



BIODIVERSITY NET GAIN

Understanding the Most Ambitious Biodiversity Policy in the World

A Policy Analysis Exercise for the Environmental Policy Innovation Center



HARVARD Kennedy School
JOHN F. KENNEDY SCHOOL OF GOVERNMENT



ENVIRONMENTAL POLICY
INNOVATION
CENTER

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About EPIC

The mission of EPIC is to build policies that deliver spectacular improvement in the speed and scale of conservation. We focus on a narrow set of strategies:

- Improving policies that allow private sector funding or stewardship to expand or supplant public or charitable conservation work
- Transforming government policies to focus on what matters—outcomes
- Eliminating the organizational barriers that prevent public agencies from adapting to 21st century solutions

We believe that innovation and speed are central to broadening efforts to conserve wildlife, to restore special natural places, and to deliver to people and nature with the clean water they need to thrive. To achieve those goals, conservation programs must evolve to accommodate our modern understanding of human behavior and incentives and the challenges posed by humanity's expanding footprint. We embrace experimentation with novel ideas in conservation policy, to learn quickly from mistakes and iteratively design effective approaches to be even more successful.

EPIC is a fiscally sponsored project of Sand County Foundation. Sand County Foundation is a nonprofit conservation organization dedicated to working with private landowners across North America to advance ethical and scientifically sound land management practices that benefit the environment.

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3. EXECUTIVE SUMMARY

In the 2021 Environmental Act, the United Kingdom created a policy aimed at leaving “the natural environment in a measurably better state than beforehand”¹ by requiring all development to demonstrate ‘no net loss’ of biodiversity and a net gain of 10% for biodiversity. *This policy is one of the boldest and most ambitious biodiversity offset policies on the planet.*

The Environment Act also defines a framework of avoidance, minimization and offset requirements for the program. Subsequent regulation and policy development in England will create a regulatory biodiversity market that covers all species and habitats. In November of 2023, mandatory net gain will go into effect and this paper aims to understand how the policy will be implemented, identify the key risks to implementation, and provide recommendations for implementation based on lessons that can be learned from environmental markets in the US.

There are three main questions that guide this report:

1. **What lessons can be learned from other environmental markets, particularly the US stream and wetlands market created by the Clean Water Act?**
2. **What is the current state of implementation of the biodiversity net gain policy and biodiversity offsets market in the UK, especially in England?**
3. **What are the greatest risks to implementation of England’s biodiversity net gain policy and what are the insights and lessons learned from other policy efforts that can enable them to best manage these risks?**

Through this work, three main risk areas surfaced as the main risks to implementing BNG in the UK:

1. **Many In-Lieu Fee programs in the US consistently underprice credits and there is a high risk of underpricing statutory credits in England.** Underpricing these credits will undercut the private market, underfund conservation, and could hamper the development of a private offsets market if prices are set too low since private companies will not be able to compete with the government credit prices.
2. **Some of the Local Planning Authorities (LPAs) in charge of implementing this policy lack sufficient capacity and technical expertise to carry it out.** Many of the LPAs do not have ecologists on staff and lack the capacity needed to properly review the net gain plans submitted with permit requests.
3. **Much of the biodiversity offsetting that will be carried out will likely occur onsite.** These onsite offsets are likely to be lower quality, create habitat that is less connected, and are less likely to be maintained. Additionally, these onsite projects will be harder to monitor given that currently the national registry for offsets will not include onsite offsetting.

To mitigate these risks, this paper has three main recommendations for the implementation of BNG in England:

1. **Prices for statutory credits should be priced relative to the private market.** To ensure prices are set competitively, regulators should create a system and schedule to regularly update prices for the statutory credits. Prices can be determined by a system to collect competitive bids for the delivery of necessary credits so that the market price is taking into account the full cost of delivering the credits. Additionally, this program should be as transparent as possible and be audited

¹ “Biodiversity Metric: Calculate the Biodiversity Net Gain of a Project or Development,” GOV.UK, March 21, 2023, <https://www.gov.uk/guidance/biodiversity-metric-calculate-the-biodiversity-net-gain-of-a-project-or-development>.

frequently and include offset credit liabilities which have been accepted but not yet provided with information on the financial burden on Natural England to provide those offsets. In a perfect world, statutory credits will only be needed on a short term basis and private market supply will eventually come close to matching local demand for credits.

- 2. Onsite offsets should be minimized and should be treated similarly to offsite offsets.** Onsite offsets should be tracked in the national registry and be held to the same monitoring, reporting, and maintenance standards that offsite offsets are held to. Additionally, there should be a clear hierarchy of preferences for types of offsetting, and this should include a strong, mandatory preference for offsets to be provided in different locations from development except in rare cases. The full range of biodiversity values in English habitats are unlikely to be maintainable over the long term on fragmented, small areas of habitat left onsite within very developed regions
- 3. The local planning authorities in charge of implementing BNG on the ground should be supported with the proper resources and technical expertise to do so.** More technical assistance should be given as guidance to LPAs, additionally capacity will need to be built up to be able to handle this additional step in the planning process. Lastly, for smaller LPAs who don't necessarily need a full-time ecologist on staff, a network of ecologists that can consult for multiple LPAs should be created to help ensure LPAs can get the technical expertise they need to effectively achieve BNG in their community.



