generated through it.

We recommend expanding the reach of a well-designed BNG scheme to leverage additional funding for biodiversity. Potential ways to do this over time could include:

- Crank up the level of ambition: raise the goal for net gains over time from 10 percent in 2023 to 30 percent in 2030 (or as soon as the market is well established);
- Extend the BNG requirement to Nationally Significant Infrastructure Projects;
- Add marine habitats to the scope of mandatory net gain;
- Boost the visibility and transparency of this market so it attracts more voluntary contributions;
- Give clearer direction on spatial planning for BU delivery—and prioritise off- over on-site mitigation where it gives the best outcomes for biodiversity (species as well as habitats) through local nature recovery strategies;
- Use BNG to renature previously developed areas in the grey belt (post-industrial land or former mines, unused factories and commercial areas) not suitable for infrastructure development;
- Tap the BNG processes for wider UK nature recovery ambitions—for example, by deploying the biodiversity metric for approaches to habitat evaluation, management and pricing under environmental land management schemes (ELMS)





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1. Introduction

Biodiversity Net Gain in England:
Developing Effective Market Mechanisms

Biodiversity continues to decline globally, driven by unprecedented urban expansion, conversion of land for agriculture, development of infrastructure to meet the demands of an increasingly global human population and climate change (Bull et al., 2020; Diaz et al., 2020; Garibaldi et al., 2020; IPBES, 2019; Maron et al., 2018; UN Population Division, 2019). In the UK, despite starting from a relatively impoverished baseline, the National Biodiversity Network's 'State of Nature' report for 2019 (www.nbn.org.uk) reported a 13 percent decline across UK taxa since 1970, with 15 percent of terrestrial and freshwater species considered to be facing extinction (Haxxyhow et al., 2019). For mammals, the figure is as high as 25 percent (Matthews and Harrower, 2020).

Global and national targets to halt biodiversity decline have not been met. New global agreements call for much greater emphasis on restoration of biodiversity, ecosystems and the services they provide, to compensate for losses. The 15th Conference of the Parties (CoP) to the UN Convention on Biological Diversity (CBD) is in the process of negotiating a 'new deal for nature' to be adopted in 2022. This will include the universal adoption of the mitigation hierarchy, which mandates avoiding impacts as the first and most important step, before minimising impacts and offsetting residual impacts. In addition, the deal is likely to set ambitious but 'plausible' global goals of no net loss by 2030, and 10 percent to 15 percent net gain by 2050 (CBD, 2020). Reaching the CBD's global targets will require much greater emphasis on avoiding new impacts to biodiversity and restoring already converted and degraded ecosystems while offsetting residual losses.

Biodiversity offsets have been identified as a market-based mechanism that could generate significant private sector funding flows for biodiversity. A recent report by the Paulson Institute, The Nature Conservancy and the Cornell Atkinson Center for Sustainability (2020), amongst others, reviewed the biodiversity-funding potential of mandatory no net loss or net gain policies. The report concluded that about 95 percent of impacts to natural areas are currently not offset and estimated that compensation of approximately USD 162 to 168 billion per year would be needed to address these impacts to achieve no net loss across all countries. This equates to GBP 116 to 121 billion per year, approximately 25 percent to 35 percent of the estimated global biodiversity financing gap (Deutz



et al., 2020). To date, 42 countries have regulatory no net loss or net gain requirements in place, 66 countries have established provisions to enable voluntary no net loss or net gain, 28 are undertaking initial explorations of policy options, and 59 countries have no such policies in place (zu Ermgassen et al., 2019)).

The UK is establishing new policies and rulesets for biodiversity on land and for freshwater, substituting for those that applied under European Union policy and legislation, which include provisions for mandatory net gains. The Environment Bill (expected to receive Royal Assent in 2021) will make BNG mandatory for most types of development from 2023. As a solid starting point, England has adopted a biodiversity metric (Panks et al., 2021), which gives clear, nationwide rules on how to assess losses and gains in biodiversity for purposes of demonstrating BNG. The national approach sets England apart from many other biodiversity offset schemes (such as in the US, Australia, Germany or France), which use many different regional metrics, resulting in a lack of consistency (ICF and IEEP, 2014) and making it challenging to track outcomes at a national level.

Potential benefits from a mandatory BNG scheme vary across stakeholders (see Box 1.1). To ensure that the BNG scheme reaches its full potential in England and to avoid risks which can result from a poorly designed scheme, careful policy and regulatory design is key.

Box 1-1. Potential benefits of a mandatory BNG scheme

For society as a whole, mandatory BNG incentivises protection of biodiversity by internalising the costs of biodiversity loss.

Without a mandatory BNG requirement, developers are not liable for the costs of habitat destruction resulting from housing and land use development. They have a limited incentive to reduce their negative impacts. Mandatory BNG holds developers accountable for their actions, in line with the polluter pays principle. Because they must pay to offset any residual impacts to ensure overall net gain, developers have an incentive to minimise their impacts on biodiversity. In well-functioning markets, prices of highly distinctive habitats are prohibitively high and a powerful disincentive.

For stakeholders looking to transform land use, BNG will allow mobilising private sector funding for these activities.

As a point of reference, in 2016 alone, USD 4.8 billion (GBP 3.4 billion) in transactions were generated through BNG or no net loss mitigation banks and financial compensation funds worldwide (Bennet et al., 2017). Approximately USD 3.9 billion (GBP 2.8 billion) was generated in the U.S. alone, mostly through the wetland and streams mitigation scheme (see Box 2.6). Substantial funding flows to landowners significantly increase the financial viability of sustainable land management. Habitat creation, restoration and conservation become a financially attractive land use alternative, able to compete with more conventional income sources such as agriculture.

For developers, a well-designed BNG scheme would lead to efficient and cost-effective permitting processes.

Studies on established net gain or no net loss schemes internationally highlight how well-functioning biodiversity markets with numerous third-party BU suppliers can generate cost- and time-saving benefits for developers. In New South Wales, Australia, habitat banking resulted in the halving of developers' time-to-permit and cost savings of AUD 35 million (GBP 20 million) across 20 projects.

For people and communities near on-site and off-site offsets, BNG schemes can generate multiple co-benefits.

The value of being in nature for mental health is widely recognized (Bratman et al., 2019). Reversing the destruction of biodiversity and increasing its abundance through net gain policy will directly benefit psychological well-being. Further, economic co-benefits associated with tourism, increased property prices and employment are likely. Regarding the latter, studies from the US suggest that every USD 1 million (GBP 0.7 million) spent on offsets delivers from seven to 40 jobs, mostly in rural areas (Duke and ten Kate, 2014).

For local authorities, BNG may offer income opportunities.

Public land can be used for the supply of biodiversity units (albeit risks of crowding out private BU suppliers would need to be carefully considered). For example, local authorities in Warwickshire and Greater Manchester are already pursuing BNG as an opportunity to fund enhancements to their local parks and green spaces while generating additional income.

The mandatory BNG rule could enable establishment of well-functioning markets, spurring demand for voluntary biodiversity offsets.

Such schemes are quite rare at present, particularly when compared to the rapid growth in carbon offsets supported by clear rules or voluntary agreements such as the Woodland Carbon Code (WCC). A well-established BNG scheme could result in more companies mitigating and offsetting their biodiversity impacts to become 'biodiversity neutral'. This could include policies to offset their historical impacts and be applied to reversing biodiversity loss associated with past developments and land degradation, rather than being limited to new developments.

Source: Authors

1.1 Paper objectives

This discussion paper has been prepared by a group of actors looking to support the net gain goal for biodiversity on land and for freshwater through approaches that deliver the best outcomes at least cost. No net loss or net gain policies do not always achieve their ambitions (zu Ermgassen et al., 2019). This paper is intended to support implementation of England's BNG policy during the upcoming two-year transition period, inform its future development and provide the basis for informing other countries looking to establish such markets.

The Nature Conservancy, with support of eCountability and eftec and input from many others, has led the preparation of this discussion paper, drawing on direct experiences with biodiversity offsets in a range of countries, including the UK, the United States, Australia, Germany, France, Colombia and Mongolia. We also build on experience from direct support to the Wendling Beck Exemplar Project, a BNG project which has participated in Natural England's national credit pilot scheme (see Box 2.5). We conducted numerous interviews with UK, European and US stakeholders involved in biodiversity no net loss and net gain markets to draw lessons from their experiences.

The paper is intended for:

- Policymakers and executive public bodies (at national and local level);
- Developers affected by the upcoming BNG policy;
- Stakeholders interested to act as biodiversity unit (BU) suppliers (including landowners or environmental service companies)
- Other parties (such as consultants or lawyers) who want to support the development of the policy and the market, by providing technical assistance or acting as intermediaries.
- The wider international environmental community with an interest in better understanding BNG schemes, supporting the establishment of BNG in the UK, or disseminating lessons from the English experience in other countries.

1.2 Paper structure

The paper furthers this discussion in the following sections:

Section 2

Section 2 provides historical and contextual background on the evolution of the UK's BNG policy to date, including upcoming changes with the adoption of the Environment Bill, current and anticipated market activity, as well as potential risks associated with a poorly designed regulatory framework. It will be of particular relevance to readers who are unfamiliar with the BNG scheme in England and with recent and anticipated market developments.

Section 3

Section 3 outlines key components for effective BNG markets, drawing on international experience with more mature markets before assessing current progress in the English market against these components and areas for improvement. This section provides an overall roadmap for setting up a regulatory framework that will provide clarity and transparency to key market players. It will be of particular relevance to policymakers and implementing agencies looking to design markets.

Section 4

Section 4 discusses in more detail selected areas for the establishment of functioning BNG markets in England:

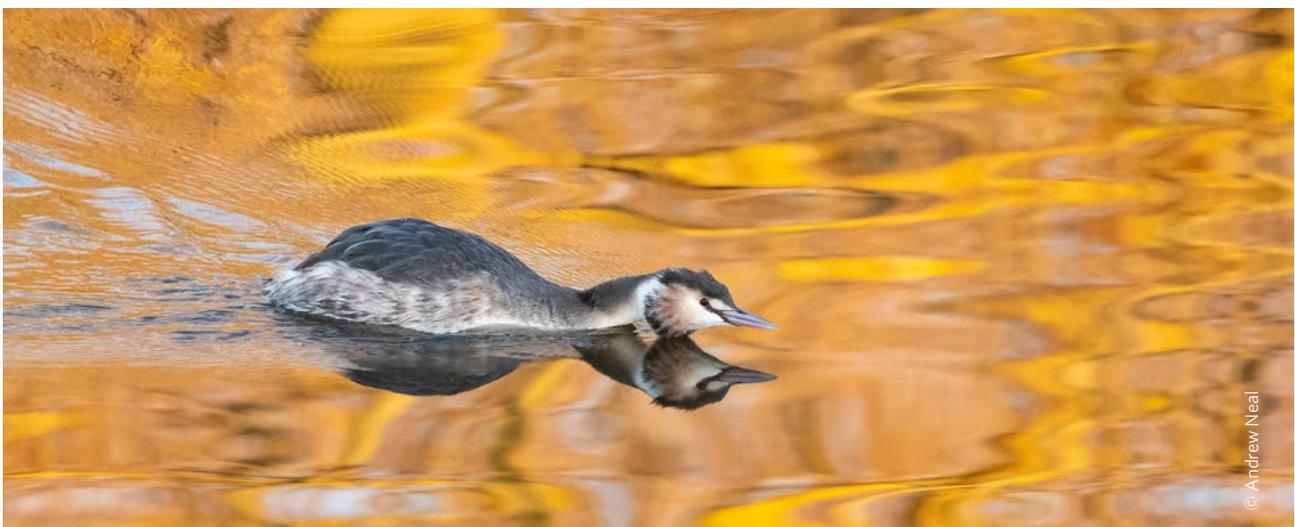
- **Measuring biodiversity and driving the right type of investments.** This subsection examines how Biodiversity Metric 3.0 (Panks et al., 2021) will provide the basis for estimating biodiversity losses and gains in the form of BUs, the 'currency' for the BNG scheme. We argue that rigorous monitoring of its application will be needed to provide the basis for possible further refinement.
- **Defining BU delivery mechanisms and enabling a level playing field.** BU delivery mechanisms envisaged in the BNG scheme are not clear. These need to be clearly defined to ensure a level playing field.
- **Stacking and bundling.** Rules on how BNG relates with other environmental credit and funding schemes also are not clear. This creates challenges for BU suppliers hoping to forecast the revenue potential of sustainable land use interventions. Clear objectives and principles are needed to guide the definition of rules and guidelines in this area.
- **Enabling efficient markets through government support.** Supply-side, demand-side, exchange and financing measures will be needed to lower transaction costs and boost participation in BNG markets, particularly in the early period when markets need to be established.

Section 5

Section 5 summarises key recommendations in a checklist for the stakeholders involved in developing the UK's BNG policy and market. These range from national policymakers to landowners interested in generating biodiversity units on their own land.

In addition:

- **Annex 1** provides an overview of BU delivery mechanisms that are in place in the US wetland and stream mitigation scheme and identifies how they have evolved over time;
- **Annex 2** sets out potential funding mechanisms that could help support the development of BU markets;
- **Annex 3** sets out other potential incentive schemes;
- **Annex 4** contains a glossary of key terms used in this paper;
- **Annex 5** contains the list of references used for this paper.





2. BNG policy in England: where we are and where we are going

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Biodiversity Net Gain in England:
Developing Effective Market Mechanisms



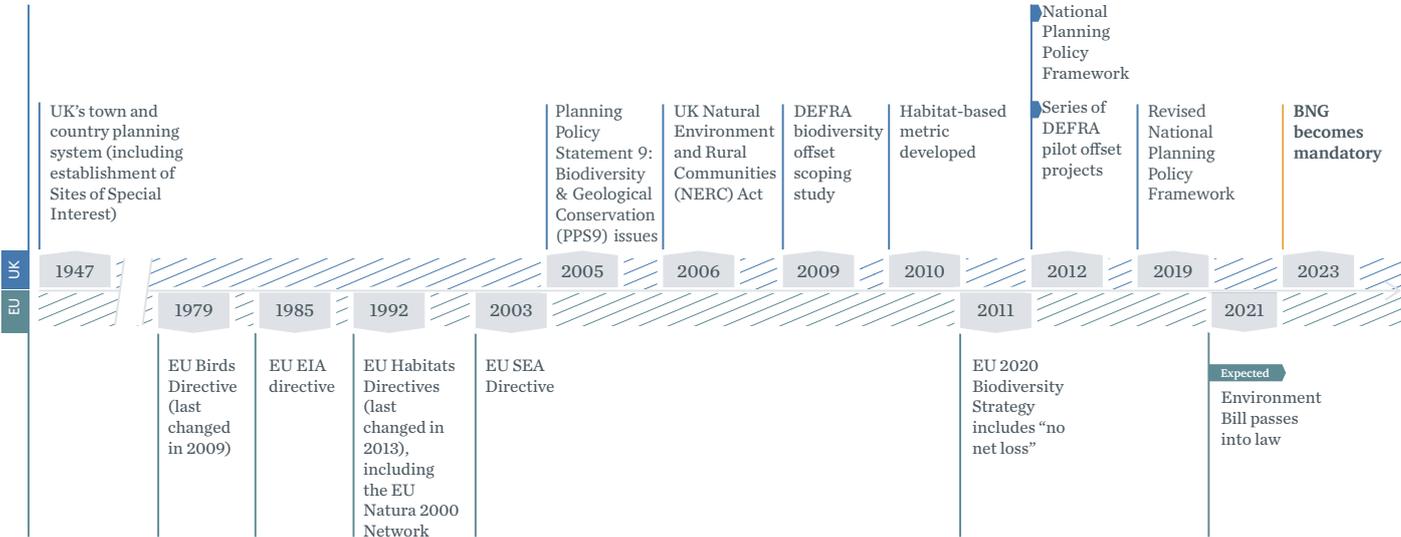
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- Since the adoption of the UK's Town and Country Planning System in 1947, various UK and EU policies have paved the way for mandatory BNG.
- The Environment Bill defines new rules for taking account of biodiversity in development planning, by introducing mandatory biodiversity net gain requirements for most types of development. The Bill is expected to be adopted in 2021 with net gain requirements becoming mandatory in the second half of 2023.
- Market activity in the area of biodiversity offsets has increased significantly in advance of adoption of the Environment Bill and other regulatory developments.
- Once the market has matured, it is estimated that mandatory net gain could offset impacts on approximately 6,300 hectares annually and generate GBP 100 million to GBP 300 million in biodiversity funding per year.
- However, if the regulatory BNG framework is unclear, this could generate significant risks. Those risks are spelled out in this section to form the basis for improved regulatory design.

2.1 Biodiversity in development planning in England: an historical perspective

Consideration of biodiversity has grown more prominent over the years in the UK planning system. This builds on a long history of efforts to safeguard nature since 1947, when the UK's Town and Country Planning System received royal assent and Sites of Special Scientific Interest (SSSIs) were established. Such efforts were heavily influenced by EU policy and legislation (Figure 2-1). Policies have evolved over the years from a focus on damage limitation towards more explicit requirements to enhance biodiversity in the planning and delivery of infrastructure and housing development, combined with greater emphasis on market-based approaches.

Figure 2-1. Relevant policy and wider developments influencing BNG in the UK, including influential EU policy



Source: Authors

2.1.1. Adoption of a 'no net loss' policy

EU directives and biodiversity strategies have paved the way for a no net loss policy in the UK. EU directives have underpinned the UK's approach to consideration of ecology (and later biodiversity) in development planning from 1973 (when the UK entered the EU) until its exit in 2020. These have included directives on nature protection such as the Birds Directive (1979) and the Habitats Directives (1992) and those related to impact assessment methodologies, such as the Strategic Environmental Assessment (2003) and the Environmental Impact Assessment (1985) Directives. Despite increasing obligations to make risks to nature and biodiversity transparent, biodiversity objectives have been largely aspirational, and declines in biodiversity continued.

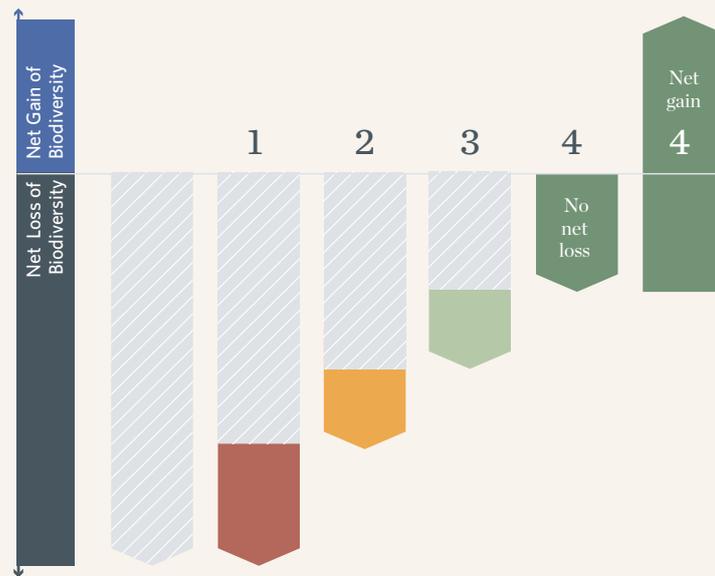
An explicit requirement to demonstrate no net loss outcomes from development was introduced in 2011 as part of the EU 2020 Biodiversity Strategy, which committed to halt the loss and degradation of terrestrial and marine biodiversity and ecosystem services by 2020. It introduced a goal to maintain and restore ecosystems and their services (Article 2) and a commitment to introduce policies requiring 'no net loss of biodiversity and ecosystem services' (Article 7). Through these articles,

the EU 2020 Biodiversity Strategy placed an obligation on Member States not only to limit damage to biodiversity from economic development, but also to implement tangible measures to protect and enhance it. It also made explicit reference to use compensation or offsetting schemes as a mechanism for achieving no net loss. The EU new 2030 Biodiversity Strategy adopted in 2021 sets out even stronger ambitions for biodiversity recovery in the long term, based on an EU nature restoration plan.

The introduction of a 'no net loss' policy across the EU through the EU 2020 Biodiversity Strategy sparked interest in the addition of an 'offset' step to the mitigation hierarchy (Box 2-1). The mitigation hierarchy has long been accepted as an important conceptual framework for ecological mitigation in impact assessment. In the EU, however, it had typically been applied with an on-site focus; avoidance opportunities were constrained by the reactive nature of many national planning systems and therefore seldom achieved. Work by the Business and Biodiversity Offsets Programme (BBOP, 2009), amongst others, emphasised the need for clear policies on no net loss to guide implementation of the mitigation hierarchy for tangible outcomes (Trewick and ten Kate, 2019).

Box 2-1. The mitigation hierarchy for biodiversity: from avoidance to net gain

The first and most important step of the mitigation hierarchy is to avoid adverse impacts, including the consideration of project alternatives. The second step consists of measures to reduce impacts that cannot be avoided, followed by work to restore or rehabilitate damaged ecosystems or species populations on the site of the development (Step 3). Offsets (Step 4) can be used as a measure of last resort if and when it can be demonstrated that appropriate efforts have been made, through other steps in the mitigation hierarchy, to minimise residual impacts. Offsets can be either on site or off site. They can be used to achieve either a no net loss objective or a net gain in biodiversity following the development.