4. INTRODUCTION & BACKGROUND

When the United Kingdom left the European Union in 2020, rules on nature protection, water quality, clean air, and the frameworks for environmental protection that came from Brussels were at risk. Additionally, the UK had already been working on the policy of Biodiversity Net Gain, including their pilots of the program that started in the early 2010s.² To ensure that these environmental policies would survive Brexit, the UK needed to develop their own policies and direction regarding environmental policy, so they started to create the 2021 Environmental Act. The United Kingdom passed the 2021 Environmental Act,³ which “aims to leave the natural environment in a measurably better state than beforehand.”⁴ This legislation included a large range of topics from setting environmental targets to creating an office for environmental protection. They also set out goals for nature and biodiversity and created requirements to achieve a net gain of ten percent for biodiversity and will require there to be biodiversity net gain (BNG) for most housing and infrastructure development projects starting in November of 2023. This project will focus in on the implementation of this biodiversity net gain policy.

The policy will require a net gain of biodiversity that is measured using the Department for Environment, Food & Rural Affairs (DEFRA) Biodiversity Metric 3.0.⁵ Developers will have to provide a plan for how they plan on achieving BNG following a mitigation hierarchy⁶ that seeks to first avoid impacts to biodiversity, then minimize, rehabilitate or restore on-site, and finally offset any impacts that remain and cannot be avoided. The Environment Act 2021⁷ was passed in 2021 and was set to be fully implemented in November of 2023 at the time of passage. Despite all the political upheaval as the UK experienced four prime ministers over four months, this deadline has remained in place with little certainty over what exactly secondary legislation coming out of DEFRA will look like to implement biodiversity net gain. With November 2023 looming, the system and market has started to take shape with the market operating on best available information. However, the system will likely face many growing pains.

A series of pilots in various localities were carried out in the early 2010s in advance of BNG becoming a national policy. A number of lessons can be learned both from these pilots that were carried out as well as similar laws and policies in other countries including the US’s ‘no net loss’ of wetland regulation, private efforts to develop voluntary biodiversity offsets in Sweden, pay-for-success contracts for Farmers in Ireland, and Germany’s regulation of biodiversity. This project will seek to analyze the pilot programs and identify risks to nationwide implementation of biodiversity net gain policies. Additionally, this project will aim to better understand the current state of implementation and market activity around biodiversity offsets and provide recommendations for implementation to achieve the original intent of the policy.

2 Sophie Trémolet et al., “Biodiversity Net Gain in England: Developing Effective Market Mechanisms” (London, United Kingdom: The Nature Conservancy, October 2021).

3 “Environment Act 2021” (Queen’s Printer of Acts of Parliament), accessed March 23, 2023, <https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted>.

4 “Biodiversity Metric.”

5 “Biodiversity Metric.”

6 Glücksman, Edward, “Biodiversity Offsetting” (Parliamentary Office of Science & Technology Houses of Parliament, January 2011), https://www.parliament.uk/globalassets/documents/post/postpn_369-biodiversity-offsetting.pdf.

7 “Environment Act 2021.”

4.1 Paper Objectives

There are three main questions that guide this report:

1. **What lessons can be learned from other environmental markets, particularly the US stream and wetlands market created by the Clean Water Act?**
2. **What is the current state of implementation of the biodiversity net gain policy and biodiversity offsets market in the UK?**
3. **What are the greatest risks to implementation of the UK's biodiversity net gain policy and what are the insights and lessons learned from other policy efforts that can enable the UK to best manage these risks?**

This paper has been prepared for the [Environmental Policy Innovation Center \(EPIC\)](#) an organization focused on:

- Improving policies that allow private sector funding or stewardship to expand or environmental work or charitable conservation work
- Transforming government policies to focus on what matters – outcomes
- Eliminating the organizational barriers that prevent public agencies from adapting to 21st century solutions

EPIC is particularly interested in the BNG policy as it is a way to bring in private sector investment into conservation and restoration. BNG in England is the only policy of its kind in the world and is the most aggressive policy effort to regulate future development impacts on all biodiversity and do so in a way that is highly transactional and efficient. The Founder and Executive Director of EPIC, Tim Male, said:

“We care about it both because of the huge goal post they’ve set up and because the efficiency of both the singular biodiversity metric and of the offset supply options promises to create version 3.0 of environmental markets on the planet. We want it to succeed because its success could influence US policy (and other global ones), and we also want to help it because experiences in the US environmental markets are directly relevant to learning that could help England’s approach succeed faster.”⁸

Additionally, they’re interested in building a transatlantic partnership focused on shared learnings from similar environmental markets. They’d also like to build a partnership to collaborate with businesses and organizations supporting this BNG policy and are part of the Biodiversity Credit Alliance run by the UN Development Program which is working develop common principles for voluntary biodiversity crediting worldwide. This report is a way to kick off that shared learning, better understand the UK policy, and how the various US policies and UK policies can learn from each other as they evolve. EPIC is particularly interested in the findings of this report that help understand the current state of implementation of BNG in England (Question 2) and understanding what the folks at all levels are doing to implement the policy (developers, restoration companies, government entities, etc.).