Steps in the mitigation hierarchy |

Predicted impact
 Avoidance
 Minimization
 Restoration/Rehabilitation
 Offset

Source: Adapted from Bennet et al., 2017

2.1.2. From no net loss to biodiversity net gain

In the UK, the need for improved ecological outcomes following development was highlighted in a series of critical reviews of ecological provisions in the Environmental Impact Assessment (EIA) process. (Treweek, 1995, 1996; Thompson et al., 1997; Treweek and Thompson, 1997; Treweek et al., 1999; and Byron et al., 2000). Some of the systemic failings identified at the time were attributed to the EU's EIA Directive (and consequently the UK's EIA Regulations) requirements to identify mitigation measures but not to implement them. This often resulted in unrealistic mitigation proposals and a failure to allocate sufficient funds for their delivery. Where ecological mitigation was carried out, it was generally on site, often in suboptimal conditions and at

an inadequate scale with little option to optimise spatial delivery of mitigation or achieve economies of scale. The requirement to avoid impacts came with caveats (with significant impacts to be avoided 'if possible'), and there was no definite requirement to follow up or monitor outcomes. It was increasingly clear that, without greater emphasis on restorative action, development would continue to erode biodiversity.

A number of factors have catalysed more explicit emphasis on restorative action. Requirements to compensate for residual impacts on the EU Natura 2000 network established some precedent for off-site interventions to restore or create habitats. Interest

in mitigation banking and other biodiversity offset mechanisms began to gain traction in 2005 when the government issued Planning Policy Statement 9: Biodiversity and Geological Conservation (PPS9). It advised local planning authorities on policies for the protection of biodiversity and geological conservation through the planning system.

PPS9 placed a clear duty on local planning authorities (the 'biodiversity duty') to ensure that protected species and habitats in the UK would be a 'material consideration' in a planning application. 'Plan policies and planning decisions should aim to maintain, enhance, restore or add to biodiversity and geological conservation interests', PPS9 stated. It also promoted incorporating biodiversity 'within the design of development' at a more strategic level, urging local planning authorities to maintain habitat networks by 'avoiding or repairing the fragmentation and isolation of natural habitats' and protecting these networks from development. ('Such habitat networks should be protected from development and, where possible, strengthened by or integrated within it.¹'). In 2006, the Natural Environment and Rural Communities (NERC) Act placed a duty to conserve biodiversity on public authorities in England. This included explicit requirements to enhance, restore or protect certain species or habitats.

In 2007, responding to increasing concerns about the loss of non-designated sites and features in the 'wider countryside', Defra identified a need to explore new policy options, including the creation of markets in biodiversity and biodiversity incentives such as offsets (Defra, 2007). Defra found that although the 'biodiversity duty' had made biodiversity a greater priority within the planning system, it was open to interpretation with respect to requirements to compensate for the residual adverse effects of a development proposal (Defra, 2009).

Defra then carried out a scoping study on the design and use of biodiversity offsets in an English context. The study reviewed policies and schemes being used worldwide and concluded that offsets could play a part in implementing policies towards no net loss or a net gain of biodiversity in England (Defra, 2009). The study found that the department could help streamline the planning process by reducing outcome uncertainties,

2005

Planning Policy Statement 9

Interest in mitigation banking and other biodiversity offset mechanisms began to gain traction.



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creating economic incentives for landowners to invest in conservation activities and helping ensure that those having a significant residual impact on biodiversity would bear some of the costs associated with its loss.

The National Planning Policy Framework of 2012 introduced an explicit requirement to minimise impacts on biodiversity and provide net gains in biodiversity as part of the government's commitment to halt biodiversity decline ((MHCLG, 2012).

A habitat-based metric developed by Treweek and Butcher (2010) and further described by Treweek, Butcher and Temple (2010) was used as the basis for a series of pilot offset projects (Defra, 2012). Stakeholders felt that the metric was largely beneficial in providing a quantified, consistent, transparent and relatively simple tool to account for a wider range of biodiversity impacts than before. The metric has been further developed and incorporated in tools developed by Natural England and Defra to underpin biodiversity net gain assessments through the Environment Bill (Panks et al., 2021). The revised National Planning Policy Framework, published in 2019, retained the biodiversity duty and also referenced the need to 'minimise impacts and provide net gains for biodiversity'.

¹ PPS9 was replaced by the National Planning Policy Framework in 2012.

2.2 Expected changes under the Environment Bill

The Environment Bill will require biodiversity net gain to be achieved and demonstrated for certain types of new development in England. It will not change existing legal protections for biodiversity and will not apply to Nationally Significant Infrastructure Projects (NSIPs) or development in the marine environment.

Box 2-2. Post-Brexit environmental reforms in the UK – a rapid overview

Given the UK's historical reliance on EU environmental rules, exiting the European Union created a need for a new legal framework to ensure effective environmental protections continue.

Here are key documents organizing the post-Brexit environmental policy framework:

The 25 Year Environment Plan (2018) presents the UK government's goal for improving the environment within a generation. The plan sets out a vision for leaving habitats for wildlife, air and water quality in a better state than they found it.

The Agriculture Bill (2020) is inspired by this plan and outlines how environmental subsidies will give farmers and land managers in England an incentive to adopt more sustainable land management practices. Through Environmental Land Management Schemes (ELMs), landowners can receive payments for the delivery of 'public goods'. These relate to local nature, landscape

and ecosystem recovery, better air and water quality, higher animal welfare standards, improved access to the countryside and measures to reduce flooding. Such environmental subsidies are anticipated to come into force by 2027 and will replace agricultural subsidies under the Common Agricultural Policy.

The Environment Bill is designed to translate the 25 Year Environment Plan's visions into specific actions. It prescribes how to protect and improve the natural environment in the UK by providing targets, policies and plans. Next to mandatory biodiversity net gain (BNG), it includes provisions on resource efficiency, waste, air quality, recall of products that do not meet environmental standards, water, regulation of chemicals and wider connected purposes.

Sources: DEFRA 2018, UK Parliament (2021), House of Commons (2020)

The Environment Bill is anticipated to receive Royal Assent in 2021. BNG will become mandatory for all new developments in the second half of 2023. Until then, the mandatory net gain regime introduced by the Environment Bill will be implemented in a transition period during which practical experience will be reviewed and important secondary legislation developed, including provisions related to irreplaceable habitat and stacking and bundling of payments for different ecosystem goods and services.

A robust and repeatable habitat classification for baseline surveys and monitoring is essential for ecological impact assessment and projects seeking to demonstrate biodiversity net gain. In England, proposed measures to achieve at least 10 percent BNG will need to be calculated using Biodiversity Metric 3.0 (Panks et al., 2021) and outlined in a biodiversity gain plan submitted with planning applications.

Biodiversity of the development site before and after development, as well as any registered offsite biodiversity gains, will be scored in terms of biodiversity units. These use habitat as a proxy for overall biodiversity and reflect

the type, area, distinctiveness and condition of habitats, as described in Box 2-3. Scores are adjusted to account for strategic significance, the difficulty of creating or restoring habitat (risk of failure) and the time taken to reach target condition. The use of one habitat classification within the Biodiversity Metric 3.0 makes it possible to track losses and gains of habitat in a consistent way and evaluate outcomes at national level. Habitats included in the biodiversity gain plan must be secured for at least 30 years. The 10 percent BNG requirement applies only to direct footprint losses due to development: There is no requirement to offset indirect or cumulative impacts, even though these can be significant.

Box 2-3. The biodiversity metric and UKHab classification

The biodiversity metric (Tweek, Butcher and Temple, 2010) was used in pilot projects conducted by Defra (Defra, 2012) and further developed by Natural England (Biodiversity Metric 3.0 – Panks et al., 2021). It underpins England's mandatory BNG policy. Natural England has developed tools and guidance for using the metric to track losses of biodiversity units (due to impacts) and gains (due to habitat restoration or creation). Developers calculate the number of BUs that they are required to deliver to achieve BNG. Potential suppliers of BUs (landowners or managers) use the metric to determine the habitat types they will target and the management they will introduce to achieve gains within their land area. Developers outline their commitments in a biodiversity net gain delivery plan, which planners review before giving consent for development.

The metric uses habitat (vegetation type) as a proxy for overall biodiversity. Affected intertidal and terrestrial habitats in England have been assigned distinctiveness scores intended to reflect their habitat assessment using the UK Habitat Classification (UKHab), a comprehensive habitat classification system that helps ecologists identify and map habitats in a field in a consistent and unified way based on five levels of increasing detail (Edmonds et al., 2014; www.ukhab.org). In addition, UKHab incorporates secondary codes to reflect condition, origin or management regime, diversity and value for conservation. Habitat parcels are scored for their condition in the field. This needs to happen at the right time of year (Spring is ideal in England.)

The number of biodiversity units (BUs) per hectare (the proposed currency for BNG) is estimated based on habitat area x distinctiveness x condition. BUs are also adjusted on the basis of uncertainty (the extent to which assured outcomes can be achieved from efforts to restore or create a particular habitat type) and the time needed to reach target condition. An adapted version is used for rivers and streams and another for linear features of habitat such as hedgerows.

Biodiversity Metric 3.0 (Panks et al., 2021) uses habitat types as a proxy for overall biodiversity. It can be applied to all UK sites/habitats and is fungible but also represents a 'lowest common denominator' in that it does not address the particular requirements of species' populations. Supplementary methods may be necessary to ensure that high-priority biodiversity features for which habitat is not a good surrogate are appropriately measured and offset, but there is not a plan to incorporate specific species-related objectives into the BNG scheme or the metric framework.

Sources: Butcher et al., 2020a, 2020b



Gains can be delivered on site, off site or via statutory biodiversity credits (credits procured through a government-operated scheme). Offsets are defined as measurable conservation outcomes; they must be based on a credible and consistent method for quantifying losses and gains so that the point of ecological equivalence (no net loss) can be clearly established. Gains can be achieved through a combination of:

- **Habitat enhancement within development sites.** Where works are involved in order to achieve this, there must be a planning condition, planning obligation or conservation covenant that ensures that the works will be maintained for at least 30 years after the development is completed.
- **Habitat enhancement can be made to a site other than the development site** but only where the enhancement is required under a planning condition or conservation covenant, recorded in a proposed new Defra biodiversity gain site register and assured of being maintained for at least 30 years. This off-site enhancement can be carried out by the developer or by a third party. Where developers purchase biodiversity units from off-site enhancement from third parties, this creates a BNG market.
- **Government as a supplier of last resort for biodiversity units.** Government is investigating ways for it to function as a supplier of last resort, in the event that developers are unable to meet their requirements for biodiversity credits elsewhere. It is anticipated that credit pricing would be set above the market price, so that it remains attractive for developers to organise their own qualifying biodiversity enhancements (either at the development site or elsewhere) if they have the option to do so.

The government wants to discourage damage to habitats on future sites before development starts because it could reduce pre-development biodiversity units and make it easier to achieve a 10 percent improvement. To that end, damage to habitats as a result of activities after 30 January 2020 will not be taken into account for the purpose of assessing predevelopment biodiversity value, unless the developer has permission.

Biodiversity gains under the Environment Bill are expected to contribute to the national nature recovery network and to local nature recovery strategies. The intent of the nature recovery network is to protect and enhance areas of particular importance for biodiversity, in line with the recommendations in the Lawton Review (Lawton et al., 2010) and the National Planning Policy Framework (NPPF) (MHCLG, 2019). It also is meant to provide an incentive to deliver net gains where they will contribute to strategic objectives for biodiversity. Supply of BUs from land managers is anticipated to come primarily from enhancement of habitats in poor or moderate condition or from the creation of higher-distinctiveness habitats on current habitats of low or medium distinctiveness.

The NPPF requires local plans to take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure, and to enhance natural capital at a catchment or landscape scale across local authority boundaries. Furthermore, in paragraph 174, the NPPF includes exacting requirements for local plans to “identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including ... designated sites of importance for biodiversity; wildlife corridors and stepping stones ... and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation” (MHCLG, 2019).

To meet their NPPF requirements, local authorities will need to consider how best to implement biodiversity offsets to optimise outcomes for biodiversity, using the biodiversity metric to account for losses and gains within their plan area.

Potential issues with the underlying methodology and application of the biodiversity metric are discussed in more detail in Section 4.1.



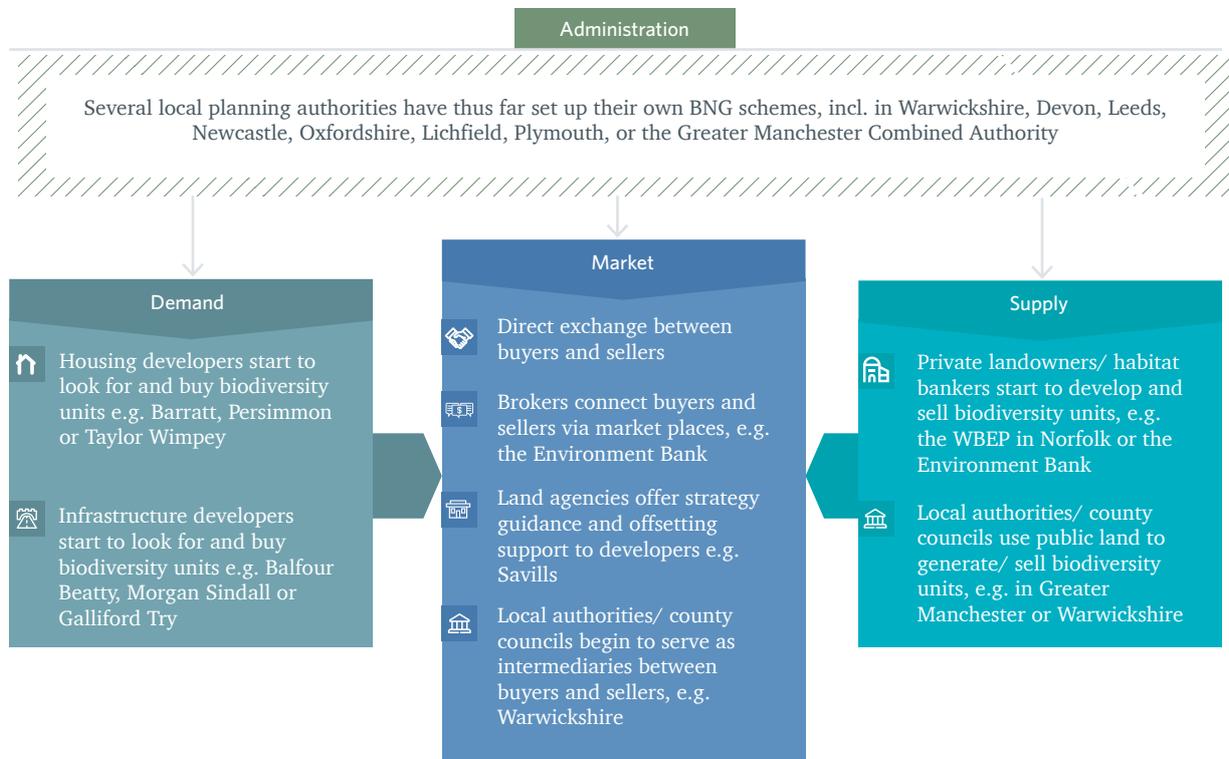
Biodiversity gains under the Environment Bill are expected to contribute to the national nature recovery network and to local nature recovery strategies.



2.3 Current and anticipated BNG market activity

In response to the development of the mandatory BNG policy proposals in the Environment Bill, pre-BNG market activity has increased across different parts of the expected market, as shown in Figure 2.2.

Figure 2-2. Ongoing BNG market activities in England



Source: Adapted from etfec et al., 2021 (forthcoming) and market participant interviews

Within the land use planning system, which is the basis for policy (and therefore market) regulation, some planning authorities or regions have been implementing BNG policy for several years already (Box 2-4).

Box 2-4. Warwickshire: from participation in the Defra pilot to broader adoption

Warwickshire's Coventry and Solihull subregion participated in the national biodiversity offsetting pilot in 2012 to 2014 as one of six pioneering regions. Due to the pilot's success, all LPAs within the subregion agreed to continue mandatory net gain for almost all development applications. Relying on the Warwickshire biodiversity impact assessment (BIA), sites' pre- and post-development biodiversity values are calculated in a uniform and transparent manner. The LPAs' ecological advisors review these BIAs, assure adherence to the mitigation hierarchy and advise on site enhancements.

Warwickshire County Council initially acted as a broker between developers and landowners and provided BUs from public land. Where local markets matured, it rolled back these actions and transitioned to a regulatory role only. Across the subregion, developers have markedly increased their efforts to avoid biodiversity losses. Landowners with an interest in serving as BU suppliers need on average one year to enter the market.

Sources: Warwickshire County Council, 2020; Natural England, 2019a; effec et al., 2021 (forthcoming)

Similar initiatives have developed in other areas, such as Oxfordshire and Greater Manchester. As in Warwickshire, these are developing:

- Processes for collaboration on delivering BNG between neighbouring planning authorities; and
- Mechanisms for biodiversity unit supply-side involvement by the local authority. For example, this entails planning local, publicly run habitat banks, or acting as an agent to organise potential BU supply.

Supply-side activities include habitat restoration and creation to generate and sell biodiversity units (BUs).

Ongoing activity by individual land managers is poorly understood, although many are now interested in the potential market opportunities. Some exemplar projects to supply BUs—such as the Wendling Beck Exemplar Project in Norfolk (see Box 2-5) or Alscot in Warwickshire—are developing land management options and associated business plans for supply of BUs.

Box 2-5. The Wendling Beck Exemplar Project: an early supplier of BUs within an emerging market

The Wendling Beck Exemplar Project (WBEP) is a landscape-scale project aiming to transform 784 hectares of farmland through biodiversity restoration, creation and enhancement. Located north of the market town of Dereham in Norfolk, the project site is within the Wendling Beck catchment and includes rivers, grasslands, woodlands, wetlands and other habitats. Landscape transformation is likely to be funded via the sale of BUs and other forms of environmental credits (including nutrient trading and carbon).

Preparation of the WBEP is piloted by the Wendling Beck Alliance (WBA), a multi-stakeholder collaboration of landowners, local government and non-governmental organisations. The four farmer/landowners who own the majority of the land, Norfolk Wildlife Trust, Norfolk County Council, Norfolk Rivers Trust, Norfolk FWAG and The Nature Conservancy, are all members of the alliance.

A deliberate approach to learning and dissemination is embedded in the project. The WBA is committed to sharing experiences nationally and globally with policymakers and practitioners. In 2020-2021, the project participated in Natural England's biodiversity credit pilot and is in continuous dialogue with policymakers to, amongst others, help clarify issues around stacking and bundling from a practitioner's perspective.

Sources: Authors

Some of these were part of Natural England's credit pilot project to design a biodiversity credit investment pipeline. A total of 87 projects responded to Natural England's call for projects; nine were funded to develop a BNG site assessment report to inform habitat management plans and help calculate predicted biodiversity unit provisions.

On the demand-side for BUs, activity has been limited to date, although some larger developers (such as housebuilders) have developed pilot schemes. In addition, large infrastructure providers (for example, Highways England and Network Rail, who are not covered by the mandatory BNG requirement) have commitments to compensate for biodiversity/environmental impacts of development and are taking actions around various projects.

Next to land use planning system actors, several private market actors also are taking on intermediary roles, facilitating transactions and exchange between developers and biodiversity unit suppliers. In areas where it anticipates an active market, the Environment Bank now purchases BUs from landowners, sells them to developers and takes on the long-term risk. Brokers, such as EnTrade, are working in specific areas of the country with individual land managers to develop options for how BUs would be supplied, enabling them to respond quickly to future demand. Start-ups like Zellar offer online marketplaces to match buyers and sellers. And large land agencies (e.g. Savills) are beginning to enter the field, ramping up internal resources to help developers provide on-site and off-site biodiversity mitigation.

Key policy areas are still unclear, which is why many project sponsors and developers are still in 'wait and see' mode or unwilling to commit. As BNG becomes mandatory in 2023 and the regulatory framework matures, market activity is expected to increase. While the size of the BNG market in England cannot be accurately predicted, current estimates point to potential annual funding via the BNG market of around GBP 100 million to 300 million (eftec et al., 2021 - forthcoming). This estimate is based on modelling activities that will shape the market, including demand for BUs and the unit cost. .



Supply-side activities include habitat restoration and creation to generate and sell biodiversity units

Demand for BUs from developers will be driven by the footprint of developments and the impact these could have on biodiversity after on-site mitigation. Irreplaceable habitats (still to be defined by secondary legislation, as shown in Table 3-2) are excluded from this footprint, which means that offsets will not be an option for them.² The residual impacts will need to be compensated off-site, either through a developer's own actions or through BUs purchased in the biodiversity market. Roughly 66 percent of England's total land is eligible for development and for potential inclusion in the BNG scheme (see Table 2-1). Over 60 percent of this land is made up of arable land and grassland.

² If, under extraordinary circumstances, such irreplaceable habitats are nevertheless affected by development, bespoke compensation packages can be negotiated. In such cases, developers would negotiate with Natural England or other governmental agencies to develop a package of interventions to achieve biodiversity gains. This might involve specialist research to develop new restoration techniques, or measures to reinstate key species, often going beyond proven methods.