⁸ Tim Male, “Client Summary for Report,” March 11, 2023

This paper will also be shared with:

- Policymakers and government staff working on implementation (particularly folks at DEFRA and Natural England)
- Developers affected by the BNG policy
- Landowners and companies interested in helping create a supply of biodiversity units
- The broader environmental community interested in understanding this policy

4.2 History of DEFRA Biodiversity Metric & BNG Policy

To understand the political and policy environment that led to biodiversity net gain being able to be considered, one first needs to understand the UK planning system. Primarily, this starts in 1947 with the UK's Town and Country Planning System which established the concept of Sites of Special Scientific Interest (SSSIs).⁹ The Town and Country Planning Act provides the legal framework for the planning system in England and Wales and requires local authorities to create local plans for the use and development of land in their areas. These plans must be in line with national policies and environment policies can dictate how some of these plans are configured, for example being able to set out Sites of Special Scientific Interest. BNG is now part of the National Planning Policy Framework (NPPF), which required that planning policies should contribute to conserving and enhancing biodiversity, and that development should result in the net gain for biodiversity.

The EU has also shaped a lot of the UK's approach to considering ecology and biodiversity in development planning up until when the UK left the EU. Some EU directives that have heavily influenced the UK's approach to biodiversity include the Birds Directive in 1979 and Habitats Directive in 1992 as well as methodologies for impact assessment including the Strategic Environmental Assessment Directive in 2003 and Environmental Impact Assessment Directive in 1985. These directives pushed things in the right direction in terms of increasing transparency of the risks to nature and biodiversity, however, did not stop biodiversity from declining. In 2011, an explicit requirement to demonstrate "no net loss" was included in the EU 2020 Biodiversity Strategy. In April 2012 a two-year biodiversity offsetting pilot program study that was commissioned by DEFRA. The program started in July of 2012 and included six pilot areas that would set up voluntary pilot schemes with Local Planning Authorities (LPAs) to pilot a voluntary biodiversity offset scheme. The six pilot schemes were located in: Coventry, Solihull, and Warwickshire (CSWAPO); Devon (comprising three sub-pilots North, South and East Devon); Doncaster; Essex; Greater Norwich; and Nottinghamshire.¹⁰

The pilot program run in six LPAs utilized a habitat-based metric¹¹ created by Jo Treweek, Bill Butcher, and Helen Temple that provided a quantified, consistent, transparent, and relatively simple tool to account for a wider range of biodiversity impacts than before.¹² This metric served as the basis for what is now the DEFRA Biodiversity Metric 3.0.

In addition to the influence the EU had on environmental protection policies in the UK, it is also important to understand the historical context around agricultural subsidies. Farmers in the UK used to receive about 3 billion pounds a year in subsidies under the EU's common agricultural policy. Once the UK left the EU,

9 Trémolet et al., "Biodiversity Net Gain in England: Developing Effective Market Mechanisms."

10 Jonathan Baker et al., "Evaluation of the Biodiversity Offsetting Pilot Programme" (Department for Environment, Food and Rural Affairs (Defra), June 2014).

11 Jo Treweek, Bill Butcher, and Helen Temple, "Biodiversity Offsets: Possible Methods for Measuring Biodiversity Losses and Gains for Use in the UK," *In Practice* 69 (January 1, 2010): 29–32.

12 "Biodiversity Offsetting Pilots Technical Paper: The Metric for the Biodiversity Offsetting Pilot in England" (DEFRA, 2012).

farmers started to fret about losing this baseline income that they came to rely on for years.¹³ While the UK government has continued some amount of subsidy to replace the EU subsidy, farmers worry that this will be phased down eventually and are looking for other ways to secure and income. One such opportunity is to look to the concept of “public money for public goods.”

The UK government estimates that they get around 4 billion pounds worth of environmental benefits from farmland, forestry, woodland, and trees per year in the UK. These benefits come from quantifying the economic benefit of natural capital from things like air filtration benefits, educational visits to nature, footpaths, bridleways and byways, iconic landscape features, etc.¹⁴ There are a number of public goods like recreation and environmental benefits that come from having a well-managed landscape and so the government is working on figuring out a way to provide public money for public goods. They are starting to figure out a payment plan for various actions farmers can take like converting lowland peat to fenland or adding organic matter to the soil.¹⁵ Another opportunity for farmers to create a viable income stream is to turn their land into biodiversity units and nutrient neutrality credits that they can sell into the new markets that will emerge out of the Environment Act. This would really help turn non-competitive agricultural lands into conservation lands and could really help rural economies in England survive without agricultural subsidies.

13 “British Farmers Fret about Losing Their Protection and Their Subsidies,” The Economist, accessed March 26, 2023, https://www.economist.com/britain/2020/02/27/british-farmers-fret-about-losing-their-protection-and-their-subsidies?utm_medium=cpc.adword.pd&utm_source=google&ppccampaignID=18156330227&ppcadID=&utm_campaign=a.22brand_pmax&utm_content=conversion.direct-response.anonymous&gclid=Cj0KCQiAjbagBhD3ARIsANRrqEvwXMRhikSquJMIInpqZweeIJHmXJaIRK4HfzKvtOiyh3kk-2IHwuQaAlnzEALw_wcB&gclid=aw.ds.

14 “Environmental Land Management and Public Money for Public Goods” (Department for Environment Food & Rural Affairs | Government Statistical Service, n.d.), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/955920/ELM-evidencepack-28jan21.pdf.

15 Fiona Harvey and Helena Horton, “Post-Brexit Farm Subsidies in England Revealed,” The Guardian, January 26, 2023, sec. Environment, <https://www.theguardian.com/environment/2023/jan/26/details-long-awaited-farming-subsidies-overhaul-england-revealed>.



4.3 Mitigation Hierarchy

The mitigation hierarchy is widely recognized as a best practice in mitigation work and is also an important part of the biodiversity offsetting principles. The mitigation hierarchy consists of four steps.

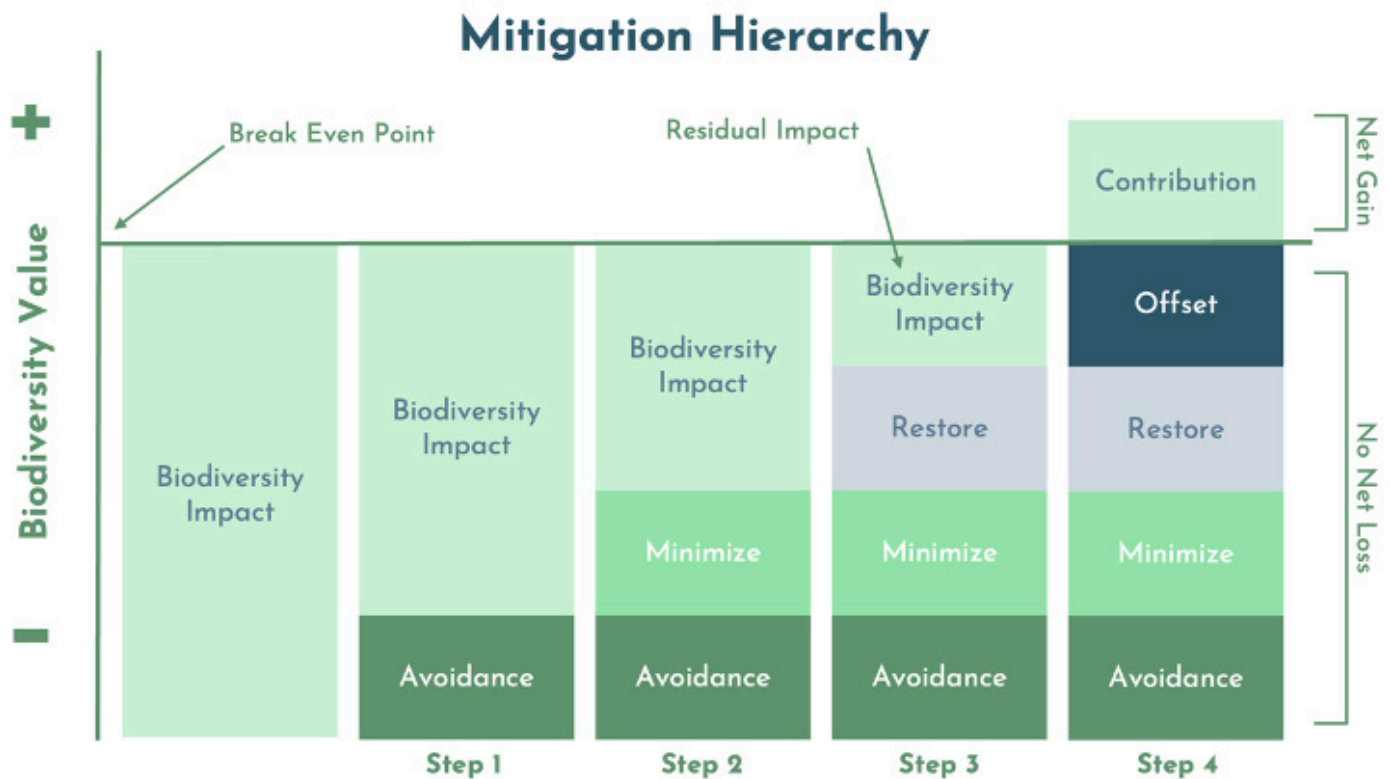
Step 1: Avoid impacts to biodiversity

Step 2: Minimize impacts that cannot be avoided

Step 3: Restore or rehabilitate ecosystems that are damaged on the site of the development

Step 4: Offset any residual impact that remains to have “no net loss” and create “net gain” by offsetting more than the residual impact caused

Figure 1: Mitigation Hierarchy Steps¹⁶



16 Adapted from Genevieve Bennett, Melissa Gallant, and Kerry ten Kate, “State of Biodiversity Mitigation 2017: Markets and Compensation for Global Infrastructure Development” (Forest Trends’ Ecosystem Marketplace, October 2017), https://www.forest-trends.org/wp-content/uploads/2018/01/doc_5707.pdf.