Habitat	Area (ha)	Area (percent)
Land already developed (total area of urban areas)	1,583,745	11
Land excluded from BNG market for biodiversity reasons (e.g., designated sites)	1,773,902	13
Land available for habitat creation	8,634,923	62
Cropland	5,320,698	38
Grassland	3,125,945	23
Woodland and forest	188,281	1
Land for habitat enhancement	577,872	4
Cropland	38,846	<1
Grassland	135,454	1
Heathland and shrub	96,100	1
Sparsely vegetated land	5,228	<1
Woodland and forest	302,245	2
Other land	1,303,007	9
England total	13,873,451	100

Source: eftec et al., 2021 – forthcoming

The land area affected by biodiversity loss on an annual basis can be estimated based on historic rates of development, although this is likely to be a low estimate given ambitious plans for housing and infrastructure development that have been put forward in the context of COVID-19 recovery plans. The historic rate of land use development in England is roughly 6,300 hectares per year. The habitat types that will be offset as part of the BNG scheme are difficult to predict. Based on conservative estimates from Defra's Biodiversity Metric 2.0 (eftec et al., 2021 – forthcoming), it can be assumed that two to three BUs would be lost for each hectare, which would amount to an overall loss of approximately 15,000 BUs per year. The rate of biodiversity loss associated with development going forward may increase if land use development accelerates (for example, to deliver housing targets) or decrease if the BNG policy acts as a disincentive to build on land of high ecological value. For example, the policy would likely provide an incentive to avoid the estimated 487 hectares per year of development that destroy priority habitat (currently making up 6 percent of the annual developed area). The expected price per BU will vary according to the type of biodiversity that needs to be compensated for (and the associated costs of enhancing it), the opportunity costs of the land and the relative scarcity of BUs in the local market. In most areas, there is no shortage of BU supply expected, so costs will be determined by the costs of actions to generate them (including opportunity costs of land and transactions costs), plus a small premium to reward the provider for the delivery risk they take.

Forecast BU prices vary widely. Initial forecasts were in the range of GBP 9,000 to 15,000 per BU (Defra IA). However, based on modelling of habitat delivery and transactions costs, revised forecasts indicate that prices could go as high as GBP 15,000 to GBP 25,000 per BU, with an expected average of GBP 20,000 per BU (eftec et al., 2021 - forthcoming).

Based on a up to 15,000 BUs per year, and assuming that 50 to 100 percent of BUs are delivered off site, a total estimated market size would be 7,500 to 15,000 BUs per year. As a point of reference, approximately 80 percent of offsets in the US wetland and streams mitigation scheme (see Box 2-6) were conducted off site in 2017, up from 50 percent in 2010 (Hough and Harrington, 2019). Using the average price of GBP 20,000 per BU gives the above-mentioned market size of GBP 100 million to 300 million per year (Figure 3-2).

Box 2-6. US wetland and stream mitigation scheme – a quick overview

The Clean Water Act Section 404 Wetland and Stream Mitigation Programme is amongst the most mature and successful biodiversity offset schemes globally. It is based on the 1972 amendments to the Federal Water Pollution Control Act, known as the Clean Water Act (CWA). Section 404 of the Act regulates the discharge of dredge or fill material into US wetlands, streams and other aquatic systems by developments. The overarching aim is to restore and maintain chemical, physical and biological integrity of wetlands, streams and other aquatic systems and to assure ‘no overall net loss’ of wetland and stream areas and functions.

Developers are obliged to mitigate and compensate their impacts on wetlands and streams as part of the project permitting process. The US Army Corps of Engineers and the US Environmental

Protection Agency (EPA) are in charge of ensuring implementation of Section 404.



In 2016, the approximate average transaction value of the US wetland and stream mitigation market was

USD 3.5 billion

(GBP 2.5 billion).

Sources: zu Ermgassen et al., 2019; The Environmental Law Institute and Land Trust Alliance, 2012; Bennet et al., 2017

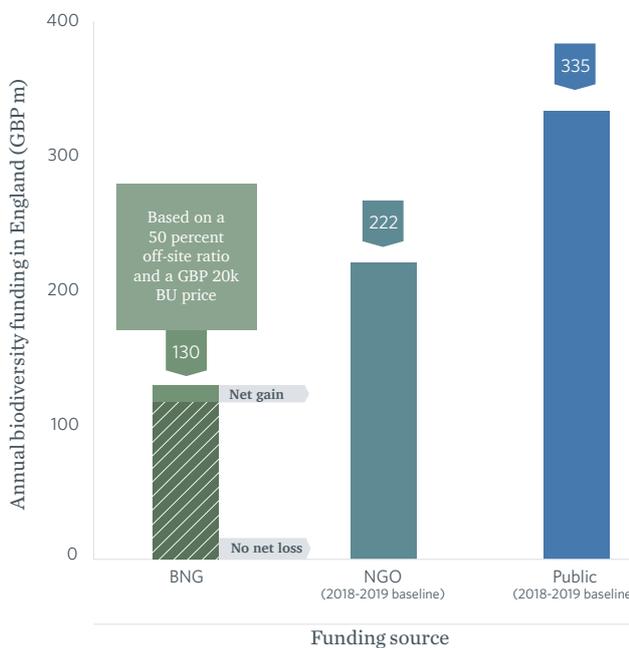
Such funding streams are significant from the point of view of fund recipients, including landowners looking for sustainable and predictable funding streams to transform land management practices and generate biodiversity benefits. As shown in Figure 2.4, a 50 percent off-site offset ratio at a BU price of GBP 20,000 would equate to approximately 40 to 50 percent of public funding and close to 70 percent of non-profit funding on biodiversity in England in 2018-2019.

Figure 2-3. BNG Market size in England



Source: Adapted from eftec et al., 2021 – forthcoming

Figure 2-4. Annual BNG funding compared to public and non-profit biodiversity funding in England in 2018-2019



Sources: eftec et al., 2021 – forthcoming; DEFRA, 2020.

Note: English NGO funding adapted from UK funding figures"



It is important to bear in mind that BNG funding is not directly comparable with public grant funding and subsidies or philanthropic donations. In practice, the BNG funding is mainly to offset loss of biodiversity from development and will deliver only 10 percent gain. Therefore, of the total value of BNG spending (estimated at GBP 100 to 300 million per year), only 10 percent (GBP 10 to 30 million per year) is comparable to public and non-profit biodiversity funding. This means the positive contribution from BNG equates to less than 10 percent of non-profit and less than 5 percent of public funding for biodiversity in 2018-2019.

2.4 Potential risks associated with poor market design

A poorly designed BNG scheme could generate significant risks, which need to be mitigated through careful policy design.

Creating a “license to trash” is a widely discussed risk. Some fear that BNG would enable developers to treat nature as a tradeable commodity, thereby legitimising its destruction on the basis that impacts can be offset, rather than incentivising avoidance. This risk must be taken seriously. It can result from failure to stringently comply with the mitigation hierarchy (due to insufficient enforcement or inadequate monitoring capacities), as well as inadequate protection of irreplaceable habitats. A situation where biodiversity units become the dominant proxy for biodiversity—while other biodiversity information, such as the presence of specific species, is less considered—can also add to this risk. In addition, a too powerful offset supply industry may seek to lobby

policymakers to ensure plentiful demand for BUs and to guarantee the industry’s revenues.

Failure to achieve net biodiversity gains is also a significant risk. Such failure can be the result of five factors, many of which are discussed further in Section 4. First, a lack of clarity around who is liable for delivering net gain can lead to inaction and non-compliance. Failure to achieve net gain outcomes can result from not holding those who are liable accountable for their delivery. This could be due to inadequate enforcement mechanisms or to insufficient requirements and resources for monitoring and enforcement. The absence of clear rules regarding additionality and combination of revenues from the sale of biodiversity units with other environmental credit markets and subsidies (“stacking”) could also weaken biodiversity outcomes. Similarly, short scheme time frames pose a risk to biodiversity outcomes. High-distinctiveness habitats can

take significantly longer than 30 years to reach maturity. Finally, lax rules on where impacts need to be offset (“service area”) can also compromise outcomes for biodiversity. For example, if a biodiversity-rich woodland forming part of a large, interconnected network is destroyed and offsets are generated on land surrounded by urban development, it is possible for it to achieve sufficient units but with much lower chances of colonisation by characteristic species. The time delay between certain losses due to impacts and gains is accounted for by a “time to target” multiplier, but this does not address the immediate habitat requirements of impacted species populations. Interim declines could be considerable unless habitat banks are used that can deliver habitat in advance of impacts, allowing displaced species to colonise replacement habitat.

Compromised biodiversity outcomes can also be a consequence of too great an emphasis on on-site mitigation. Experience from the US wetland and stream mitigation scheme has shown that on-site mitigation

can have a track record of poor ecological success (see Box 2-7). Studies on ecological impact assessments (EclAs) in England have also identified poor ecological effectiveness of on-site mitigation measures (Drayson and Thompson, 2013). There are enforcement and liability risks associated with on-site mitigation that need to be adequately considered. Developers could pass on ambitious on-site BNG commitments to homeowners who may be unaware of the necessary expenses or unforeseen liabilities associated with those commitments and may lack appropriate qualifications to ensure long-term habitat management. Social benefits associated with green spaces in urban areas may thus be better addressed through additional green infrastructure and green open space requirements in planning policy (for example, Building with Nature, BREEAM and the Natural England Green Infrastructure Standards) rather than BNG.

Box 2-7. The US wetland and stream mitigation program’s evolution: from on-site to off-site mitigation

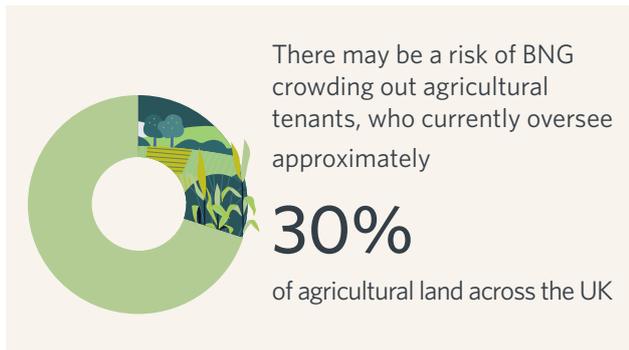
The US wetland and stream mitigation program saw a shift in preference from on- to off-site mitigation, after on-site mitigation demonstrated a poor ecological track record. The Memorandum of Agreement (MOA) between the Department of the Army (DOA) and the Environmental Protection Agency (EPA) set formal guidelines for no net loss mitigation of wetlands and streams for close to 20 years until 2008. This document articulated a clear preference for on-site mitigation: ‘Compensatory actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands) should be undertaken when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). If on-site compensatory mitigation is not practicable, off-site compensatory mitigation should be undertaken in the same geographic area if practicable (i.e., in close proximity and, to the extent possible, the same watershed).’

A 2001 study by the National Research Council (NRC) evaluated the effectiveness of the scheme and concluded that taking a watershed approach

to offset site selection would be more ecologically effective than an on-site offsetting preference. It stated that the ‘preference for on-site and in-kind mitigation should not be automatic but should follow from an analytically based assessment of the wetland needs in the watershed and the potential for the compensatory wetland to persist over time.’ It stressed that there are cases in which on-site mitigation is neither practicable nor environmentally preferable.

In 2008, the DOA and EPA issued new regulations on compensatory mitigation. The regulations noted: ‘We disagree that the rule should establish a preference for on-site compensatory mitigation, because the failure rate for such projects is quite high. ... Because of its poor record of ecological success, a preference for onsite mitigation cannot be justified.’ The rule established a new ‘preference hierarchy’ (Section 332.3b) for compensatory mitigation, with offsite mitigation options given a preference over on-site mitigation.

Sources: DOA and EPA, 1990, 2008; NRC, 2001



Poorly designed or overly complex market rules may prevent the BNG scheme from reaching its full potential.

As outlined earlier, markets with high rates of participation can generate cost advantages stemming from lower transaction costs in the permitting process. Low participation in the market, in turn, can have the opposite effect. This may be the result of an unclear, inconsistent or overcomplicated regulatory framework, and it can lead to uncertainty and reduce incentives to engage in the market. For example, BU providers must be able to predict BNG revenue streams so that they can invest in land-use change and commit to long-term management arrangements. Developers need to clearly understand what their BNG obligations are and how they can fulfil them. Without such clarity on both sides, trade will be constrained. Potential market actors will remain in a ‘wait and see’ mode or decide against participating in the market, if they think it is too risky.

The ecological robustness of the scheme should not be compromised. Academic research (e.g. zu Ermgassen et al., 2020) has shown how too much flexibility for offset trading rules can undermine biodiversity impact avoidance. However, falling victim to the ‘precision trap’ (designing the regulatory framework and resulting permitting process in such a way that it becomes too complicated, inflexible and burdensome) can result in significant costs and be impractical. This in turn discourages potential BU suppliers from entering the market.

Low market activity can result from offset service areas that are too small or through indirect incentivization of on-site offsets. If the area in which an offset for a specific impact can be conducted is small, particularly in areas with low development activity, potential BU suppliers may be discouraged from participating in the market due to the risk of being unable to sell their biodiversity units. This also results in higher

costs and administrative burdens for developers who have less choice in terms of BU providers and therefore less negotiating power. Where there is no supply, developers may need to organise their own offset provisions (Duke and ten Kate, 2014).

Indirect incentivisation of on-site offsets can also take place, even though these may be less beneficial for nature (as discussed in Box 2-7). If on-site offsets are less stringently monitored and enforced, or have lower quality standards than off-site offsets, this gives them a cost advantage. Developers with an interest in minimising their cost would have less incentive to rely on third-party off-site BU providers.

A lack of transparency (for example, on historical transactions and on BU pricing) can result in disadvantages for both developers and BU providers.

Developers run the risk of paying unreasonably high prices for BUs. In turn, landowners may run the risk of accepting unreasonably low compensation for their services, particularly when markets are being set up and no price benchmark is available.

Finally, poorly designed BNG schemes can have perverse social justice outcomes. For example, there may be a risk of BNG crowding out agricultural tenants, who currently oversee approximately 30 percent of agricultural land across the UK. While agricultural tenancy is incentivised through taxes, no such tax incentives are in place for BU supply.

Overall, the number one driver for such risks or perverse outcomes is an imperfect and incoherent regulatory framework.

For developing a market that benefits nature, clear and well-designed rules on implementation, enforcement and long-term governance are needed. As part of England’s two-year BNG pilot phase, the suitable design of such a ruleset needs to be further explored via end-to-end learning so that the Environment Bill, associated secondary legislation and the biodiversity metric can be crafted in ways that maximise opportunities and mitigate risks.

The following sections identify necessary components of a successful offset programme (including based on international experience) and a number of critical areas that need to be addressed in order to provide sufficient certainty for stakeholders on both sides of the market equation to actively engage at scale.



3. How can BNG markets generate maximum gains at least cost?

Biodiversity Net Gain in England:
Developing Effective Market Mechanisms

- International experience provides a solid basis for defining key components for effective and environmentally beneficial BNG markets.
- We set out 20 key components that need to be adequately tackled in the BNG regulatory framework, including the definition and enforcement of the mitigation hierarchy; the definition of clear rules on what needs to be restored, where and how; the types of BU delivery mechanisms that can be established; and disclosure and scheme administration processes.
- UK policymakers should ensure that these key components are adequately addressed when revising the Environment Bill, drafting secondary legislation and upgrading the biodiversity metric

3.1 Key components for an effective BNG scheme

A well-designed regulatory framework is essential for a BNG scheme to operate effectively. Based on learnings from other biodiversity net gain or no net loss schemes across the globe, we have identified 20 key components for an effective BNG scheme which is beneficial for the environment and does not generate unnecessary costs. The identification of these components was particularly influenced by interviews with stakeholders involved in the US wetland and stream mitigation scheme, one of the most mature biodiversity offsetting schemes globally (e.g. zu Ermgassen et al., 2019).

In Table 3-1 below, these key components are grouped in three categories:

What

BNG foundations and ground rules.

These provide the foundational basis and set out the rules that all market actors must follow for overall positive outcomes for biodiversity. They establish policy objectives, define which development impacts are offset, establish the basis for mitigation requirements (including spatial delivery) and provide clarity on what qualifies as net gain.

Who

BU delivery mechanisms and roles.

These establish BU delivery mechanisms, define rules regarding use of each mechanism and define roles and responsibilities for all stakeholders.

How

Disclosure and scheme administration.

These establish the basis for ensuring that market actors comply with the underlying rules. They establish requirements for disclosure and the administrative arrangements needed for ensuring a smoothly functioning BNG scheme.

Table 3-1 briefly elaborates on the nature of these key components. Together they define the core structure for an effective and environmentally beneficial BNG market. These components alone are not sufficient to determine whether or not the market will function, as market activity will be driven as much by government policy as by voluntary drivers influencing voluntary demand for offsets.

Table 3-1. Key components for an effective BNG scheme

	Component	Requirements
	What: BNG foundations and ground rules	
1	Policy goal	Requirement and goals for mandatory 'no net loss' or 'net gain' are established.
2	Policy scope	The types of developments as well as the natural assets to which the policy applies are clearly defined.
3	Loss/gain methodology	A methodology is in place to quantify impacts and BU supply using a consistent and credible metric. This enables developers to assess unavoidable residual impacts and BU suppliers to determine the number of units they can supply.
4	Mitigation hierarchy	Strict rules are in place to ensure that developers adhere to the mitigation hierarchy , which itself is clearly defined.
5	Strategic spatial plan for biodiversity	Strategic spatial plans prioritise BNG offsets in ecologically appropriate locations or locations prioritised for conservation , allowing BNG to contribute to wider biodiversity priorities.
6	BNG site selection rules/ criteria	Clear criteria establish where BNG delivery and BU supply can be located (including definition of areas not considered suitable for BU supply). This includes spatial limits on delivery of BU relative to impact locations. Such rules may be dictated by ecological/biodiversity outcome or by uses and values attached to nature by people (ecosystem service or natural capital considerations).

	Component	Requirements
7	BNG durability criteria	Durability criteria are in place to ensure that BNG measures are sufficiently long-lasting (e.g. gains persist at least for the duration of impacts) . These can include mandatory legal mechanisms safeguarding against incompatible uses, the requirement to have long-term site management plans in place or proof of available funding to finance long-term management activities.
8	BNG actions/additionality	Specific actions may be used to provide net gain/BUs beyond gains that are already mandated, taking into account existing mechanisms for conservation. Also includes rules regarding mechanisms for gain given the habitats and locations concerned (e.g. habitat restoration, preservation, enhancement, creation).
9	Exchange rules/equivalence	Clear rules on what constitutes equivalence between residual development impacts and offsets are defined, e.g. whether offsets must be in-kind (i.e. compensate impacts through restoration/creation of the same type of habitat) or out-of-kind (i.e. compensation via inequivalent habitat types or financial measures).
10	Duration of offset	The length of time BNG schemes and offsets need to be in place is determined.
11	Performance criteria and standards	Uniform performance criteria and standards are established, which all BNG actors and BU suppliers must adhere to . These form the basis for ongoing reporting and monitoring.
12	Timing of compensation & credit release	Clear rules on timing include specifications on how long impacts must be offset after the time of development . They also specify when BUs can be sold —for example, whether a partial release of BUs, tied to intermediary milestones, is possible or whether BUs can be sold only once a habitat is fully restored.
Who: BU delivery mechanisms and roles		
13	BU delivery mechanisms	Institutional mechanisms through which BUs can be delivered are well defined. These could include permittee-responsible offsets or third-party offsets (e.g. habitat banks or compensation funds). Clear rules outline when each mechanism can or cannot be deployed.
14	Clear roles	Roles and responsibilities for all BNG parties, including for developers, BU suppliers and administrative agencies in charge , are clearly defined. An important role to be specified is that of the oversight agency, which is responsible to ensure disclosure and long-term compliance.
How: Disclosure and scheme administration		
15	Net gain plans	Clear guidance on how developers must report their net gain strategy and prove adherence to the mitigation hierarchy is provided. A net gain plan can be submitted as part of the formal permitting process.
16	BU delivery plans	Clear guidance on how BU providers must report on an offsetting site and their long-term management plans is set. This can be submitted either as part of the formal permitting process or as part of the BU supplier registration process. To ensure a level playing field, the same requirements should apply to all BU delivery mechanisms.
17	Permitting process and timeline	Administrative permitting processes and timelines are defined. These determine how and when developers receive permits and commit to a net gain plan. They also need to specify the offset plan approval process.
18	Monitoring and long-term reporting	Clear rules on how to report performance throughout implementation and long-term management are provided. Implementation monitoring ensures successful establishment of the BNG (offset) site, while long-term management monitoring discloses whether the desired ecological impacts are met. The resulting reports serve as the basis for effective enforcement.
19	Enforcement	Well-articulated and effective enforcement mechanisms prevent noncompliance. These should apply to the initial BNG implementation process as well as to long-term site management.
20	BNG tracking system	Transparent and publicly accessible systems for tracking BNG demand, supply and transactions are provided.

Source: Adapted from Wilkinson, 2017

3.2 Assessing the current status of the BNG scheme in England

In England, several of the key components for an effective BNG scheme have been defined. However, as of June 2021, several critical components had been only partially addressed or not at all, as discussed in Table 3-2. Whereas some aspects are covered in the draft version of the Environment Bill, the Bill mandates that other key components should be addressed in secondary legislation, while others are assumed to be covered by the biodiversity metric framework and guidance.

Overall, it is important for policymakers to approach these components holistically and to not prioritise some over others. It is in their entirety that these components establish a sound regulatory framework. To provide certainty and avoid delays, these components should be addressed, refined where needed and implemented as soon as possible.

To further effective implementation of all components, a joined-up strategy for government on BNG could be of value. This also could help avoid conflict of interest in public sector roles. Regular stock-taking, for example every five years, on the implementation of these components as well as the overarching success of the scheme (e.g. its ecological effectiveness and market implications) could be considered to ensure iterative improvements.

Table 3-2. UK progress on the BNG components

Legend | ■ Addressed via metric ■ Addressed via Environment Bill ■ Mandated via secondary legislation
■ Partially/not fully addressed

Component	Current status	What more is needed
What: BNG foundations and ground rules		
1 Policy goal	■ The Environment Bill prescribes mandatory 'biodiversity gain as condition of planning permissions' . The percentage gain is to be set via secondary legislation but is anticipated to be 10 percent.	Secondary legislation should strive for a net gain goal of 10 percent or higher, potentially via increases in the level of ambition over time (e.g. 20 percent net gain by 2050). A reduction in the scheme's net gain level of ambitions should be avoided to ensure that the scheme delivers meaningful results.
2 Policy scope	■ Regulated resources include all land and related freshwater habitat types. (BNG applies to most developments , except those commissioned by a development order or urgent Crown developments).	The types of regulated resources and developments to which mandatory BNG applies could be expanded. Thus far, mandatory BNG does not cover marine biodiversity, which should be included in future expansions of the scheme. Furthermore, the scheme covers infrastructure (including nationally significant infrastructure projects) and housing developments but not agricultural expansion. This significantly constrains the net gain potential, as in 2018 only approximately 5 to 10 percent of England's land was developed, while 60 to 65 percent was under agricultural use (Ministry of Housing, Communities & Local Government, 2020). If limited to infrastructure and housing developments, annual BNG activity will occur on only a tiny fraction of land (less than 0.1 percent).
	■ Secondary legislation defines irreplaceable habitats where offsetting is not an option (90A.18). Types of developments required to offset impacts (including exceptions) can be refined via secondary legislation.	

	Component	Current status	What more is needed
3	Loss/gain methodology	<p><input type="checkbox"/> The biodiversity metric sets a standard methodology for quantifying the assessment of biodiversity losses and gains. This metric is to be continuously refined (the next version being expected imminently).</p>	<p>Regulators should systematically monitor practical experiences of using the metric to keep track of its ecological comprehensiveness and cost efficiency. As discussed in Section 4.1., this can provide the basis for continuous refinements to the metric.</p>
4	Mitigation hierarchy	<p><input type="checkbox"/> Developers must provide 'information about the steps taken or to be taken to minimise the adverse effect' on biodiversity by the development.</p>	<p>Strict adherence to the mitigation hierarchy should be ensured throughout the scheme, to avoid generating a 'licence to trash'. Strict protection of irreplaceable habitats as well as appropriate monitoring and enforcement capabilities are needed.</p>
5	Strategic spatial plan for biodiversity	<p><input type="checkbox"/> Nature recovery strategies set out areas to be prioritised for biodiversity recovery. These strategies are to be defined by local authorities via secondary legislation.</p> <p><input type="checkbox"/> The extent to which BNG delivery projects must align with nature recovery strategies is not specified.</p>	<p>Clear rules should be determined on how BNG delivery must align with strategic spatial plans and overarching conservation priorities (such as the national Nature Recovery Network and local nature recovery strategies). Service areas should be determined carefully to avoid a mismatch between supply and demand, as this could disincentivise BU suppliers from entering the market.</p>
6	BNG site selection criteria	<p><input type="checkbox"/> The circumstances under which land is or is not eligible to be registered as a BNG site are to be set out by secondary legislation.</p> <p><input type="checkbox"/> The adequate distance between impact and BU supply sites is factored into the metric's calculation, creating incentives for offsets close to impact site.</p>	<p>Site selection criteria should prioritise ecological integrity over distance to impact site. As experience in the US has shown (see Box 2-7), on-site mitigation can result in poorer ecological outcomes than off-site mitigation. BNG delivery sites further away from the impact site in connected biodiversity-rich areas could result in greater benefits for nature.</p>
7	BNG durability criteria	<p><input type="checkbox"/> Legal durability mechanisms are defined as (a) a condition subject to which the planning permission is granted, (b) a planning obligation, or (c) a conservation covenant.</p> <p><input type="checkbox"/> Long-term site management and funding requirements are thus far not addressed.</p>	<p>Beyond legal mechanisms, further attention should be directed to long-term site management and funding activities. For example, in the US wetlands and stream mitigation scheme, endowment funds are mandatory for habitat banks to finance a mitigation site's long-term management, monitoring and enforcement activities in perpetuity.</p>
8	BNG actions/additionality	<p><input type="checkbox"/> Actions to provide BUs are determined by the metric. Habitat interventions measured by the metric must result in improved habitat conditions to generate tradeable BUs, thereby disqualifying pure conservation activities as a BU supply action.</p>	<p>Potential disincentives to maintain existing good habitat should be monitored carefully. Additional legislation (for example ELMs) should be crafted in such a way to effectively incentivise landowners to safeguard habitats of conservation value. Perverse outcomes should be prevented (e.g. that landowners destroy high-quality habitat to participate in the financially attractive BNG scheme).</p>
9	Equivalence/habitat types	<p><input type="checkbox"/> Equivalence is determined via the metric through assigned levels of distinctiveness for each habitat type. Rules allow the exchange within the same (in-kind) or a higher (out-of-kind) level of distinctiveness. 'Trading-down' by offsetting impacts on a high-distinctiveness habitat through lower distinctiveness habitat is not permitted.</p>	<p>Not applicable.</p>

	Component	Current status	What more is needed
10	Duration of offset	<input type="checkbox"/> The duration of BNG delivery is set to 30 years.	30 years is very short by the standards of nature and could prevent long-term net gain beyond this period. While certain restrictions on full habitat creation and restoration reversal are to be expected, more comprehensive measures to ensure long-term site conservation could be considered, particularly of high-distinctiveness habitats. Mature and successful schemes such as the US wetlands and streams mitigation scheme have shown that perpetual offsetting requirements do not hinder market participation. A similar approach to high-distinctiveness habitats in England is advisable.
11	Performance criteria and standards	<input type="checkbox"/> Performance criteria or standards for onsite or offsite BU delivery are thus far not addressed.	Clear implementation and ecological impact performance criteria and standards should be set. Ideally, these should incorporate ambitious ecological criteria which not only focus on habitat type and area, but also address nuances such as species abundance. To leapfrog experience in the US (see Section 4.2) and ensure a level playing field, such standards must apply in equal measure to all BU delivery mechanisms.
12	Timing of compensation & credit release	<input type="checkbox"/> Time lags between residual impacts and compensatory BU supply are priced into the metric, incentivising BU supply temporally close to impacts. <input type="checkbox"/> Rules on the temporal release of BUs and whether BUs can be (partially) sold prior to full habitat creation/restoration are not addressed.	Open questions around the temporal release of BUs from BU delivery mechanisms should be addressed. Amongst others, these include: <ol style="list-style-type: none"> 1. How long can credits be held after a site is restored? 2. Can a percentage of credits be sold prior to habitat restoration, in line with defined milestones or performance criteria?
Who: BU delivery mechanisms and roles			
13	BU delivery mechanisms (including rules)	<input type="checkbox"/> Acceptable BU delivery mechanisms and clear rules for when which mechanism can be used are not (yet) defined.	 Policymakers should reflect on the desirable types of BU delivery mechanisms. Acceptable mechanisms should be defined, along with rules and guidelines outlining when which mechanism should be used. (For more details, see Section 4.3).
14	Clear roles	<input type="checkbox"/> Some (administrative) BNG roles are spelled out by the Environment Bill. For example, the secretary of state may sell credits to developers and the planning authority may approve biodiversity gain plans. <input type="checkbox"/> Several critical roles needed for effective BNG scheme administration have thus far not been defined or assigned.	More clarity on who the key administrative stakeholders of England's BNG scheme are would be beneficial. Clear roles should be assigned early on, to give these stakeholders enough time to prepare and stock up their internal capacities accordingly. For example, two important roles that could be clarified include: <ol style="list-style-type: none"> 1. Long-term administrative oversight and enforcement of BNG. 2. Long-term data collection, storage and processing related to BNG registries.
How: Disclosure and scheme administration			
15	Net gain plans	<input type="checkbox"/> The Environment Bill makes the submission of biodiversity gain plans mandatory for planning authorisation. A biodiversity gain plan should list the development, prove adherence to the mitigation hierarchy, showcase biodiversity value of a site pre- and post-development and reference offsite BU delivery sites or BU purchases if applicable. <input type="checkbox"/> Secondary legislation may define other matters to be included in net gain plans, as well as their format, submission procedures and liable submission parties.	Not applicable.

	Component	Current status	What more is needed
16	BU delivery plans	<input type="checkbox"/> BU delivery plans , in which BU suppliers spell out their mitigation actions and long-term management plans, are thus far not addressed or mandated.	Policymakers should consider making the submission of BU delivery plans mandatory for BU suppliers. Just as biodiversity gain plans spell out actions taken by developers to adhere with the BNG scheme, BU delivery plans are a means to create transparency on BU suppliers' actions. The plans could provide details on the offsetting measures taken by BU suppliers, including quality criteria compliance. They could be loosely based on the 12 elements of an offset plan mandatory for offsetting providers in the US wetland and streams mitigation scheme (see Section 4.3).
17	Permitting process and timeline	<input type="checkbox"/> Required timelines for submitting and approving gain plans are to be determined by the Secretary of State in secondary legislation. <input type="checkbox"/> Timeline and submission procedures related to BU delivery plans are thus far not addressed.	Administrative logistics for BU delivery plans should be clarified. This entails clear procedures and timelines for submission and approval, as well as clarity on interrelations and interdependencies with net gain plans.
18	Monitoring and long-term reporting	<input type="checkbox"/> Long-term monitoring and reporting requirements are thus far not addressed.	Clear rules on monitoring and reporting should be set out. For example, BNG delivery mechanism could report on their implementation process, the meeting of their performance standards and long-term biodiversity impacts.
19	Enforcement	<input type="checkbox"/> Secondary legislation will set out financial penalties for the supply of false or misleading information in connection to the biodiversity gain site register. <input type="checkbox"/> Wider enforcement measures throughout the 30-year net gain period are not specified.	Enforcement mechanisms ensuring the meeting of performance standards over the full net gain period should be defined and implemented to ensure successful and long-term BNG delivery. The implementation and long-term performance of on- and off-site BNG delivery sites should be enforced in equal rigour.
20	BNG tracking system	<input type="checkbox"/> The creation of a public "biodiversity gain site register" is set out via secondary legislation. Such a registry will include the location of the land, the work and enhancement to be carried out, information on the state of the land before and after the work is carried out, liable parties as well as reference to developments which rely on the site for offsetting.	The development of a clear vision of what is expected from such a registry (e.g. level of granularity and filter functionalities) and who will be responsible to implement it (e.g. local record centres) should be a priority. The registry is time sensitive, as it relates to the overarching data management infrastructure needed to provide market transparency. The establishment of such a data management infrastructure will demand significant time and resources.

Source: Adapted from Wilkinson, 2017; Defra, 2021



4. Selected areas requiring further elaboration for BNG in England

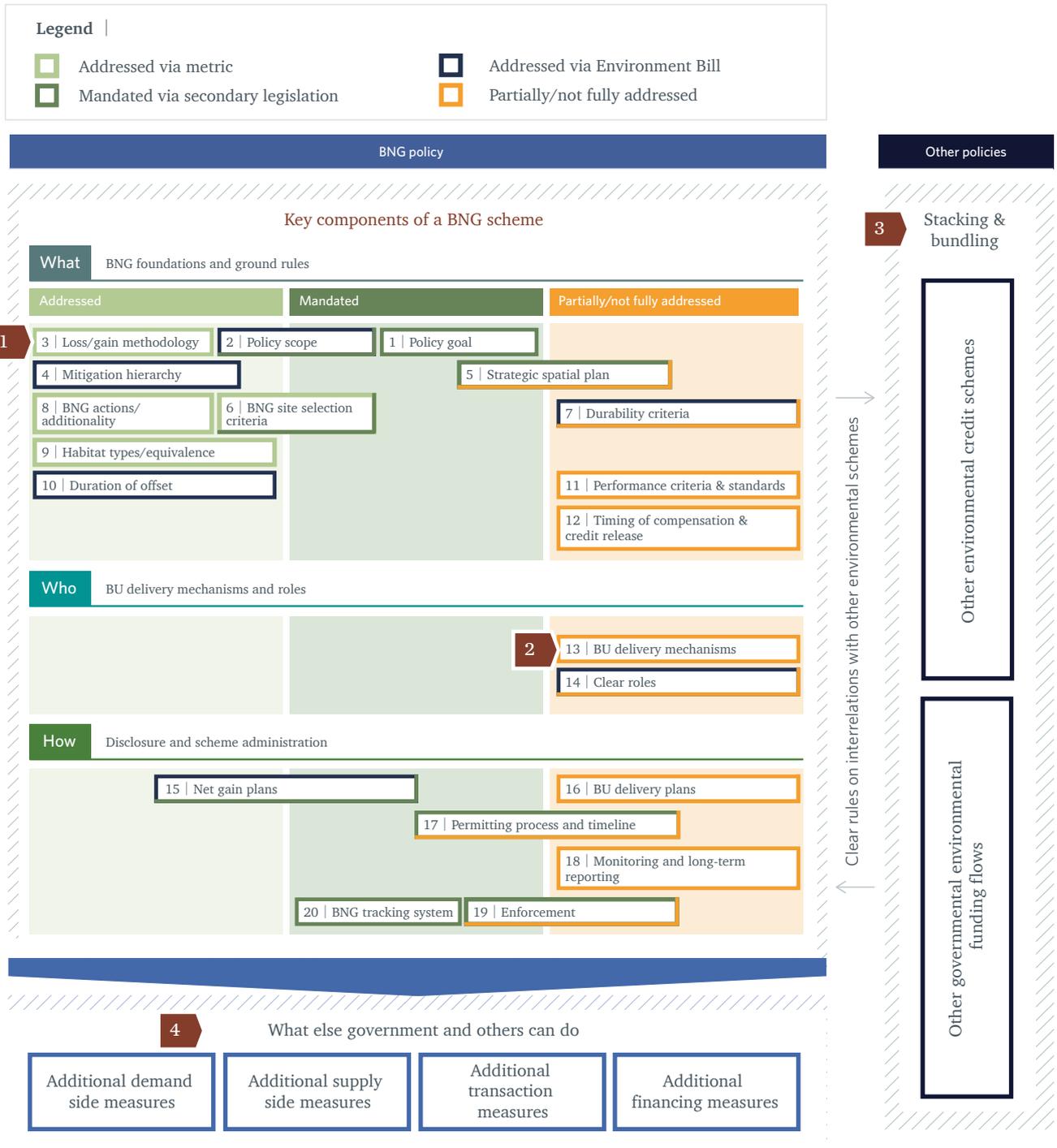
Biodiversity Net Gain in England:
Developing Effective Market Mechanisms



Critical areas need to be addressed for the success of England's BNG scheme. These include some components highlighted above, as well as wider considerations that need to be addressed in the short or medium term. These key areas are also represented on Figure 4-1.

- 1. Measuring biodiversity and driving the right type of investments.** Biodiversity Metric 3.0 provides the basis for estimating biodiversity losses and gains using a consistent 'currency' (biodiversity units, or BUs). It will be critical to monitor and evaluate the strengths and weaknesses of its underlying methodology, practical use and resulting outcomes for biodiversity in England at local and national scales. This is needed to provide the basis for further refinement, if necessary.
- 2. Defining BU delivery mechanisms and enabling a level playing field.** BNG scheme mechanisms for delivering BUs are being developed. These need to be clearly defined to ensure a level playing field between on- and off-site mechanisms. International experience points to clear advantages of a habitat banking approach, with lessons for defining mechanisms suitable to the English context.
- 3. Defining clear rules on stacking and bundling.** How BNG interrelates with other environmental credit and funding schemes is not understood. This creates challenges for BU suppliers hoping to forecast the revenue potential of sustainable land use interventions. Clear objectives and principles are needed in this regard.
- 4. Enabling efficient markets via government-led measures.** Supply-side, demand-side, exchange and financing measures will be needed to lower transaction costs and boost stakeholder participation, particularly in the early period when markets need to be established.

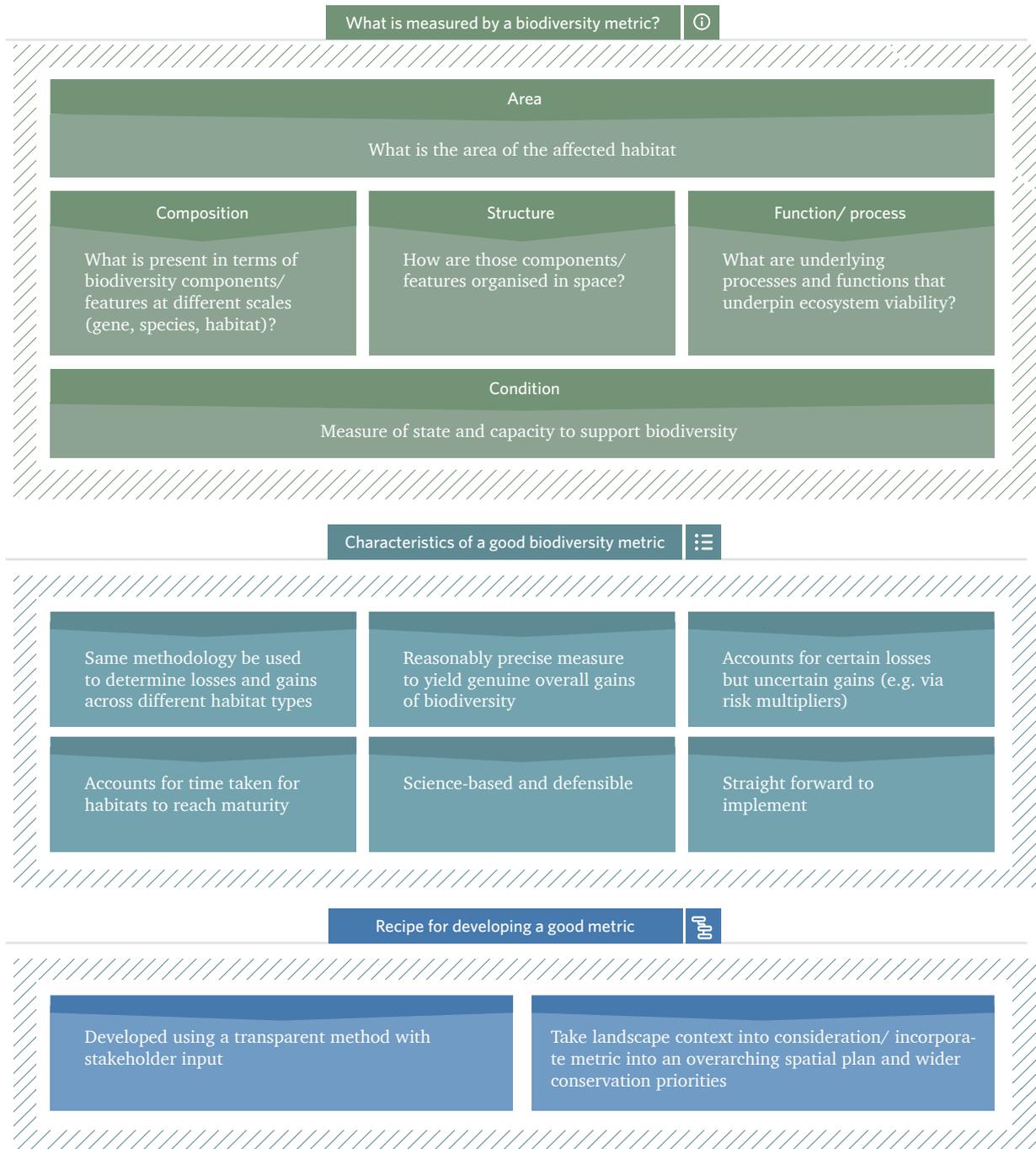
Figure 4-1. Overview of main discussion areas covered in this section



Clear rules on interrelations with other environmental schemes

Source: Authors

Figure 4-2. What should a good biodiversity metric cover?



Sources: Wilkinson et al., 2017; Zambello et al., 2017

Potential risks associated with the proposed approach and ways to mitigate them are identified below.

4.1.1. Using 'habitat' as a proxy for biodiversity vs. addressing species requirements

The Biodiversity Metric 3.0 (Panks et al., 2021) uses 'habitat' as a proxy for biodiversity, partly because it's easier to use. Much UK and European nature conservation policy target habitats because they provide a pragmatic link between efforts to conserve populations of individual species and more integrated approaches to landscape-level management. Habitats are relatively stable over time compared with species populations. In addition, they can be adequately described with fewer types and are normally used as the primary focus of biodiversity conservation (Treweek et al., 2010). One habitat type may support several species of conservation concern (Bunce et al., 2013); this means management to enhance its extent or condition can deliver multiple benefits. A potential result is more efficient allocation of resources for conservation. Links between habitats and the species populations they support are not explicit, however.

One of the main motivations for developing the UK Habitat Classification (UKHab, as described in Box 2-3) was to support direct comparisons of habitat extent or condition before and after development. Although habitats have been the main unit for monitoring biodiversity and ecosystems at national and European levels, achieving consistency has been constrained by use of multiple classification systems, with variable and inconsistent definitions. UKHab ensures consistent definition of habitats across the country, identifying vegetation types that can be expected to support a predictable, characteristic or typical range of species. Habitats are described primarily on the basis of vegetation characteristics (composition and structure), with additional descriptors of biophysical context (calcareous grassland, for example) or sometimes management being available through secondary codes.

Biodiversity is multidimensional and difficult to define and measure. While it is important to avoid oversimplification, highly complex metrics that require detailed baseline data to use could create regulatory



Much of UK and European nature conservation policies target habitats because they provide a pragmatic link between efforts to conserve populations of individual species and more integrated approaches to landscape-level management.



bottlenecks. Nevertheless, use of a habitat proxy alone may have limitations. Biodiversity Metric 3.0 reflects species' requirements only insofar as they affect assigned scores for intrinsic distinctiveness of habitats and their recognition in the field, or benefit from habitat enhancements. It remains to be seen, then, whether Biodiversity Metric 3.0 will deliver tangible overall gains in biodiversity in all its dimensions. Structure and function of the habitats are reflected in the condition assessment methods to a degree but are not necessarily given sufficient emphasis considering their importance for some taxa.