17 DEFRA released version 4.0 of the metric the week before this report was finalized so this report is written referencing version 3.1

What does Biodiversity Net Gain look like?

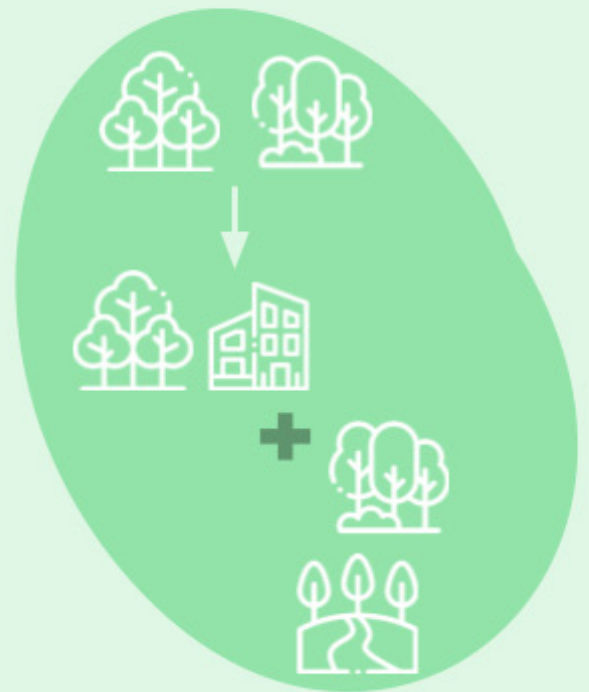


Scenario 1: Development & Mitigation Onsite

Developer is able to avoid harm, mitigate and enhance biodiversity onsite within the “redline” boundary

Scenario 2: Development & Mitigation Offsite Within LPA

The developer is unable to avoid, mitigate, and compensate all impacts onsite, but is able to secure local compensatory mitigation offsite to offset the impact.



Scenario 3: Development & Mitigation Offsite At a Distance

The developer is unable to avoid, mitigate, and compensate all impacts on site and unable to find local compensatory mitigation offsets. The multiplier is then used to require that even more habitat be offset or go towards funding cost-effective habitat creation projects through statutory credits that are in line with local and national conservation priorities.



4.5 DEFRA Biodiversity Metric

In order to be able to implement the BNG policy, everyone involved needs to be using a common method to quantify biodiversity, so DEFRA has developed the Biodiversity Metric¹⁷ which uses habitat as a proxy for biodiversity. The metric has to balance “robustness with simplicity” and “uses habitat as a proxy for wider biodiversity with different habitat types scored according to their relative biodiversity potential. This score is then adjusted, depending on the size, condition and location of the habitat, to calculate ‘biodiversity units’ for that specific project or development.”¹⁸ The metric also incorporates in risk multipliers for “risk associated with creating or enhancing habitat.”¹⁹ The metric aims to encourage projects that establish “more, bigger, better and joined”²⁰ ecological networks through “the use of robust trading rules, positively weighting outcomes of ‘strategic significance’, and measuring changes in habitat size, as well as biodiversity unit value.”²¹

The biodiversity metric 3.1 categorizes habitats into three main categories and as a result the calculations are done slightly differently, but the metric is designed to calculate habitat and convert that into “biodiversity units.” The three broad categories are: area habitats (grasslands, woodlands, mudflats); linear hedgerows and lines of trees; and linear rivers and streams. It is important to note that “the three types of biodiversity units described above are unique and cannot be summed, traded or converted.”²² The metric can be used for a variety of uses and DEFRA has published a calculation tool that can be used to account for the calculations of all three categories and reports the values for three categories as separate values given that they cannot be combined.

The main components of the biodiversity unit calculation are **size, quality, and risk** (where new habitat is being created). For **size**, area habitats are measured in hectares and linear habitats (hedgerows, lines of trees, rivers, and streams) are measured in kilometers. **Quality** is measured by three scores: distinctiveness, condition, and strategic significance. Distinctiveness is based on the habitat type an area is and “habitats that are scarce or declining typically score highly relative to habitats that are more common and widespread.”²³ The condition of the habitat is scored based on the value of the habitat relative to other habitats of the same type. To incorporate the value of connectivity for nature or areas that are strategically important, the metric incorporates a score for “whether or not the habitat is sited in an area identified, typically in a relevant local strategy or plan, as being of strategic significance for nature.”²⁴ **Risk** is incorporated to add in risk multipliers for various risks including the difficulty associated with creating or enhancing habitat, if the habitat is compensating for loss of habitat (to help with the 10% net gain goal), the proximity to the loss, and the temporal risk of creating new habitat.

18 Stephen Panks et al., “Biodiversity Metric 3.1: Auditing and Accounting for Biodiversity – User Guide” (Natural England, 2022), <http://nepubprod.appspot.com/file/4711800952848384>.