Objective approach. Some of the subjectivity associated with other biodiversity loss/gain metrics has been removed in Biodiversity Metric 3.0 by assigning levels of distinctiveness based on published literature and specialist knowledge regarding characteristic species composition of different UK habitats. For example, an agricultural ryegrass ley is inherently less distinctive than a species-rich chalk grassland (Treweek et al., 2010).

Gains can be achieved by increasing the area occupied by higher distinctiveness habitats and/or by improving the condition of existing habitats, allowing quite a lot of flexibility in the delivery of gains. Obviously the two parameters are not completely independent as lower distinctiveness habitat types transition to higher distinctiveness types with suitable management and vice versa, according to reasonably predictable trajectories. Distinctiveness reflects the plant species composition of habitats (vegetation types) but does not necessarily reflect diversity or abundance of other taxa. Many offset systems in other parts of the world establish mechanisms to offset impacts on some species of conservation importance. Under the proposed system for England, existing mechanisms will remain in place to safeguard protected species, but there are many other species for which there is no targeted provision, including many rare and declining species that were identified for action under the UK's Biodiversity Action Plan.

Bespoke offsets of a higher standard than regular BNG delivery and with more rigorous and stringent monitoring should be developed to offset impacts on very high-distinctiveness habitats and specific species.

The need for such tailored offsets was envisaged in addition to use of a broad habitat proxy in the initial work that led to the definition of UKHab. Treweek et al. (2010) recommended that 'supplementary methods would be necessary to ensure that high-priority biodiversity features for which habitat is not a good surrogate would be appropriately measured and offset'. Otherwise, they noted, important assemblages of flora and fauna would not necessarily benefit from broad habitat interventions because they require specific management in specific locations with sufficient ecological potential. In some cases, deliberate introduction of species might be needed to achieve colonisation of newly created habitat because some species now have very fragmented distributions in the landscape. In theory, strict regulation should prevent development affecting very high-distinctiveness habitats, but in practice these habitats are regularly damaged and lost (as previously



Gains can be achieved by increasing the area occupied by higher distinctiveness habitats and/or by improving the condition of existing habitats.



mentioned, up to 6 percent of the annual developed area affects priority habitat). Bespoke offsets might be necessary or appropriate to improve outcomes for very high distinctiveness habitats. The resulting increase in developers' costs would further remove incentives to develop in such high-distinctiveness habitats. In addition, the metric specifically flags some 'irreplaceable habitats', but further work is needed to define those and establish a comprehensive listing.

4.1.2. Other key considerations for Biodiversity Metric 3.0

Defining area multipliers. Established offset principles generally require the creation of an area of equal size or larger than the area lost or affected by development. There is a great deal of published literature from the United States suggesting that chances of assured delivery of biodiversity credits are considerably improved by use of larger area multipliers. When conceived (Treweek et al., 2010), a minimum 1:1 replacement ratio was envisaged for this reason to reduce cumulative erosion of the area of land allocated to biodiversity/conservation, especially given the fact that indirect impacts are not addressed by the current system. This has not been carried through into current proposals for Biodiversity Metric 3.0, though it is partially addressed by the spatial and temporal multipliers.

Limits to what can be offset: defining irreplaceable habitats. It is generally accepted that there are limits to what can be offset on a like-for-like basis due to the inherent vulnerability or irreplaceability of affected biodiversity (BBOP, 2012).

The UK's proposed framework is based on a presumption against damage or loss of certain irreplaceable habitats, but there is further work to be done to establish the relative irreplaceability of certain habitats. It is difficult to see how this can be evaluated meaningfully without detailed consideration of the requirements of discerning species that are largely confined to ancient habitats (or otherwise relatively irreplaceable habitats) and hence act as indicators of their presence.

Strategic spatial planning and site selection. The UK BNG framework creates incentives for location of offsets that will contribute to BNG within strategic spatial networks, established at local or national level (nature recovery networks) through use of a multiplier. This approach can also contribute towards a degree of additionality (achieving gains that would not have been achieved otherwise through existing statutory conservation mechanisms).

Experience from overseas emphasises the importance of clearly defined service areas where offsets delivery is considered acceptable or allowable. The BNG scheme for England uses strategic multipliers to encourage targeting of BNG actions within defined nature recovery networks, but these are relatively low. Aside from this element, there is some uncertainty around legitimate jurisdictional limits and spatial separation between impacts and off-site offsets. Biodiversity Metric 3.0 does not quantify connectivity and it will be up to local authority regulators and planners to judge whether proposed habitat creation or restoration is appropriately located in ecological



Experience from overseas emphasises the importance of clearly defined service areas where offsets delivery is considered acceptable or allowable.

terms (e.g. on a suitable geological substrate, where there are reasonable chances that characteristic species will colonise or where key functions and processes will operate). Judgements about the extent to which these conditions are met in proposed off-site offset locations will often need specialist input.

Experience also highlights the common tendency to confuse ecological aspects of spatial delivery (i.e. delivery where BNG outcomes can be achieved in technical terms) with ecosystem service aspects (i.e. delivery where people benefit from the offset and do not experience adverse impacts from habitat loss in one location and gain in another). During the UK's voluntary offset phase (since 2012), the assumption has been that gains should be delivered as close as possible to where losses occur. But the basis for this rule is not clearly established, and it should be reconsidered in the light of clear social and ecological criteria.

Habitat banking potentially has an important part to play in improving habitat connectivity within strategic spatial networks; it provides opportunities to consolidate, link and aggregate gains.



Onsite versus offsite delivery of biodiversity gains

Biodiversity Metric 3.0 allows flexibility regarding on-site or off-site delivery of BNG and permits on-site offsets. As originally conceived (Treweek et al., 2010), the metric would have been used for off-site offsets only, with a minimum area replacement ratio of 1:1, to achieve gains of higher distinctiveness habitats outside designated or protected areas and to bring more land into suitable management to improve the condition of existing habitats. Allowable mechanisms for gain would have linked to no net loss targets in the UK Biodiversity Action Plan at the time (maintain condition of existing high-distinctiveness habitats, restore degraded habitat or create new, high-distinctiveness habitat, etc.), focusing spatial delivery on suitable land to network habitat or benefit particular species populations.

Under the proposed system, nature recovery networks will be pivotal to ensure that newly restored or created habitats do contribute to conservation outcomes for rare and declining species that are not covered by protected species legislation. Selecting optimal locations for delivery of biodiversity gain may not guarantee that impacted species are able to benefit, however. First, losses may be experienced by one population, with BNG delivery benefitting another. Second, time delays between impacts and gains may mean there are significant interim losses of habitat for declining species.

One of the main reasons that habitat banks emerged was the general failure of onsite mitigation. Much on-site habitat mitigation will form beneficial green infrastructure but may not genuinely benefit biodiversity for a variety of reasons—such as available areas are below minimum viable habitat thresholds, or they are too disturbed by the presence of people and domestic cats. Access for suitable management may also become increasingly constrained over time.

Duration of offset. International good practice in design of biodiversity offsets requires biodiversity gains (and/or the management required to deliver them) to persist in perpetuity or at least for the duration of the impacts being offset. A fixed time frame based on duration of impacts (30 years is currently envisaged) will have different implications for different habitat types. Creating some habitat types (such as salt marsh) may result in land use change that is effectively irreversible without major capital expenditure. Creating or removing other habitats can be more straightforward (a woodland may be cut, for example, although this would require a felling licence). A scheme duration of 30 years could limit

the net gain potential of higher-distinctiveness habitats, as some high-distinctiveness habitats (e.g. woodlands) require significantly more time than 30 years to reach maturity and become fully restored (see Table 4-1). Existing habitats will also vary in terms of their suitability and cost of delivering BUs; supplying BU from agricultural land is generally cheaper without having to 'buy out' from existing land use at a significant cost. A hybrid approach to the duration of offsets may be advisable: upholding a 30-year time frame for lower-distinctiveness habitats, while stipulating 'in perpetuity' offsets for higher-distinctiveness habitats.

Table 4-1. Examples of time to maturity for different habitat types

Habitat type	Time to maturity (years)	
Linear		
Rivers and streams	15-25	Restored biotic composition, diversity and functioning
Hedgerows	3-5	Establishment of structure
	>30	Species colonisation
Aerial		
Wetlands	1-2	Improved hydrology and arrival of bird species
	<10	Beneficial changes for vegetation and invertebrates
	>60	Full recovery of habitat
Lowland heaths	c. 2	Vegetation improvements
	10-15	Full recovery of pollinator functions
Semi-natural grasslands	4-5	Restoration of MG5 and acid grassland vegetation
	>100	Restoration of calcareous grassland and species-rich meadows
	<10	Soil restoration
	4-15	Full recovery of pollinator functions
Woodlands	20-30	Full canopy restoration
	30-40	Colonisation of shade-tolerant species
	>80	Full restoration

Source: Maskell et al., 2014

Potential perverse outcomes of maintaining existing habitats. The current system does not provide for maintenance of existing higher-distinctiveness habitats that form valuable sources of species for colonising new habitats—and are important in their own right. As originally conceived, the metric would have allowed sales of credits from such habitats, priced to cover the maintenance needed to sustain them in the landscape, or the management needed to bring them into suitable or optimal condition. This is a feature that has been lost as a result of transitioning from a no net loss system to BNG ('new' habitat only). Failure to provide incentives to preserve such habitats could lead to significant losses of important species reservoirs, management neglect or, at worst, deliberate removal to make way for more lucrative 'uplift' opportunities. While it may be possible to establish cut-off dates for baseline definition that will partially address this risk, further consideration of possible protection mechanisms is needed—for example, as part of the ELMS scheme.

For very high-distinctiveness habitats, certain losses might translate into very uncertain gains—unless their taxonomic diversity and specific management requirements are addressed. The system relies on the nature recovery network to ensure that newly created habitat or management improvements are spatially targeted to benefit species of conservation importance. However, if losses continue, this alone might not result in recovery within the time frame needed to ensure that declining species have continuity of habitat.

Review and accreditation. Further consideration needs to be given to the process of restoration and creation (BU supply side) and how it will be monitored and ensured in ecological terms.

This includes considerations such as:

1. Ensuring that 'gain' sites are suitable or have the potential to achieve target outcomes;
2. Establishing clear benchmarks that can be used to monitor progress over time, tied to release of payments; or
3. Testing actual achievement of gains in biodiversity overall (at local, regional or national scales) and having insight into trade-offs between habitat types (are some being lost more than they are gained, or is there a preference for habitats that are easier to create?)

Other factors to be considered are:

1. Existence of colonisers to benefit from habitat restoration or creation, and what action should be taken if their presence is unlikely without deliberate intervention or, on the other hand, incentivising selection of more suitable sites;
2. Management needed to create specific biophysical conditions for discerning species; and
3. Management needed to create habitat structure that will benefit particular species.



As things stand, local authorities are seriously lacking the capacity needed to review BNG delivery plans in detail from a technical biodiversity perspective or to evaluate the suitability of proposed BNG sites. Critical reviews of biodiversity offset schemes globally have identified the need for independent review and verification.

Practical considerations. Some habitat restoration/creation will depend critically on sources of propagules that may be in limited supply—for example, seed stocks for lowland meadows of the right local provenance. This could affect costs of habitat creation or cause delays.



4.2 Defining BU delivery mechanisms and enabling a level playing field

As discussed in Section 2.3, there has been some limited market activity over recent years driven by voluntary offsets and isolated cases of mandatory offsets in local planning authorities where initial Defra pilots had taken place.

The BU delivery mechanisms that will be established to supply BUs are unclear. In the US, broad types of market supply mechanisms have become established over time, as described in more detail in Annex 1. It is essential that these mechanisms develop in a way that will support a liquid market for BUs. Having sufficient BU supply options has multiple benefits in terms of efficiency and environmental outcomes. The more quickly potential BU delivery mechanisms are clarified and the market becomes established, the more efficiently the market will operate.

BU supply in England is likely to come from a mixture of sources (which are not mutually exclusive), including:

- Farm businesses, where small areas of less productive land may be used to generate BUs due to more sensitive farming operations;
- Private estates, where BU supply aligns to existing habitat management plans or is a commercially viable opportunity due to a large local development;
- Bespoke environmental enhancement projects, where BU supply is one of the key products/ revenue sources for the business plan;
- Public sector land holdings, including public bodies that manage large estates (e.g. MoD) or surplus land held by local authorities;

- Non-governmental organisations (NGOs), where BU supply fits with wider strategic opportunities—e.g. by enabling expansion of existing high-biodiversity habitats.

Major uncertainties remain over how BNG will be contracted and therefore who will bear the risk of BU delivery, which will affect BU prices and will determine which land managers will commit to the process.

All suppliers will be committing their land to the BNG agreement for 30 years according to the legal requirement, and in practice potentially longer, as restrictions may then apply to habitat management beyond the 30 years.

The market exchange of BUs will require supply to meet demand at a precise point in time, i.e. exactly when the developer needs to show a BNG plan to an LPA to obtain planning permission.

This timing requirement is potentially a constraint on market activity because sellers waiting for buyers, and buyers waiting for sellers, will both be incurring costs. Various processes can help mitigate this timing risk.

Habitat banking can help with creating liquidity in the market as it allows BUs to be stored ready to be provided as demand arises.

With the habitat banking market mechanism, the biodiversity credits in an offset scheme are produced before (and do not require ex-ante links to) the losses they compensate for, and are stored over time (eftec et al., 2010). Banking helps align supply with demand over time. It can benefit suppliers as the BU value of habitat enhancement can increase over time, due to the 'time to target' penalty in the biodiversity metric reducing. As biodiversity enhancement is already underway/completed, this reduces risks to biodiversity. In New South Wales, Australia, a study of 20 projects found that biobanking halved average time-to-permit and delivered cost savings totalling AUS 35 million. The average time-cost saving for smaller projects was AUS 0.25 to 0.75 million (GBP 0.14 to 0.45 million) and for larger projects AUS 1.5 to 4.5 million (GBP 0.88 to 2.65 million) (Duke and ten Kate, 2014).

As habitat banks have actions already underway, they have better knowledge of what price per BU they need to charge developers in order to cover their costs (such as securing land and implementing management plans to deliver BUs).



In New South Wales, Australia, a study of 20 projects found that biobanking halved average time-to-permit and delivered cost savings totalling

AUS 35 M

Source: Duke and ten Kate, 2014

In line with US experience (discussed in Annex 1), habitat banking should be encouraged because it can benefit both biodiversity outcomes and market liquidity.

Although banking is not precluded in the currently proposed system, it could be supported more clearly by defining the process for banking BUs and setting up the market components that support banking (as described in Section 3.2). This includes having a process for registering BU supply in order to bank it, stating what information is required for registration, and outlining good practice on demonstrating additionality and rules on stacking and bundling (see Section 4.3). The parameters in the metric (see Section 4.1) also influence the process of banking; being able to sell more BUs as their delivery progresses (and the 'time-to-target condition' risk reduces), will mean there is a return to placing projects in a bank and progressing with BU delivery actions.

Brokers can also help line up supply ready to meet demand when developers require it.

This can be particularly important if BUs from specific habitat types are required. Individual private landowners, such as farms and estates where BNG is a minority source of income, are more likely to benefit from using brokers to participate in the market. For projects where BU supply is a more significant (even potentially the main) source of income, brokers may also be helpful and—similar to the potential to operate a habitat bank, from which to sell BUs over time as buyers come forward—will improve their ability to supply the market.

Whatever offsetting mechanisms will be legally available within the English BNG scheme, they need to ensure a level playing field. On-site biodiversity mitigation should be regulated to the same standards as off-site BU supply—for example, by requiring their use of the biodiversity metric, and management plans to deliver BUs, to be transparent. Mechanisms to monitor and enforce BNG delivery over the long term must be applied in equal rigor to sites both on- and off-site. Weaker standards and regulation for on-site mitigation will weaken demand for BUs, deter supply and therefore weaken the BNG market. This will both harm development (with less supply, there is less opportunity for competition to reduce prices) and weaken biodiversity delivery. Experience in the 1990s in the UK showed that integration of biodiversity mitigation into on-site measures generally failed because it was poorly implemented and not monitored, and requirements were not enforced.

All landowners, including public bodies and environmental NGOs, should avoid supplying BUs at less than their cost of delivery or market value (whichever is higher). Doing so would represent a subsidy to biodiversity damage, which would therefore amount to giving a ‘licence to trash’ and would conflict with public bodies’ and environmental NGOs’ obligations.

Along with the rules and processes through which these transactions will operate in the market, there is also a need for independent oversight of market operations. An Office of Environmental Markets, or



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a similar regulatory body, could support monitoring of individual transactions (particularly more complex and/or precedent-setting ones, including BNG trading between local authorities), and it could track overall transaction outcomes (i.e. is BNG actually being delivered?). Evaluating these outcomes and providing feedback into the new market systems is crucial to improve environmental outcomes over time.

4.3 Stacking and bundling: How can projects mobilise diversified funding sources?

The sale of biodiversity offsets is likely to generate substantial funding for landowners looking to repurpose the use of their land. Land use change needs to be a viable business proposition for suppliers of biodiversity units so that they have an incentive to participate in the market rather than use the land for other purposes. Expected profit levels are unclear; they will in part depend on how efficiently BU suppliers generate and manage delivery. However, given the risks involved in BU supply (including policy risks from Government actions and delivery risk), sellers will likely expect profits per BU transaction in the region of several GBP 100s or GBP 1,000 per hectare (over 30 years). As a point of reference, the gross margin for wheat, which entails significantly lower implementation risks and temporal lock-in, is approximately GBP 700 per hectare (Webster and Baley, 2019). Another factor influencing market returns will be other environmental goods and services that can be sold with or alongside BUs.

Selling multiple ecosystem services from an area of land can be done by selling them separately (stacking) or in combination (bundling), as defined in Box 4-1. Table 4-1 shows that approaches to stacking and bundling can vary considerably from one place to another.

Box 4-1. Stacking and bundling: definitions

 Stacking	 Bundling
<p>Stacking means measuring and accrediting the different types of environmental services from a nature-based project on a single area of land, and selling the services to different buyers, or receiving multiple payments from a single buyer for each service delivered.</p>	<p>Bundling means packaging the biodiversity and environmental services produced by a nature-based project on a single area of land and selling the package (typically as a single unit of trade or credit) to a single buyer.</p>

Table 4-2. Types of stacking and bundling

Types of stacking and bundling	Description	Example
 Horizontal stacking	A nature creation/restoration project performs more than one distinct environmental management practice on non-spatially overlapping areas and receives a single payment for each practice.	A landowner plants trees across distinct parts of property, receiving nutrient credits for forested buffer along a stream and carbon credits for the trees upland in the property.
 Vertical stacking	A nature creation/restoration project receives multiple payments for a single environmental management activity on spatially overlapping areas.	A landowner plants a forested riparian buffer to receive both water quality credits and carbon credits.
 Temporal stacking	A nature creation/restoration project involves only one management activity but payments are disbursed over time for different ecosystem services.	A landowner initially restores a habitat to receive endangered species credits. Later, when a carbon market develops, the landowner receives carbon offset credits.
 Bundling	A nature creation/restoration project receives a single payment for providing multiple ecosystem services on the same land.	Often applicable to broader environmental credit types which encompass multiple ecosystem services (e.g. US wetland credits).

Source: Cooley and Olander, 2011

In the UK, markets for different ecosystem services are still developing. Potential returns for other environmental services that could be stacked or bundled with BUs include:

- Carbon credits associated with tree planting:** The Woodland Carbon Code is a voluntary carbon offset market with clear rules and an associated trading platform. Returns associated with woodland carbon code transactions vary by woodland type and other factors but can generate around 100 to 300 tonnes of carbon over 30 years. Historic price levels of around GBP 10 per tonne give a present value revenue of around GBP 1,000 to GBP 2,000 per hectare over 30 years. However, more recently the Woodland Carbon Guarantee auction has been clearing at around GBP 19 per carbon unit, giving higher returns.

- **Nutrient trading schemes:** These are understood to involve payments of around GBP 100 per hectare per year, giving a potential present value revenue of around GBP 2,000 per hectare over 30 years.

Returns from other ecosystem service markets are a fraction of the expected total price per BU.

However, they may not involve any or much additional management action on top of the costs of delivering BU supply (although some monitoring and other transaction costs would be expected). Therefore, the additional revenues they provide could be significant relative to the profits that BU sellers may achieve.