19 Panks et al.

20 Panks et al.

21 Panks et al.

22 Panks et al.

23 Panks et al.

24 Panks et al.

Figure 2. Summary of DEFRA Biodiversity Metric

Size X Quality X Risk = Biodiversity Units

Baseline Calculation



Post-Intervention Biodiversity Calculation For Newly Created Habitat



Calculation of Gains or Losses



Size of Habitat Parcel	Distinctiveness	Condition	Strategic Significance
Area (hectares)	Very high 8	Good 3	High 1.15
	High 6	Fairly Good 2.5	Medium 1.10
	Medium 4	Moderate 2	Low 1
	Low 2	Fairly Poor 1.5	
	Very Low (hedgerow module) 1	Poor 1	
	Very Low (area and watercourse module) 0	Condition Assessment N/A 1	
		Condition Assessment N/A 0	

4.6 Biodiversity Offsetting Principles

There are a number of biodiversity offsetting principles that have been agreed to by the members of the Business and Biodiversity Offsets Programme (BBOP), which is a group that comprises of companies, financial institutions, governments, and civil society organizations internationally that are working towards a net gain of biodiversity. The guiding principles outlined by the BBOP incorporate best practices and are important guiding principles when designing a biodiversity net gain policy. Any policy that aims to successfully achieve BNG should set up a system that encourages biodiversity offsets to follow the ten principles below.²⁵

- 1. Adherence to the mitigation hierarchy: a commitment to avoid, minimize, and carryout onsite measures before offsetting impacts to biodiversity.**
- 2. Limits to what can be offset: there are certain irreplaceable, strategic, or vulnerable areas that cannot be offset.**
- 3. Landscape context: offsets should be designed taking into account best available knowledge on the surrounding landscape and should be designed with an ecosystem approach.**
- 4. No net loss: offsets should be designed in a way that will result in no net loss and ideally net gain of biodiversity.**
- 5. Additional conservation outcomes: offsets should have conservation outcomes in addition to what would have occurred without the offset.**
- 6. Stakeholder participation: stakeholders should be conducted during decision-making processes.**
- 7. Equity: A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognized rights of indigenous peoples and local communities.**
- 8. Long-term outcomes: monitoring and evaluation of an offset should be planned for with an adaptive management plan and the goal of securing outcomes for at least the length of impacts, but ideally in perpetuity.**
- 9. Transparency: the design and implementation of a biodiversity offset should be transparent and timely.**
- 10. Science and traditional knowledge: the process of designing offsets should be informed by sound science and the incorporation of traditional knowledge.**

4.7 US Environmental Markets

The US has two major policies that have created regulatory environmental markets and driven the demand for and creation of nature offsets in the past 30 years: the habitat banking program from the Endangered Species Act, and stream and wetland banking from the Clean Water Act.

The Endangered Species Act has created government and private demand for offsets for 1,600 species.²⁶ The Endangered Species Act (ESA) of 1973 played a key role in the development of habitat banking, by requiring that federal agencies take measures to minimize the impact of their actions on endangered and threatened

²⁵ "The BBOP Principles on Biodiversity Offsets" (Business and Biodiversity Offsets Programme (BBOP), n.d.), https://www.forest-trends.org/wp-content/uploads/2018/10/The-BBOP-Principles_20181023.pdf.

²⁶ "The Endangered Species Act," accessed April 4, 2023, <https://www.biologicaldiversity.org/campaigns/esa/index.html>.

species and their habitats. This led to the creation of habitat banks, which are large-scale habitat restoration projects that provide credits for the mitigation of impacts on endangered species and their habitats. The credits can then be sold to developers to offset the environmental impacts of their projects.

The Clean Water Act (CWA) was enacted in 1972 to regulate and reduce water pollution in the US and had a number of provisions including setting water quality standards, regulating point source pollution, and regulating activity that impacts wetlands and aquatic ecosystems. The US has a “no net loss” of wetlands policy which was first established as a goal by President Carter under Executive Order 11990 when the federal government began to recognize the ecological and economic importance of wetlands and the need for their protection and restoration. In 1986 the US Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA) published a goal to have “no net loss” of wetlands and aimed to achieve a balance between wetland losses from development and wetland gains from mitigation and restoration efforts. Then in 1989, President George H.W. Bush doubled down on this goal and required federal agencies to establish a goal of no net loss of wetlands and avoid, minimize, and compensate for the loss of wetlands that occurred as a result of their activities. To achieve this goal, several regulatory programs were established, including the Clean Water Act’s Section 404 permit program, which requires developers to obtain permits from the USACE before discharging dredged or fill material into waters of the United States, including wetlands.

The Section 404 program requires developers to avoid and minimize impacts on wetlands to the greatest extent possible and to compensate for any remaining impacts through mitigation. In 1990, the USACE and the EPA jointly issued a Wetlands Mitigation Banking Guidance that established the framework for mitigation banking, which has become an essential tool for achieving the “No Net Loss” goal. Mitigation banking allows developers to purchase credits from wetland mitigation banks, which represent the amount of wetland habitat that has been restored, created, or enhanced. The credits can then be used to offset the impact of wetland losses from their own projects. In addition to wetland mitigation banking, the CWA also allows for other types of mitigation, such as habitat conservation banking and stream mitigation banking, which operate in a similar way to wetland mitigation banking. These types of mitigation banking provide developers with additional options for offsetting the impact of their development activities on biodiversity.