In addition, revenues from BU sales could potentially be stacked or bundled with:

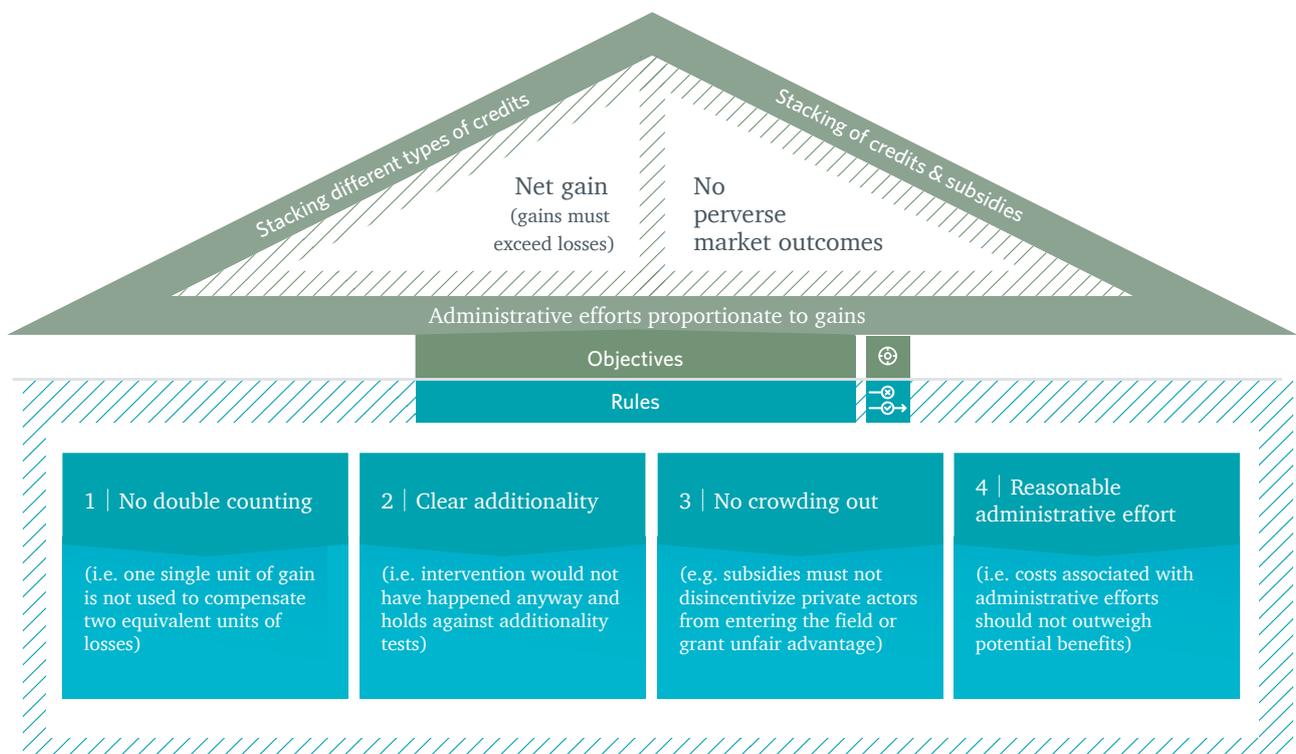
- **Funding schemes, such as agri-environment schemes** (e.g. ELMS)
- **Different grants** (e.g. Woodland Creation Planning Grant, HS2 Woodland Fund).

Separate sale of nutrient, carbon and/or other credits on top of BUs through stacking or bundling involves complex issues.

It is essential for BU suppliers to have clarity on combining revenues from biodiversity units with other types of revenues. In the English context, it would be helpful to set out explicit objectives for defining rules on stacking and bundling regulations. As outlined in Figure 4-3, such objectives could include:

- **Objective 1:** Guarantee additional biodiversity net gain at all times, i.e. biodiversity gains must exceed losses from impacts. Resulting rules would centre on prohibiting double counting and ensuring clear additionality;
- **Objective 2:** Avoid perverse market outcomes from stacking and bundling;
- **Objective 3:** Administrative efforts associated with developing, monitoring and enforcing stacking and bundling policy must be proportionate to environmental and social benefits.

Figure 4-3. Objectives and associated rules for stacking and bundling



Sources: Authors

To achieve these broad objectives, key areas require clarification:

Rules to evaluate additionality of actions. Evaluating whether an action is additional amounts to assessing whether it would have otherwise happened if not for the selling of the offset (Broadway Group, 2021 – forthcoming). Additionality may need to be assessed through a combination of tests and can become more complex when considering the interactions among schemes with different parameters.

These tests are based on different aspects of ecosystem services markets, including:

Legal requirements

Are actions additional to standards required in laws or regulations?

Economics

Would actions be profitable without the stacked or bundled payment?

Timing

Did the project commence before payments were available?

Environmental performance

Are there positive outcomes against a pre-project environmental baseline?

Rules to evaluate additionality of outcomes. Besides the potential lack of additionality of actions, the way ecosystem outcomes are measured could also compromise the additionality of outcomes or lead to double counting. This is a risk with BNG, as the way biodiversity loss is measured (through BUs) excludes other ecosystem services (e.g. carbon sequestration and storage in habitats). If credit is claimed for carbon benefits from actions supplying BUs, but losses of carbon are not measured, then revenues could be received for providing carbon sequestration that is not additional to the pre-development baseline. However, the current state of play is that the carbon losses as a result of land use development are not measured, and developers are not responsible for compensating for them.

This illustrates the relevance of different additionality tests. In environmental outcome terms, compared to before the development and BU supply actions take place, there may be no additional carbon sequestration and/or storage (depending on the types of habitats involved). However, in a legal sense, carbon benefits from actions to supply BUs are additional, as there is no requirement at present to compensate for carbon losses from development (although this could be built into good practice).





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Good practice in measuring and recording baselines is also important for habitat banking in BNG.

Coordination across different ecosystem services markets. The current range of developing markets (BNG, carbon, nutrients, etc.) have different measurement approaches, duration and voluntary/mandatory status. This makes it important to measure baselines and demonstrate additionality for all potential markets in a consistent manner ex-ante of a transaction in any one of them. Good practice in measuring and recording baselines is also important for habitat banking in BNG. This is an area in which pilot BU supply projects can demonstrate good practice. They can be transparent to buyers and regulators about how their baseline has been defined and measured for BNG—and across the different parameters potentially used to measure other ecosystem market transactions.

The importance of this is further underlined by issues related to stacking and bundling that have emerged in the US and Australia (see Box 4-2). A lack of well-designed and consistent rules can result in double counting or a lack of additionality, causing lower biodiversity outcomes. In addition, if every region determines its own rules and enforcement mechanisms independently, this can result in higher administrative costs and uncertainty for market actors. In order to coordinate activity in different environmental markets and ensure additionality of environmental benefits, Government must provide clear rules on whether and how stacking and bundling will operate across the multiple ecosystem markets and subsidy schemes (e.g. ELMs) developing in the UK.

In the short term, a period of market design and learning through trials will enable the development of adequate rules for the BNG market. To make this happen, Government should offer clarity on whether it is acceptable to simultaneously participate in different payments for ecosystem services (PES) setups and receive public payments. Government must have the capacity to monitor, evaluate and offer feedback from the trials.

During the trial and development of the rules, Government should not exclude land managers who have already invested in payments from ecosystem services schemes or other funding programmes, provided they can:

- Demonstrate additionality for each scheme/payment, which are measured and justified against a recorded baseline;
- Base this on agreed (interim) criteria;
- Are transparent with their measurement and justification.

More work is needed on stacking and bundling, so that practical tools and information enable land managers and investors to plan and act with confidence. This goes beyond the scope of this paper.

Box 4-2. International lessons associated with stacking and bundling

Pitfalls from lack of stacking and bundling regulations in the US.

In the US, there are no national rules around stacking and bundling of different environmental credits. This has resulted in multiple cases where actions or outcomes were not additional or led to double counting. For example, a disputed case concerns the Environmental Banc & Exchange in North Carolina. This habitat bank sold wetland credits to the Department of Transportation in 2000. In 2008, it then sold nutrient offset credits for the same conservation actions to another public buyer, despite lacking additionality. North Carolina has since revised its rules for stacking and bundling, no longer allowing such temporal stacking.

Controversies around problematic regulation in New South Wales, Australia.

In Australia discrepancies between national and state rules on stacking and bundling have led to controversies. Australia's national EPBC Biodiversity Offset Policy clearly prohibits stacking and bundling of carbon and biodiversity credits, explicitly stating: 'The conservation gain achieved while participating in another scheme (such as the Carbon Farming Initiative) would also not be eligible for use as an offset'. However, several states have developed their own policies around stacking and bundling. In New South Wales, stacking and bundling of biodiversity and carbon credits is formally enabled. The policy states: 'Land management requirements for the purpose of creating carbon credits are not considered to be legal requirements for biodiversity management under this policy. This

means that the same site can potentially generate both biodiversity credits and carbon credits through the same management actions' (State of NSW and OEH, 2014). This has been criticised over concerns about lacking additionality and double counting by various stakeholders (e.g. the Australian Conservation Foundation).

Positive lessons from a well-thought-through approach to vertical stacking in the COTE scheme.

The Willamette Partnership scheme 'Counting on the Environment' (COTE) represents an interesting potential approach to vertical stacking. Established in 2009 by a series of US public, non-profit and private stakeholders, the partnership was set out to pilot trading of different types of environmental credits. Four credits were included in the scheme: Wetlands, water quality, upland prairie and salmonid habitat. An accounting and measurement protocol was created to define eligibility and additionality, including methods to reconcile environmental credit incomes and public subsidies. Based on the protocol, more than one type of credit could be sold from the same management activity and proportionately reduced in number when one of another form of credit was sold. When a certain amount wetland credits were sold, species credits from the same plot of land were reduced by the same proportion. The scheme provides landowners with the flexibility to sell credits which are most valuable at any one time, while avoiding double counting.

Sources: Poulton, 2014; von Hase, et al., 2018

4.4 Enabling functioning markets: what can government do?

Besides establishing the regulatory framework for an effective BNG scheme, government will need to play an active role to ensure that markets function efficiently. In the early phases of the scheme, an active involvement will be essential to help avoid regulatory failure, accelerate market participation and ensure smooth transaction processes. This section discusses policies and interventions to ensure robust and predictable demand, stimulate supply and facilitate transactional market aspects, such as transparency and administrative capacity. These will influence the willingness of the financial sector to invest in the supply side of the market, so finance-specific interventions to encourage investment are also discussed.

Government agencies should avoid trying to do too much, however, and focus on essential government tasks that include legislating and regulating. Other optional roles for the public sector (such as a seller or a broker of BUs) risk creating distractions for public sector agents, generating conflicts of interest and crowding out the private sector. Such additional functions should therefore be kept to a minimum, at least while the market becomes established. For example, brokering of BUs would best be carried out by private sector agents rather than by multiple local authorities, particularly when brokering needs to take place across local planning boundaries.

4.4.1. Ensuring robust and predictable demand for BUs

A potential demand-side measure is to increase the transparency of the scheme to boost voluntary participation. Voluntary demand for BUs is quite rare. Public and non-profit campaigns centred on the mandatory scheme to boost public awareness could give more companies incentives to aspire to 'biodiversity neutrality'. Such voluntary company commitments could apply to historical as well as international developments. This could expand potential demand for BUs and help establish market confidence.

A more specific demand-side intervention is a demand guarantee. Government could provide such a guarantee. This instrument has been used in other environmental markets (e.g. through the floor price in the Woodland Carbon Code credits) and to ensure supply of other public goods (e.g. advanced market commitments to encourage pharmaceutical research).

Government could commit to purchase a certain number of BUs in each LPA (or other zones, such as local nature recovery strategy areas). The anticipated purchases could be determined through spatial modelling of expected requirements and advertised ex-ante to encourage supply. Purchases could be spread evenly over all supply of an adequate standard and put forward by a certain date or prioritised through a bidding process. Government could then potentially do several things with this supply:

- Act as a broker, i.e. resell to the market at cost as soon as possible;
- Retain it as 'net gain' towards national biodiversity objectives; or
- Bank it to ensure future supply shortages are avoided.

A variation on this option is for Government to purchase BUs through option contracts, giving the seller an opportunity, but not obligation, to sell to Government at an agreed price. This would allow suppliers to choose not to sell to Government if they wish to sell in the open market.



Government agencies should avoid trying to do too much, however, and focus on essential government tasks that include legislating and regulating.



A major challenge for efficient demand guarantee policies is to identify the right price level for Government intervention. A price that is too high means Government overpays; too low, and Government will undercut suppliers and weaken market confidence. The best way to establish pricing is through actual supply actions, such as encouraging habitat banks or undertaking a reverse auction.

Advance purchase capability could also be enabled for the wider market: Land use developers could purchase BUs (or BU options) to cover their anticipated future needs. This would fuel suppliers with revenue early in their project development and also help smooth the levels of demand and supply over time.

Markets provide the incentives for buyers and sellers to innovate to overcome challenges (such as on timing) in an efficient manner. The challenge in the BNG market is to keep Government's rules from blocking such innovation, while still ensuring efficient market outcomes for biodiversity and society.

It should be noted that several of these interventions that spend money to boost demand for BUs would have a 'no-regrets' element; the worst-case outcome would be biodiversity enhancements that helped deliver 25 Year Environment Plan objectives. Another advantage of ex-ante interventions would be to help establish the actual costs of supply; this would inform expected prices to the market. Their disadvantage could be to cost more per BU than measures that support (but have less control over) supply of BUs, or market activity overall, so there is a trade-off to assess between certainty and cost of outcome.

4.4.2. Stimulating BU supply

The BNG policy proposals in the Environment Bill include a provision for the Government to act as a 'seller of last resort'. This is to ensure that the BNG requirement does not act as a block on development and/or impose excessive costs on developers (if they are not able to procure BUs in the market). However, such powers for Government could potentially create a perverse incentive because they introduce an additional risk for private suppliers. By deterring investment in supply, they could increase the risk of supply shortages, which they are designed to address in the first place. Alternatively, there are a number of other

policy mechanisms that Government could use to support supply:

- **Enabling trading between adjacent and non-adjacent LPAs would stimulate supply.** The Environment Bill already includes a provision to allow purchases of BUs from outside an LPA. Through the metric, a penalty is attached to this (a 25 percent reduction for BUs in neighbouring LPAs, and 50 percent beyond). Ensuring this option is used will give confidence to suppliers that they can sell to buyers from outside their LPA. For example, this would include supporting consistent implementation of the BNG regulatory process (such as for granting of planning permission) by the two LPAs involved (the supply and demand locations).
- **Governmental grants to suppliers could provide payments to help start BU supply projects.** Experience from projects within Natural England's credit pilot scheme have shown that



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project preparation costs can be significant. Grant initiatives such as Natural Environment Investment Readiness Fund (NEIRF) deployed by the Environment Agency can alleviate some of these. Governmental grants for project preparation can help kick-start the market and build a project pipeline. However, they lack the incentives created by investments (i.e. the need to repay capital) and may be a less cost-effective use of public finances compared to investing in suppliers or demand-side measures as there is no direct return on investment (e.g. BUs supplied or financial revenue).

The Government could develop, and possibly co-fund, insurance (or re-insurance) schemes for supply of BUs. The purpose would be to allow BU suppliers (and, potentially, buyers), to insure themselves against failure of BU supply (i.e. where habitat management actions do not result in the expected biodiversity gains). This would help build confidence in the market and give the Government an incentive to regulate the market effectively to reduce its

insurer risks.

Similarly, government could consider de-risking BU supply by temporally limiting suppliers' liability.

Measures of this sort are in place in the US wetlands and streams mitigation scheme, where habitat bankers are liable for meeting strict performance standards over the first 10 years of delivery. After that, liability is transferred to an endowment fund, usually overseen by a local conservation organisation. Habitat bankers are responsible to endow this fund appropriately. They do this by factoring the costs of a site's long-term management, monitoring and enforcement into the credit price, combined with interest rates to sustain the fund into perpetuity (The Environmental Law Institute and Land Trust Alliance, 2012). Additional potential de-risking measures are outlined in Annex 3.

Finally, Government could support the supply of propagules critical to the restoration and creation of certain habitat types. This can lower habitat creation costs and prevent delays in supply. To decrease risks of importing diseases when procuring propagules from afar, government could promote species seed banks of local provenance.



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4.4.3. Facilitating market transactions

Although the Government can influence both the demand and supply sides of the market, its key role is to ensure they transact in a way that is transparent and inspires trust. Indeed, the main function for Government in this respect is to act as an effective regulator.

To avoid risks of regulatory failure, the Government needs to resource and implement the regulatory processes that will oversee the BNG market. Local planning authorities are in charge of environmental and monitoring/regulatory functions at the local level. In addition, the national government will need to establish a register for BU trading, which is transparent, easy to use and publicly accessible. It will also need to define rules and processes for habitat banking and inter-planning authority trading, and to monitor the use of the biodiversity metric and ensure that it performs as needed. The central government has a key role to play to ensure that the BNG scheme is delivering as planned and to conduct ongoing learning and evaluation to continue improving the scheme going forward.

Some of the major risk factors in this area that could lead to regulatory failure include:

➤ **If insufficient regulatory powers to oversee and control the market are transferred.**

Enforcement powers are planned to be at the local level. There are also planned processes to monitor outcomes ex-post—for example, as part of biodiversity outcomes monitored by the Office of Environmental Protection (OEP), which will be created following adoption of the Environment Bill. However, there appears to be a gap in terms of macro regulatory powers (i.e. across the market) when more than one planning authority is involved. Additional regulatory capacity at national level could also be beneficial. For example, it could vet offset plans and their implementation to ensure that these are developed and implemented in a consistent manner.

➤ **If resources for government agencies to undertake their assigned functions are inadequate. Primary capacity constraints include:**

- Local governments do not have enough ecologists on staff to monitor BNG requirements adequately. (By one estimate, only one third of Local Planning Authorities have their own ecologist, and these functions can be challenging to contract out.) The central government is committed to transferring additional resources, but it would be important to ensure that this is not done at the expense of existing budgets. It should result in only a moderate or no overall increase in budget available at local level for nature recovery;
- Access to technical assistance from national public bodies on the transactions process to make sure local government can enable timely transactions; and
- Good infrastructure to allow adequate access to data (e.g. to relevant biodiversity data through local records centres).

The **capacity across the system can be aided by a program of training**—first, to develop a common understanding of the process among buyers, sellers, brokers, regulators and other players, and, second, in specific parts of the system (e.g. training sellers and regulators on good practice for BU supply). An example of a specific area to build capacity and discuss processes is the time-phasing of the sale of BUs from a supplier, which may sell BUs to buyers in stages over time.

In addition to BU transactions themselves, there is a **need to strengthen adjacent biodiversity policy measures**. This need has been observed in other uses of economic instruments in environmental policy. For example, the introduction of the landfill tax, without additional resources to regulate or control illegal waste disposal, led to an increase in fly-tipping. In the case of BNG, this means strengthening associated BNG policy enforcement through sufficient capacity in LPAs, Natural England and biodiversity monitoring (e.g. through better access to biodiversity data). This resourcing should be part of a cross-Government strategy for BNG delivery.

To recoup regulatory costs to the public sector, full-cost recovery could be considered. This is practiced by some jurisdictions in the US and Australia, who charge fees for their administrative services to credit suppliers. Additional costs are factored into the final credit price (Duke and ten Kate, 2014). Full-cost recovery will also ensure that Government neither subsidises demand nor undercuts private suppliers.

Market transactions can be supported through other measures relating to information, brokering and regulatory capacity. As shown in Box 4-3, different international no net loss or net gain schemes facilitate market transparency in various ways.

Box 4-3. No net loss or net gain market transparency measures in the US and Australia

International approaches to enhance no net loss or net gain market transparency can inform England's current developments.

In the US, the Regulatory In-lieu fee and Bank Information Tracking System (RIBITS) provides in-depth information on third-party mitigation providers across different environmental credit schemes. It helps connect buyers and sellers by listing providers, their geographic service areas and the number of credits they have sold or are hoping to sell. It includes suppliers' contact information and documentation, along with information on mandatory mitigation policy and practices on a national, regional and local level. The platform holds data on approximately 5,000 operational, terminated, pending and sold out habitat banks and in-lieu fee project sites.

In Australia's New South Wales biodiversity offsetting schemes, five public registries facilitate market transactions. Three of these provide transparency on the supply side, while the other two provide information on demand and exchange:

1. The **credit supply register** details the number, types and locations of credits available for purchase. It encompasses expressions of interest in potential credit supply, credits pending approval and issued credits.
2. The **accredited assessors register** provides information on credit accreditation, which is mandatory within the New South Wales scheme. It includes contact details of individuals and organisations eligible to prepare accreditations of biodiversity values and credits for suppliers.
3. Completed conservation agreements within the scheme are listed in the **private land and conservation agreement register**, including details on the size of the site, the type of agreement, its starting date, terms of the agreement and more.
4. The **credit demand register** records the number, type and location of credits required by developers, including confirmed and still pending demand (undergoing permitting approval).
5. Historical credit transactions are listed in the **transaction register**. This provides an overview of credit transfers and retirements, including information on the credit type, number of credits, price, date of transaction and any potential suspensions or cancellations.

Sources: NSW Government, 2021; RIBITS, 2021

To support the transaction process within the BNG market, the Government can take steps to improve availability of information. A key aspect of this in England is the planned BNG registry. While the registry will have a core regulatory purpose of recording BNG actions that accompany planning approvals, it can also help share information across market participants. There is a danger that the registry is required to perform too many functions, distracting from its core purpose. One solution would be to have a core registry focused on the delivery of the legal requirement for BNG, linked to a BNG hub which enables access to a wider range of information designed to support the market. Information contained in the BNG hub could include:

- Banking of BUs (i.e. the locations where they are being generated);
- Publication of market data, for example:
 - Historical levels of land use development in each LPA, to share information on potential demand;
 - Actual transactions, through aggregate and anonymous data that is confidential on individual transactions, such as on areas managed under BNG agreements, and on price per BU.

Information sharing through the registry and other structures better supports market development the earlier it happens. The aim should be for structures to be ready within six months of the Environment Bill adoption (rather than wait until BNG becomes mandatory in 2023). This will allow voluntary BNG activity (which is already taking place) to start using the registry, generating experience through which to refine its operation. Opening processes for banking BUs earlier will encourage habitat banking before BNG becomes mandatory and could provide valuable information, including to Government, on available supply, actual delivery costs and any potential issues for functioning markets.

Government can also encourage exchange of BUs by supporting brokering services. Brokering services can reduce market entry costs for buyers and/or sellers. Through the BNG hub, Government could provide a system for registration of potentially available supply (but not actual supply, which can be banked) and expected future demand, by habitat and LPA.

Having consistent market information and enabling access to this through the registry and hub will improve market operation. This can be supported by Government in several ways—first, by clearly defining required content and, second, by producing templates for BNG agreements and management documents (e.g. a standard contract form, contents for a BNG site delivery plan). These documents can also help reduce transactions costs between buyers and sellers (e.g. facilitating due diligence of suppliers by buyers).

The option for **central or local Government to act as a broker in the market should be avoided**, despite signs that this is already happening. It can distract from Government's essential functions (such as establishing the registry) and produce conflicts of interest.

4.4.4. Stimulating investment in BU supply

Investors will need to see a sufficient prospect of financial returns relative to the risks in order to invest in BU markets. Addressing the issues identified in Sections 4.4.1 to 4.4.3 (such as restricting the Government's 'seller of last resort' powers) will help boost investment opportunities.

In addition, a range of potential Government interventions can directly encourage investment in BU supply. These are summarized in Annexes 2 and 3. Suitable measures include technical assistance, guarantees, tax incentives and advanced purchases, described above under demand measures (4.4.1).

Further priority interventions are:

- **Pump priming:** Government injects funds into the BU market, either as grants to suppliers or (as an extension of advanced purchase commitments—see Section 4.4.1.) as payments for a certain number of units to be supplied in the early years of the market. Government could act in partnership with potential buyers.
- **Invest in BU suppliers:** In line with the Government's Green Finance Strategy (HM Government, 2019), it could invest directly in suppliers—for example, by giving loans on

Market operation can be improved by:



Having consistent market information



Enabling access through the registry and hub



favourable terms and/or taking a minority first-loss share in habitat banks. The habitat banks to invest in could be identified through a reverse auction or similar bidding process. As well as funding investment in supply, this would also create an incentive for Government to ensure the market functions (so it does not lose its investment), giving confidence to other market participants.

- **Tax reliefs.** These are an important incentive mechanism for existing land use in England. Reliefs currently applied in agriculture could be extended to BU supply to create a level playing field between commercial uses of land for agriculture and BNG. A conservation property relief (CPR) could be considered or guarantees that the agricultural property relief (APR) would not be affected by BNG delivery could be provided.

The new UK Infrastructure Bank (UK IB) could implement its environmental remit by actively taking forward one or more of these financial measures (other than tax reliefs). With a sufficient scale of investment in the market (e.g. through pump-priming and investments in suppliers), the UK IB could issue a specific financial investment product (e.g. a green bond) against these investments. The UK IB could act in conjunction with other market interventions, in particular Government advanced market commitments for BUs from specific habitats with co-benefits, such as native woodland that extends existing areas of ancient woodland, or salt marsh or peatland for carbon. Overall, Government needs to identify the most cost-effective combination of demand, supply, transactions and finance measures to inject confidence into the market and stimulate supply (in particular, habitat banking) while still ensuring biodiversity objectives are met.





5. Next steps: checklist for market players

Biodiversity Net Gain in England:
Developing Effective Market Mechanisms

This section formulates recommendations for entities that can play a role in market development, ranging from government agencies to BU suppliers to housing developers. Recommendations are broadly structured according to the main sections of this paper.

Area of focus	Recommendations	Relevant for:
BNG framework	<p>Policymakers should carefully consider the key BNG components outlined in this paper and lay out a clear pathway to ensure they are adequately covered in England's BNG framework. This can be done through:</p> <ul style="list-style-type: none"> ■ Amendments to the Environment Bill before its adoption (expected in 2021) ■ Secondary legislation accompanying the Bill ■ Departmental resourcing (e.g. land use planning system capacity) and policy implementation (e.g. other biodiversity policies) ■ Revisions of the biodiversity metric 	Defra, NE
Scope of BNG scheme	<p>Consider increasing the scope of the BNG scheme to increase potential environmental benefits:</p> <ul style="list-style-type: none"> ▲ Increase the duration of the scheme from 30 years to perpetuity, especially for high-distinctiveness habitats, to ensure long-term gains for nature, or make clear provisions for what will happen beyond 30 years. ▲ Extend the BNG requirement to Nationally Significant Infrastructure Projects ▲ Increase the level of net gain ambition over time—for example, from 10 percent in 2023 to 20 percent by 2030 (or as soon as the market is well established). ▲ Increase the scope of mandatory net gain to cover marine habitats. ▲ Be more directive in terms of where BU delivery is to be targeted geographically and incentivise off-site over on-site BNG delivery to create larger, better-connected biodiversity-rich areas in line with local nature recovery strategies. ▲ Increase the visibility and transparency of the BU market so that it can attract more voluntary demand. ▲ Use the BNG schemes' infrastructure for wider UK nature recovery ambitions—for example, by deploying the biodiversity metric to habitat evaluation, management and pricing under ELMs. 	Defra, NE
Joined-up Government strategy on BNG	<p>Define a joined-up strategy for Government on BNG to ensure integrated delivery of multiple policy objectives (e.g. housing growth and environmental protection). Ensure the strategy is adequately resourced, particularly in terms of regulatory capacity.</p>	Defra, HMT, MHCLG, DfT, BEIS
	<p>Take regular stock (for example, every five years) of the success of the scheme, its ecological effectiveness and market implications to ensure iterative improvements.</p>	Defra, NE, OEP

Area of focus	Recommendations	Relevant for:
Biodiversity metric	<p>Regulators should systematically monitor practical experiences of using the metric in the initial years of the scheme to track its ecological comprehensiveness and cost efficiency.</p> <p>This can provide the basis for future improvements. Monitoring could include:</p>	NE, Defra, Market stakeholders
	<ul style="list-style-type: none"> Review biodiversity outcomes across different sites and scales to, amongst others, help develop criteria to establish acceptability of on-site vs. off-site gains. 	NE
	<ul style="list-style-type: none"> Assess whether existing multipliers to encourage BNG delivery within strategic spatial networks are strong enough and increase weighting of such multipliers if appropriate. 	NE
	<ul style="list-style-type: none"> Monitor potentially perverse incentives—for example, regarding maintenance of existing good, unprotected habitats which would not attract BNG funding under the current scheme. 	Defra
	<ul style="list-style-type: none"> Survey whether the metric supports the market effectively (including considerations of costs, time requirements and compliance). 	Defra, NE, Office for environmental protection
	<ul style="list-style-type: none"> Identify biodiversity components or values that are not fully reflected by a broad habitat proxy. These may require additional targeted regulatory action or bespoke offsets—for example, for impacts on rare or threatened species outside development site boundaries. 	NE, Defra, Professional bodies
	<ul style="list-style-type: none"> Incorporate a requirement to include indirect impacts in BNG calculations. Evaluate integration of BNG with EcIA standards and practices over time to ensure that BNG delivery aligns with and is underpinned by rigorous EcIA approaches and methods. 	
Strengthen implementation of existing biodiversity policies	<p>Step up implementation of biodiversity policies that will interact with BNG:</p> <ul style="list-style-type: none"> A market mechanism puts associated policies under more pressure (because their outcomes have a financial implication), so they need to be strengthened. Relevant policies include those that preserve existing high-distinctiveness habitat, environmental impact assessment and those related to ELMs. 	Defra, NE, LPAs
BU supply mechanisms	<ul style="list-style-type: none"> Provide clear guidance and rules on acceptable BU supply mechanisms, ideally encouraging habitat banking Ensure a level playing field across mechanisms, maintaining the same quality standards for on- and off-site net gain delivery Provide independent oversight of the operation of the market system and transactions. 	Defra
Stacking and bundling	<ul style="list-style-type: none"> Establish clear objectives and principles as the basis for stacking and bundling to address additionality. These principles will guide the definition of rules and guidelines. 	Defra, HMT, Office for environmental protection
	<ul style="list-style-type: none"> Recognise the need for clarity, acknowledging the risks of stacking and bundling, as well as the potential benefits. 	Defra, NE
	<ul style="list-style-type: none"> Alongside the mandatory use of the biodiversity metric, record other environmental losses that can be traded as credits (e.g. carbon) to monitor BNG impacts and the additionality of stacking and bundling. 	NE, LPAs

Area of focus	Recommendations	Relevant for:
Stacking and bundling	<ul style="list-style-type: none"> During the development of the rules/ guidelines, encourage trial stacking and bundling projects. Government should prepare to monitor and learn from them. 	Defra, NE
	<ul style="list-style-type: none"> Do not exclude land managers who have already invested in projects from payments from ecosystem services schemes or other funding programmes, provided they can: <ul style="list-style-type: none"> Demonstrate additionality for each scheme/payment, measured and justified against a recorded baseline Base this on agreed (interim) criteria where provided by regulators Are transparent with their measurement and justification. 	Defra, NE
Demand-side actions	<p>Suitable demand-side actions could include:</p> <ul style="list-style-type: none"> A market mechanism puts associated policies under more · Ensuring a level playing field across on- and off-site BNG delivery Extending mandatory BNG regulation to all land use developments Governmental commitments towards demand guarantees. 	Defra, NE, LPAs
Support market transactions	<ul style="list-style-type: none"> Outline good practice guidance on key steps in BNG transactions, including: <ul style="list-style-type: none"> Templates for BNG transactions, including measuring baselines for BU and other environmental markets, legal agreements, management plans, financial plans for BU supply Milestones for payments from buyers and for release of biodiversity units from suppliers, including from mitigation/ habitat banks. 	Defra, NE
	<ul style="list-style-type: none"> Ensure smooth transactions with relevant additional actions: <ul style="list-style-type: none"> Strengthen capacities of key regulatory stakeholders for smooth scheme administration. Improve availability of information, e.g. via a BNG information hub. Encourage early BNG market systems operations prior to mandatory regulation (on a voluntary basis), to enable learning by doing 	Defra, NE, LPAs
Stimulate investment	<ul style="list-style-type: none"> Supplier financing (via pump priming, tax reliefs, etc.) or co-investment Insurance offerings for supply or demand, to reduce risks Regulatory certainty (see demand- and supply-side measures above) Reduce policy risk (e.g. by avoiding conflicts of interest, use of seller of last resort powers) 	Defra, HMT, UK Infrastructure Bank
Other actions	<p>Non-governmental actors can accelerate market uptake and facilitate learning, particularly during the two-year transition period up to 2023. For example:</p> <ul style="list-style-type: none"> Companies which outsource/procure their infrastructure/housing developments via third parties can accelerate BNG uptake by including BNG requirements in their tenders. Suppliers can start identifying and preparing for projects and learning the full costs of supply 	All stakeholders



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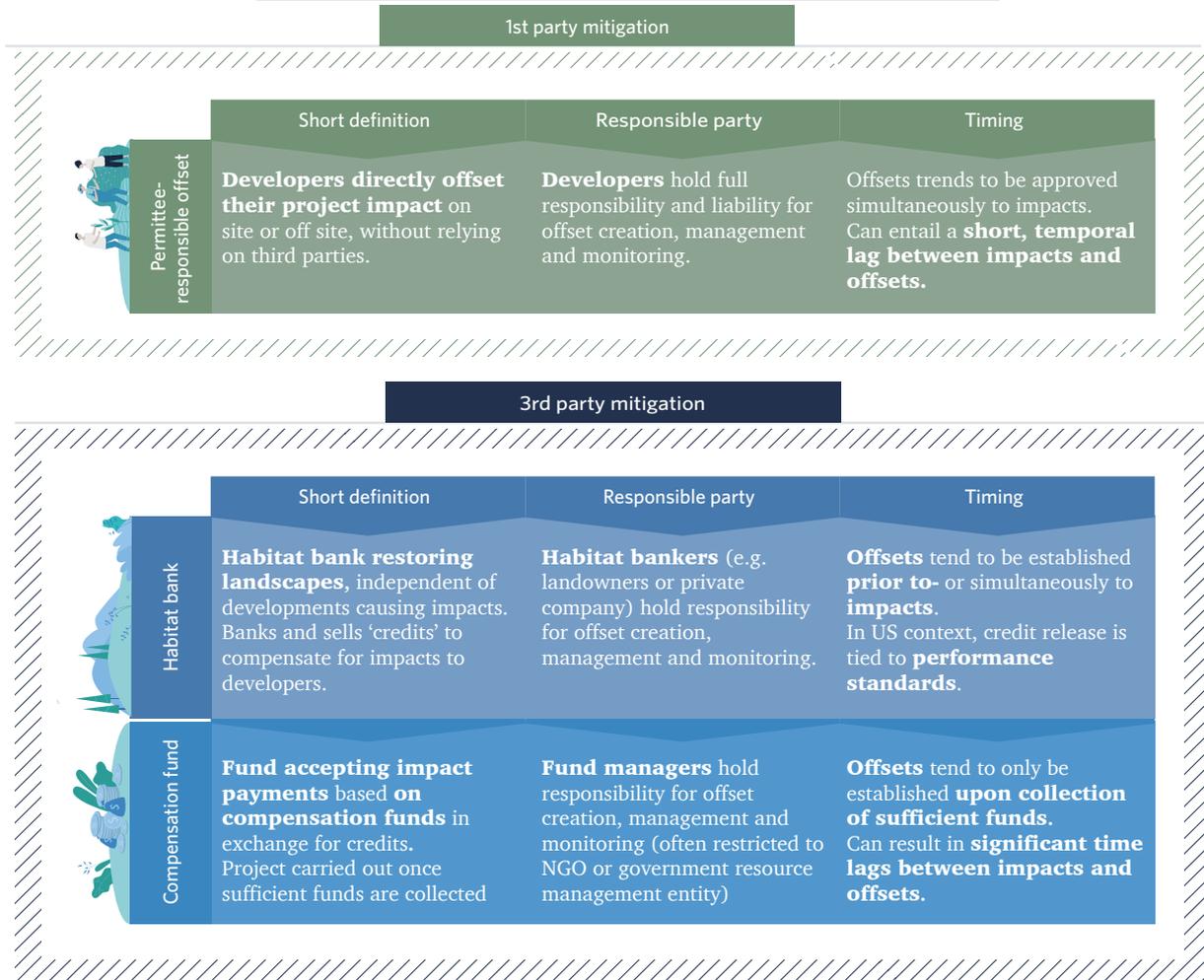
Annex 1: BU delivery mechanisms in the US

This annex provides additional information on delivery mechanisms for BUs (also referred to as “credits”) in the US wetland and stream mitigations scheme and lays out how they have evolved over time. The experience in the US offers interesting lessons for the development of BNG markets in England and the UK more generally.

Three dominant institutional mechanisms in this scheme deliver offsets:

1. **Permittee-responsible offsets**, where developers directly offset their project impacts;
2. **Habitat banks** run by individual landowners or commercial environmental service companies, which restore and create habitat on a single site or across multiple sites to bank and sell BUs to developers;
3. **Compensation funds**, which accept impact payments from developers and carry out offsetting projects once enough funds have been collected.

Figure A-1. Offsetting mechanisms in the US wetland and streams mitigation scheme



Source: Deutz et al., 2020; Environmental Law Institute and Land Trust Alliance, 2012

Each BU delivery mechanisms has its advantages and disadvantages.

Figure A-2. Advantages and disadvantages of offsetting mechanisms prevalent in the US

	⊕	⊖
	Advantages	Disadvantages
 <p>Permittee-responsible offset(s)</p>	<p>In case of large-impact projects, permittee-responsible offsets can cover large areas and respectively provide landscape-scale environmental benefits (comparable with habitat banks and compensation funds).</p> <p>Grants permittees full control over offsetting projects.</p>	<p>Frequently low scale of typical offsetting interventions tends to result in less meaningful environmental outcomes .</p> <p>Approval of offsets often temporally simultaneous with impacts, resulting in time lag between project impacts and functional replacement of offsets.</p> <p>High rates of non-compliance due to challenge for regulators to monitor many small, geographically dispersed projects (in contrast to fewer, larger third-party offsets).</p>
 <p>Habitat bank(s)</p>	<p>Clear view on biodiversity unit pricing as habitat tends to be restored in advance.</p> <p>Provides opportunity for landscape-level restoration.</p> <p>Temporal alignment: Credits readily available upon project impacts, avoiding time lag between impact and replacement.</p> <p>Time-to-permit savings¹ and potential cost savings for developers (especially small ones) due to outsourced liability, frequently cheaper land prices and economies of scale².</p>	<p>High upfront capital requirements, constraining market participation.</p> <p>Commercial intermediaries acting as habitat banks with motive to maximise profit tend to request high commission fees, risking reduced returns for landowners or higher credit prices; incentivised to conduct cheapest offsets possible.</p> <p>Operations often limited to areas with high and predictable demand for credits.</p> <p>Mitigation often farther away from impact sites.</p>
 <p>Compensation fund(s)</p>	<p>Low upfront investment requirements, allowing market participation of non-profit and governmental agencies.</p> <p>Provides opportunity to aggregate various small impacts for landscape-level restoration especially in areas with less predictable demand.</p> <p>Time-to-permit savings and potential cost savings for developers (especially small ones) due to outsourced liability, frequently cheaper land prices and economies of scale².</p>	<p>Associated with reputation of less management of funds and less precise pricing of credits, potentially crowding out private sector led habitat banks and resulting in lower conservation outcomes.</p> <p>Limited to NGO and governmental agencies (in the US).</p> <p>Temporal time lag between project impacts and offsetting interventions, as offsetting projects are only undertaken once sufficient funds are gathered</p>

Notes |

¹Some studies suggest up to five months of associated time savings for developers when relying on habitat banks vs. permittee-responsible offsets.

²Australia studies indicate that third-party offsets allow delivery of 30 percent more area at two-thirds of the cost vs. permittee-responsible compensation under the Environmental Planning & Assessment Act.

Sources: Wilkinson, 2018; Duke and ten Kate, 2014

The US wetland mitigation scheme introduced a level playing field across offsetting mechanisms a full 30 years after the beginnings of the scheme. This is because there was an unintentional policy bias towards permittee-led offsetting mechanisms, because such mechanisms were less closely monitored and enforced. It also resulted in lower conservation outcomes by permittee-led offsetting schemes. To overcome this unintentional bias, the Final Compensatory Mitigation Rule was introduced in 2008, mandating 12 standards that all offsetting mechanisms (on- and off-site, permittee- and third-party led) must report on (see Box A-1). The 12 standards have contributed to a level playing field across different offsetting mechanisms and have encouraged greater developer compliance to the mitigation hierarchy—as on-site and off-site permittee-responsible offsets became more expensive (Duke and ten Kate, 2014; Hough and Robertson, 2008; Hough and Harrington, 2019).

After equal standards were set across all mechanisms, the US witnessed a significant increase in the number of habitat banks, which have gradually become the dominant BU delivery mechanism at the expense of permittee-responsible offsets. In 2010, 55 to 65 percent of all offsets were conducted via permittee-responsible schemes; 45 to 55 percent were on site. In 2017, the share decreased to 20 to 25 percent, and merely 5 to 10 percent was on site. In the same time, habitat banking has increased from 25 to 35 percent to 55 to 65 percent. The rest of the market is served by compensation funds, the share of which also increased from 5 to 10 percent in 2010 to 15 to 20 percent in 2017 (Hough and Harrington, 2019). These changes were the result of the Final Rule, as well as other rules that defined a level playing field across on- and off-site BU delivery mechanisms.