4.8 Controversy Behind Biodiversity Offsets & Criticisms

Some environmental advocates have really criticized the UK’s BNG policy and one of the main reasons this law is considered controversial is because some argue that the offsets will essentially provide developers with “permits to destroy.” They worry that this offsetting scheme will cause adverse effects to biodiversity now that a price is assigned to biodiversity and as long as that price is paid, destroying biodiversity is ok. Others are concerned that the law will allow developers to offset biodiversity and invest in habitats that are completely different than the ones destroyed and will result in landscapes that are completely different than what existed before. Additionally, there are concerns that quality will not be properly maintained and that developers will offset with the habitats that are the easiest, cheapest, and fastest to restore which will then result in a decline of biodiversity rather than a net gain of biodiversity as intended.

Others have responded to this criticism stating that for 200 years (or really, forever) UK landowners, developers and farmers have been able to destroy biodiversity basically without consequence. They have had free license to destroy. This new policy makes that illegal and is a pragmatic way to deal with the reality that a country simply can’t make space for 7-9 billion people and their economy without sometimes putting projects where there is also biodiversity. The UK is facing a housing crisis and is also continuing to grow. The government cannot just tell communities, developers, and everyone else that you can’t build anything

27 Natasha White, “Controversial Law Could Remake English Countryside — And Not in a Good Way,” Bloomberg.Com, June 28, 2022, <https://www.bloomberg.com/news/articles/2022-06-28/england-poised-for-controversial-biodiversity-offsets-market>.

new wherever non-human life exists. This policy allows people to fix nature in one place in exchange for damaging it somewhere else. So, these offsets are not permits to destroy. Instead, every previous permit issued, as well as the thousands of actions allowed without permits, were permits to destroy and what the UK now has is a system that for the first time asks for tangible, measurable, verifiable, and enforceable benefits in exchange for that permit.

In terms of addressing the concerns about replacing habitat with completely different types of habitat or quality losses, that will all play out as DEFRA, the government department responsible for overseeing the implementation formulates the secondary legislation and continues to oversee its implementation. DEFRA has been maintaining that the “rule will require most habitats to be replaced on a like for like or higher basis.”²⁷ Additionally, the findings and analysis from this project will attempt to outline some of the other ways in which DEFRA is implementing this policy and the risks that will be faced to implementing this in a way that achieves the stated goal of having 10% biodiversity net gain and leaving “the natural environment in a measurably better state than beforehand.”²⁸

4.9 Methodology Summary

Two parallel workstreams guided this process: understanding US environmental markets and gaining a deeper understanding of the UK BNG policy and the current state of its implementation. First, I conducted desk research and a literature review to understand similar policies in the US, pilot programs that took place, understanding the DEFRA Biodiversity Metric 3.0, and other relevant literature. The goal of the literature review was to assess the pilot programs, identify areas of similarities between other policies, the pilot programs, and current policy and start to apply lessons from the pilots and similar policies to the new law where relevant. Additionally, a review of the DEFRA Biodiversity Metric 3.1 documents that were published was conducted to understand how biodiversity would be quantified and understand how a market can form for biodiversity offsets and how companies can start to create offsets that will qualify and meet all requirements.

After conducting some desk research, I started to reach out to experts and conduct interviews to gain a more nuanced understanding. This was particularly helpful given that the current state of policy implementation in the UK was difficult to understand from just publicly published documents. Interviews were conducted with academics, government officials, people involved in the creation of the biodiversity metric, companies working to create biodiversity offsets, mitigation bankers, and ecologists (a full list of interviewees can be found in Appendix A). Interviews were unstructured and held for 60 minutes and the snowball approach was taken which involved asking each interviewee at the end of the interview for suggestions on who else to talk to. These discussions informed and understanding of the US system, implementation challenges, and how policy implementation evolved over time. They also helped paint a picture of the UK system and potential risk areas. From these interviews and research, I catalogued a list of interesting findings on the UK front, created an in-depth analysis of learnings from the North Carolina Stream and Wetlands market, and pulled out all potential risk areas in the UK market.

I then worked to identify similarities in the US and UK markets and pair risks with examples from other markets and recommendations. I also identified the biggest areas for risk using the BBOP Biodiversity Offsetting Principles as guiding criteria for the program. While further efforts need to establish details on implementation, these recommendations provide an analysis of areas for growth and examples of how other programs evolved in these domains after the policy was initially implemented.

²⁸ “Biodiversity Net Gain: Updating Planning Requirements,” GOV.UK, December 2, 2018, <https://www.gov.uk/government/consultations/biodiversity-net-gain-updating-planning-requirements>.