Box A-1. Twelve standards of the US wetland and stream's mandatory offset plan

The US wetland and streams mitigation scheme includes a mandatory offset plan which all biodiversity unit suppliers must report against. This offset plan consists of 12 elements:

1. **Project objectives:**
Overview of the provided habitat types and offset actions (e.g. habitat restoration, creation, etc.). This must also include a description of how the project will address landscape-level considerations.
2. **Site selection:**
Proof of meeting governmental criteria on site selection
3. **Site protection:**
Proof that adequate mechanisms have been put in place to protect the site. This includes legal arrangements to allow restoration, protection and prohibition of incompatible uses. Any changes in the site's level of protection must be reported.
4. **Baseline information:**
Information on the baseline condition of the site (e.g. a description of the ecological characteristics of the proposed site, maps of the site, etc.)
5. **Determination of biodiversity units:**
An overview of the number of biodiversity units to be generated and a description of how the number of units was determined
6. **Mitigation work plan:**
Outline of the habitat creation, restoration or conservation activities to be carried out at the site, including project boundaries, construction methods and timing
7. **Performance standards:**
Disclosure of objective and verifiable parameters against which the project's success will be measured

8. Monitoring and ecological reporting:

Elaboration of ecological monitoring parameters and requirements, including details on logistics such as the monitoring schedule, duration of the monitoring period and the party responsible for monitoring

9. Administrative reporting:

Defined administrative reporting parameters and requirements (e.g. financial assurance, long-term management, funding, BU release) and details on reporting logistics (as outlined above in standard 8)

10. Long-term management and funding plan:

Appointment of a party responsible for long-term management and a description of the long-term management obligations, annual costs and financing mechanisms

11. Contingency and adaptive management measures:

Appointment of a party responsible for contingency measures and a description of how the offset plan may be revised to address remedial procedures. This further entails a commitment to notify the regulatory agency if significant modifications occur—for example, if monitoring data indicates that the project is not progressing towards meeting its performance standards

12. Financial assurance:

Overview of the types of financial assurance provided, including a description of how assurances were calculated and how financial assurances can be mobilised in event of non-compliance

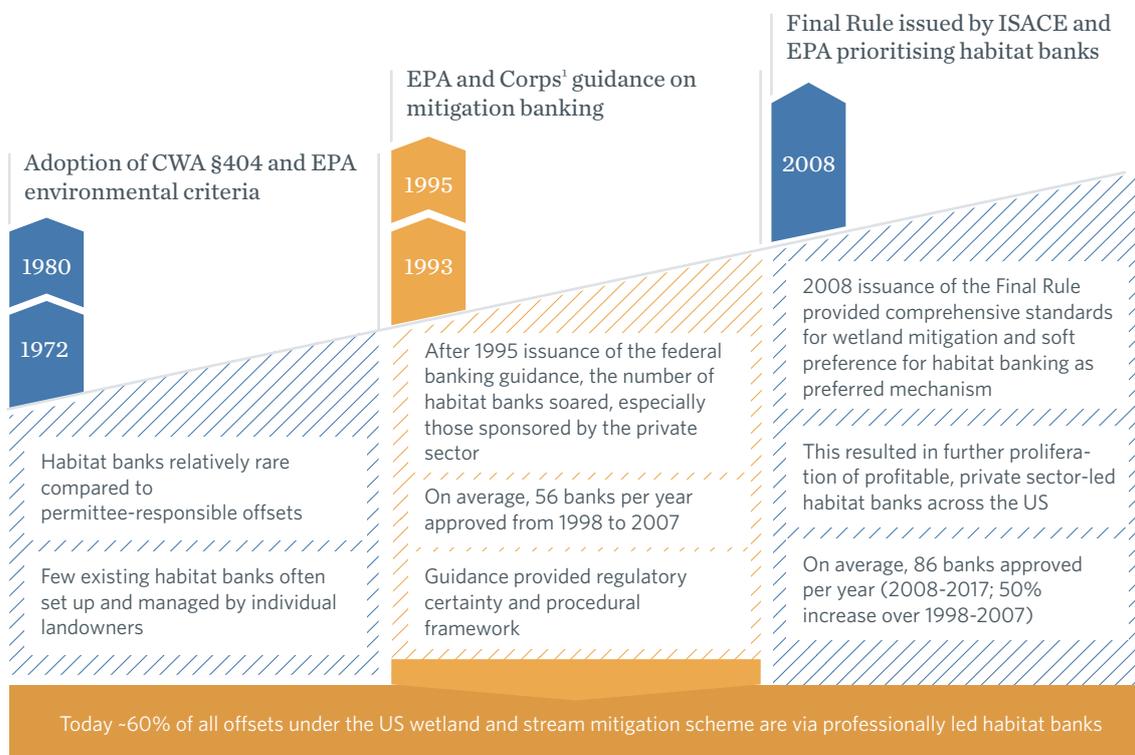
Sources: Environmental Law Institute and Land Trust Alliance, 2012; DOA and EOA, 2008



Over more than 30 years, the composition of habitat banks in the US has shifted markedly—away from small enterprises owned and managed by landowners to large professional environmental services companies, which bank credits across dozens of sites and receive investments from major private equity firms (e.g. KKR). This process occurred on the back of a gradually more conducive policy environment, granting regulatory certainty and defining procedural frameworks.

This has led to significant economies of scale (see Figure A-3). Large, multisite habitat banking entities can buffer risks, as fallouts or limited credit demand on one site can be compensated through revenues derived from other sites. However, on the flip side, these habitat banks have gained significant political influence and are now in a position to effectively lobby for policies that may place economic gains above environmental gains (for example, by allowing sale of a certain percentage of credits prior to any undertaken habitat restoration or creation activities).

Figure A-3. US historical uptake of habitat banks



¹ Army Corps of Engineers.

Source: Bean, et al., 2008; Hough and Harrington, 2019



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Annex 2: Potential funding instruments for BNG

	Instruments	Description	Relevance for BNG	Examples
Governmental financing	Pump-priming	<ul style="list-style-type: none"> ➤ Gap funding: Initial public funding to grow market/spur private sector investment ➤ Blueprint financing: Funding of replicable projects 	<ul style="list-style-type: none"> ✔ ➤ Central governmental BNG credit scheme ➤ Direct investment in pioneering BU suppliers ➤ Potentially by UK Infrastructure Bank via Green Bond 	<ul style="list-style-type: none"> ➤ Heat Networks Investment Project: on basis of public investment of GBP 320 million, the project is aiming to lever -GBP 1 billion in private capital ➤ Northern Forest initiative: GBP 5.7 million governmental investment to develop and test approaches for the National Forest Partnership (aiming to plant 50 million trees over next 25 years)
	Loan schemes/ soft loan	<ul style="list-style-type: none"> ➤ Governmental loans with favourable terms (i.e. lower interest rates) 	<ul style="list-style-type: none"> ✔ ➤ Governmental loans to finance BU suppliers potentially via UK Infrastructure Bank 	<ul style="list-style-type: none"> ➤ Public Sector Energy Efficiency Loan Scheme (managed by Salix Finance)
	Technical assistance	<ul style="list-style-type: none"> ➤ Technical assistance to further capacity and establish pipeline of commercially attractive projects 	<ul style="list-style-type: none"> ✔ ➤ Technical assistance body for credit suppliers 	<ul style="list-style-type: none"> ➤ Currently considered by UK government regarding a Natural Environment Impact Fund
	Blended finance	First-loss shares	<ul style="list-style-type: none"> ➤ Losses affecting publicly owned shares first in the context of blended public and private investments to reduce private sector risks 	<ul style="list-style-type: none"> ✔ ➤ Joint public and private investment in BNG credit suppliers
Guarantees		<ul style="list-style-type: none"> ➤ Guarantees of a minimum return on investments provided via public funding 	<ul style="list-style-type: none"> ✔ ➤ Guarantees for BNG supplier investments potentially hard to judge ex-ante of market 	<ul style="list-style-type: none"> ➤ UK government call for evidence on value of governmental guarantee to underpin loans to SMEs from energy service companies (ESCOs), banks, lenders and partner organisations, with aim to cut SME emissions and energy bills
Public private partnership (PPP) bonds		<ul style="list-style-type: none"> ➤ Upfront investment by private sector against public payments over the long term in return for specific services 	<ul style="list-style-type: none"> ✔ ➤ Most suitable for public infrastructure projects and respective offsetting of unavoidable damages 	<ul style="list-style-type: none"> ➤ DC Water Environment Bond on green infrastructure (i.e. permeable pavement and bioretention) amongst others by DC Water, DC Water and Sewer Authority and Calvert Foundation

	Instruments	Description	Relevance for BNG	Examples
 Innovative financial vehicles	Public-private fund design	<ul style="list-style-type: none"> ➤ Private investments funds designed with help of governmental consultation to serve public interests 	<ul style="list-style-type: none"> ● ➤ BNG investment fund with governmental design support ➤ Relevance unclear 	<ul style="list-style-type: none"> ➤ Industrial Energy Transformation Fund, including GBP 315 million of investment; UK government has consulted on the design of the fund
	Aggregation of small-scale projects	<ul style="list-style-type: none"> ➤ Aggregation of several small-scale projects into a single capital-raising prospectus as a means to lower transaction costs 	<ul style="list-style-type: none"> ✔ ➤ Council-level initiatives to finance smaller, landowner-led habitat banks 	<ul style="list-style-type: none"> ➤ City Leap Project, led by Bristol City Council
 Tax incentives	Tax reliefs	<ul style="list-style-type: none"> ➤ Tax reliefs on capital assets to provide incentives, e.g. through capital gains tax, corporation tax, inheritance tax and the way that business property is classified for tax purposes 	<ul style="list-style-type: none"> ✔ ➤ Tax reliefs for BNG credit providers, influencing land use and mitigating BNG supplier risks 	<ul style="list-style-type: none"> ➤ UK agricultural rate relief via annual business rate and inheritance tax
	Hypothecated tax fund	<ul style="list-style-type: none"> ➤ Forgone tax revenues match funded by additional private finance 	<ul style="list-style-type: none"> ● ➤ Hypothecated BNG tax fund ➤ Limited potential due to low tax revenue 	<ul style="list-style-type: none"> ➤ UK Aggregates Levy Sustainability Fund and the UK Landfill Communities Fund

Source: IIEP, 2013; HM Government, 2019; efc and GMCA, 2019; Government Outcomes Lab, 2021; GIIN, 2013

Legend |  Strong fit  Moderate fit  Low fit



Annex 3: Potential incentive mechanisms

	Instruments	Description	Relevance for BNG	Examples
Risk reduction	Lower policy uncertainty	<ul style="list-style-type: none"> Reduction in policy/regulatory risk through: <ul style="list-style-type: none"> Long-term commitments to reduce risk from policy changes Clear and straightforward rules and communication Legal instrument backing to ensure right conditions 	<ul style="list-style-type: none"> Implementation of the 18 BNG policy components from the onset Clear and transparent BNG policy communication 	<ul style="list-style-type: none"> N/A
	Trading in larger service areas and across regions	<ul style="list-style-type: none"> Expansion of area within which BNG credit suppliers can sell credits, reducing risk of insufficient demand 	<ul style="list-style-type: none"> Lower spatial penalties within BNG metric Rules allowing trading across regions 	<ul style="list-style-type: none"> Increase in service areas actively lobbied for by US habitat bankers under the US wetland and streams mitigation scheme
	Demand registries	<ul style="list-style-type: none"> Publicly available registries of planned developments (potentially including respective credit demand) per area, increasing certainty around demand 	<ul style="list-style-type: none"> BNG demand/development registry 	<ul style="list-style-type: none"> Australia's New South Wales biodiversity offsetting scheme has a formal credit demand register detailing the number, type and location of credits required by developers
	Reduced liability periods for credit suppliers	<ul style="list-style-type: none"> Temporally limited liability for credit suppliers (e.g. credit supplier liability limited to 10 years while prefinanced endowment funds are liable for long-term management) 	<ul style="list-style-type: none"> Temporally finite supplier liability (e.g. 10 years) Endowment fund liable for long-term management (after initial 10 years) 	<ul style="list-style-type: none"> Habitat banks under the US wetlands and streams mitigation scheme liable for meeting performance standards only for the first 10 years, after which an endowment fund (financed by habitat bank) is liable for long-term management

Legend | Strong fit Moderate fit Low fit

	Instruments	Description	Relevance for BNG	Examples
Cost reduction (1/2)	Preferential credit release schedules	<ul style="list-style-type: none"> ➤ Upfront percentage-based release of credits (i.e. prior to habitat creation/ restoration), reducing need for upfront financing 	<ul style="list-style-type: none"> ✔ ➤ Credit release schedules for BNG habitat banks 	<ul style="list-style-type: none"> ➤ Credit release schedule for habitat banks under the US wetlands and streams mitigation scheme tying credit release to tiered performance standards and enabling certain percentage of credits to be released before habitat creation/restoration
	Events connecting buyers and sellers	<ul style="list-style-type: none"> ➤ Dual approach of providing information on funding opportunities and promoting investable supply projects, reducing transaction costs 	<ul style="list-style-type: none"> ✔ ➤ Council-organised events connecting buyers and sellers 	<ul style="list-style-type: none"> ➤ Financing Green/Greening Finance for Maritime initiative at London International Shipping Week
Cost reduction (2/2)	Trainings and technical support for mitigation suppliers and regulators	<ul style="list-style-type: none"> ➤ Publicly offered trainings and technical support to increase technical capacity, spur efficiencies and reduce costs 	<ul style="list-style-type: none"> ✔ ➤ Council-organised training sessions for land owners and environmental service companies engaged in BNG 	<ul style="list-style-type: none"> ➤ Regularly conducted in the US wetlands and streams mitigation scheme
	Platform matching BNG credit buyers and sellers	<ul style="list-style-type: none"> ➤ Publicly accessible registry listing credit suppliers across regions, facilitating the credit supply search 	<ul style="list-style-type: none"> ✔ ➤ BNG supply registries categorised by region 	<ul style="list-style-type: none"> ➤ RIBITS platform of the US wetland and stream mitigation scheme lists credits available from banks and compensation funds per region
	Standard permitting templates	<ul style="list-style-type: none"> ➤ Standard templates for permitting applications and/or habitat bank registrations to simplify/reduce costs of the process 	<ul style="list-style-type: none"> ✔ ➤ National or county-level standard templates for BNG permitting processes 	<ul style="list-style-type: none"> ➤ Introduced by the state of California under the US wetlands and streams mitigation programme
	Reverse auctions	<ul style="list-style-type: none"> ➤ Auction models in which potential buyers pitch their needs while potential suppliers auction their services. Connects demand and supply while ensuring cost effectiveness. 	<ul style="list-style-type: none"> ✔ ➤ Council-level reverse auctions to connect demand and supply 	<ul style="list-style-type: none"> ➤ Landscape Enterprise Network (LENS) in Cumbria by Nestle and other partners ➤ National Forest in England to identify first sites to plant trees in respective planting zones

Legend | ✔ Strong fit ✔ Moderate fit ● Low fit

	Instruments	Description	Relevance for BNG	Examples
Other	Coalitions to address key barriers	➤ Coalitions identifying barriers and means to overcome them	✔ ➤ National BNG coalition	➤ Green Finance Institute's mission-led coalitions
	Product labelling and certification	➤ Certification and labelling to improve corporate image	◐ ➤ Voluntary BNG certificates with constrained potential due to limited voluntary demand	➤ Forest Stewardship Council (FSC) or the Marine Stewardship Council (MSC)
	Competitions	➤ Governmental competitions with financial rewards/ dedicated funding for winning projects	✔ ➤ Competition around credit supply delivery models to boost supply with potential to connect this to best practice sharing	➤ Boosting Access for SMEs to Energy Efficiency (BASEE) competition (2019)

Source: IIEP 2013; HM Government, 2019; eftcc and GMCA, 2019; expert interviews

Legend |  Strong fit  Moderate fit  Low fit

Annex 4 : Glossary

<u>Assemblage</u>	A group of species found in the same location
<u>Avoidance</u>	Actions taken to prevent impacts from occurring, taking account of predictions for potentially negative environmental effects (e.g. project decisions about site location or design)
<u>Baseline conditions</u>	The conditions of a land area in the absence of a proposed plan or project. The definition of these baseline conditions should take account of changes arising from other causes (e.g. other consented developments or climate change).
<u>Biodiversity</u>	The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.
<u>Biodiversity credit</u>	A term widely used in the literature for units of biodiversity to which a value can be applied, or more specifically for BUs created in advance of sale and banked (known as habitat banking)
<u>Biodiversity net gain</u>	A specific, measurable outcome of development in which demonstrable and quantifiable benefits to biodiversity are achieved, compared to the baseline situation
<u>Biodiversity net gain market</u>	Market activity and trade resulting from mandatory net gain. This includes biodiversity unit buyers (mostly developers or public bodies) and sellers (mostly landowners or intermediaries) as well as the transaction processes themselves.
<u>Biodiversity net gain policy</u>	Specific legislations and regulations spelling out biodiversity net gain policy
<u>Biodiversity net gain regulatory framework</u>	All the rules which must be adhered to as part of mandatory net gain. Such rules can be set out by policies and regulations on a national and local level, as well as by the metric and its implicit rules on how to deliver gains.
<u>Biodiversity net gain scheme</u>	The overarching system to establish biodiversity net gain markets. The biodiversity net gain scheme encompasses the regulatory framework, the policy, the metric and the market.
<u>Biodiversity offsets</u>	Measurable conservation outcomes resulting from actions designed to compensate for unavoidable significant negative effects on biodiversity. The goal of biodiversity offsets is to achieve no net loss, or preferably a net gain, of biodiversity.
<u>Biodiversity unit (BU)</u>	A proxy measure for biodiversity used to quantify biodiversity losses or gains using a consistent measure. In England, these are calculated based on the biodiversity metric tool which combines habitat type, area distinctiveness and condition.
<u>Biodiversity unit delivery mechanism</u>	Mechanisms by which biodiversity units are delivered. In the UK context, this can include permittee-led delivery and habitat banking. Other countries such as the US would also allow compensation funds. The term is synonymous with biodiversity offsetting mechanism.

<u>Biodiversity unit supplier</u>	Entity (private landowners, habitat banks, NGOs, councils, etc.) that transforms land use to generate and sell biodiversity units
<u>Condition</u>	A measure of the state of an ecosystem or habitat influenced by management. In England, this is assessed using condition criteria set out in the technical supplement for Biodiversity Metric 2.0 (with Metric 3.0 soon to be released).
<u>Connectivity</u>	A measure of the functional availability of the habitats needed for a particular species or set of species to move through a given area. Examples include the flight lines used by bats to travel between roosts and foraging areas.
<u>Conservation covenants</u>	Private, voluntary agreements between a landowner and a responsible body, such as a conservation charity or a public body, allowing for positive or restrictive obligations to fulfil a conservation objective. These covenants can be binding not only on the landowner but also on subsequent landowners. As such, they have the potential to deliver lasting conservation benefits for the public good. Covenants offer flexibility as the parties negotiate the terms to suit their particular circumstances, including the covenant duration.
<u>Creation</u>	The act of introducing a habitat or ecosystem on land where there is no evidence of it having been present previously
<u>Credits</u>	Either BUs generally or specifically BUs created in advance of sale and banked (where habitat banking is in place)
<u>Cumulative impact/effect</u>	Effects on a receptor from multiple sources acting together, including background changes in the environment and other reasonably foreseeable developments
<u>Distinctiveness</u>	A score reflecting the intrinsic species diversity of a habitat for vegetation types in England. Distinctiveness scores are assigned to English Habitats in Biodiversity Metric 3.0 and range from 2 to 8..
<u>Ecosystem services</u>	The benefits that people derive from the natural environment, a stock of 'natural capital' from which many benefits flow—social, health-related, cultural or economic
<u>Enhancement</u>	The act of managing a habitat or ecosystem so that it is improved for biodiversity
<u>Fragmentation</u>	The breaking up of a habitat, ecosystem or land-use type into smaller spatial units or parcels with a consequent impairment of ecological connectivity and function
<u>Habitat</u>	The place or type of site or set of conditions where an organism or population naturally occurs. Often used in a wider sense referring to where particular assemblages of plants and animals are found together (correctly defined as a biotope).

Habitat banking

A market mechanism where credits from actions with beneficial biodiversity outcomes (BU in the case of England) can be purchased to offset the debit from environmental damage. Credits/BUs can be produced in advance of, and without ex-ante links to, the debits they compensate for, and they can be stored over time.

In-lieu fee program/ compensation fund

A biodiversity unit delivery mechanism prevalent in the US. In-lieu fee programs (also known as compensation funds) accept payments in exchange for credits. Habitat creation and restoration projects are carried out once enough funds have been collected. This form of biodiversity unit delivery is limited to NGOs and public bodies.

Linear habitats

Habitats that are given a length value in the Biodiversity Metric 3.0. These include hedgerows and lines of trees.

Irreplaceable habitat

Habitats which would be technically very difficult (or take a significant time) to restore, recreate or replace once destroyed, taking into account their age, uniqueness, species diversity or rarity. In the UK, they include ancient woodland and veteran trees, blanket bogs, limestone pavement, sand dunes, salt marshes and lowland fens.

Mitigation

Measures taken to avoid or reduce negative impacts and effects and restore damaged habitats, ecosystems or species populations

Mitigation hierarchy

A hierarchy of actions to mitigate negative impacts on biodiversity: avoidance of biodiversity loss in development plans, minimisation in project design, on-site mitigation to restore damaged habitats, and off-site offsets to restore or create them to compensate for residual loss

Net gain delivery

A type of measure taken to not only offset residual losses of, or permanent damage to, ecological features, but further ensure percentage-based gains. For example, if a land area of 100 square metres is damaged, net gain delivery based on 10 percent net gain would restore 110 metres of the same or higher distinctiveness habitat. Depending on the circumstances, net gain delivery measures may be located within or outside the project site.

No net loss

The outcome of biodiversity losses offset by commensurate gains

Offset

Net gain or no net loss delivery

Permittee-led biodiversity unit delivery

A type of biodiversity unit delivery in which developers directly offset their project impacts (whether on site or off site), without relying on third parties

<u>Priority habitats and species</u>	Species and habitats of principal importance included in the England Biodiversity List published by the Secretary of State under Section 41 of the Natural Environment and Rural Communities Act 2006
<u>Project</u>	All types of proposals to which mandatory net gain might be applied (e.g. development proposal/scheme or other land use change)
<u>Restoration</u>	The re-establishment of a damaged or degraded system or habitat to a close approximation of its pre-impact condition
<u>River habitats</u>	River or stream habitats that are given a length value in the biodiversity metric. These include any habitat with flowing water.
<u>Service area</u>	The area in which an offset for a specific impact can be conducted. Depending on the size of this service area, the offset can be very close to the impact or relatively far away.
<u>Site of Special Scientific Interest (SSSI)</u>	Sites designated by Natural England under the Wildlife and Countryside Act 1981
<u>Stacking and bundling</u>	Alternative approaches for selling multiple ecosystem services from an area of land or for combining the sale of environmental credits with public subsidies
<u>Strategic significance</u>	The relative conservation importance of an area at a local or national level. The extent to which restored or newly created habitat in that location would contribute to wider conservation objectives. In the UK/England, under BNG policy a multiplier is applied to reflect this with a score of 1 for locations that are not identified as significant and 1.15 for those that are.
<u>Target condition</u>	In BNG policy for England, this describes the intended condition of habitat that will be delivered as a result of post-development habitat management, in order to achieve the required level of BNG

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The Nature Conservancy is a leading global environmental organisation. Its mission is to conserve the lands and waters on which all life depends.

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eCountability

eCountability is an ecological consultancy, supporting financial institutions, government and business to achieve ecological accountability. Jo Treweek and Bill Butcher (Directors of eCountability) developed the biodiversity metric that has been adapted and developed by Defra and Natural England as the basis for biodiversity net gain in England.



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Developing Effective Market Mechanisms

Discussion Paper
October 2021

The Nature
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