5. ANALYSIS

5.1 In-Lieu Fee Programs

Of the three types of compensatory mitigation, In-Lieu Fee programs are a system designed to aggregate funding from permittees (e.g., private companies, transportation agencies, etc.) who need to offset their impacts to wetlands, streams, riparian buffers, or water quality. Funds are used to carry out restoration projects in the same watersheds in which impacts are occurring. Because ILFs aggregate funding, they can create larger and more ecologically beneficial restoration than one-off restoration projects. ILF restoration credits also transfer legal liability of restoration success from the permittee to the ILF program. The statutory credit scheme that is being implemented by Natural England effectively is an In-Lieu Fee Program and will face many similar risks to other ILF programs.

ILF programs run by government entities have been known to have a number of emergent and systemic negative characteristics because of the nature of the incentives created by ILF program structures. ILF programs are known to have several issues that are summarized in a study by Martin Doyle:²⁹

Underpricing: Many ILF Programs can set their fees too low.

- Transparency: ILF Program record-keeping is not transparent.
- Flexibility: Regulators use discretion to exercise flexibility in their oversight of ILF Programs and have adjusted the rules for ILF programs.
- Lack of Clear Liability: It is unclear who is liable for ILF Program failure.
- Moral Hazard: ILF Programs create a situation similar to a moral hazard—ILF Programs take on potentially excessive risk because the program itself may not have to absorb the costs of their decisions.

5.1.1 Underpricing

Many ILF programs tend to set their fees too low for a number of reasons.

1. It can be difficult to accurately assess what the full costs of a credit may be or the costs of government credits might be subsidized by the fact that restoration is being conducted on public land and therefore the cost of the credit is subsidized.
2. Sometimes fees are set by a rulemaking process or governed by specific structures that make it difficult to flexibly price credits, increase the price, etc. There may be constraints on price, the rate at which prices can increase, how often prices can be reassessed, etc.
3. ILF prices are subject to immense pressure to keep prices low. “There is considerable pressure to either underestimate or even suppress fees, and once they are set, to not adjust them quickly enough to reflect real costs of mitigation.”³⁰
4. It’s hard to understand the full costs of mitigation and accurately create a price that reflects the true cost of carrying out that mitigation. Additionally, if projects are delayed, that cost can increase significantly.

5.1.2 Transparency

“Understanding ILF Programs, and regulating them, requires great transparency of record-keeping to ensure that the programs are being implemented as designed, agreed upon, and intended. However, another problematic characteristic of ILF Programs is their potential for lack transparency in their record-

²⁹ Martin W Doyle, “The Financial and Environmental Risks of In Lieu Fee Programs for Compensatory Mitigation” (Durham, NC: Duke University, 2019), https://nicholasinstitute.duke.edu/sites/default/files/publications/nicholas-institute-report_doyle_in-lieu-fee_web.pdf.

³⁰ Doyle.

keeping.”³¹ For example the Western Association of Fish and Wildlife Agencies (WAFWA) ILF program collects all the important and necessary information, but package it in a way that is not user friendly and cannot be accessed without technical assistance from WAFWA staff. Before North Carolina revamped their program, their records were incredibly unclear and “in a review of transactions and associated records conducted during the mid-2000s, three academic researchers required more than a year to recreate and understand the records kept by the ILF Program.”³²

5.1.3 Flexibility

In-Lieu Fee Programs are often help to a lower standard than other forms of compensatory mitigation due to the fact that the regulators are intertwined with or are the ones implementing the ILF Program. There are many examples of regulators adjusting the way rules are applied to ILF programs including when programs take in fees for impacts to ecosystems and fail to spend money in the agreed upon time frame. For example, in North Carolina:

“Over a 5-year period, the ILF Program had accepted \$58 million in fees, yet restored only 10 acres of wetlands, or 0.05% of its obligated amount. Of 22 projects required by regulators to be built by the summer of 2001, none had been initiated; the program had accepted fees and impacts to ecosystems had already occurred, but the program was not compliant with the rules governing it and in so doing was facilitating the ongoing ecological degradation it was intended to offset.”³³

Programs in Tennessee, Kentucky, Virginia, California, and ESA ILF programs have seen similar challenges.

5.1.4 Lack of Clear Liability

ILF programs are designed to operate in debt and when programs are operating in an unsustainable way either because of mismanagement or taking on unrealistic amounts of debt it’s unclear what happens next. In some cases, programs have increased future fees to account of this, but that “penalizes future permittees for the program subsidizing impacts in the past.”³⁴ In other cases, the program is then backstopped by the government agency it sits under.

5.1.5 Moral Hazard

ILF programs are prone to moral hazard because they can take on risk without taking on the costs of failure. For example, they can take in fees to deliver mitigation and fail to actually produce the credits without facing any of the costs of failing the environment. They could also take in fees that are not enough to cover the mitigation necessary to create the credits they’ve taken fees for and lead to financial failure that they don’t have to beat the costs of.

5.2 North Carolina In-Lieu Fee Program Case Study

5.2.1 Program Description

The state’s Division of Mitigation Services (DMS) in-lieu fee (ILF) program purchases environmental outcomes to enable environmentally responsible economic development. This state-wide program is designed to help both private and public entities meet wetland mitigation and nutrient offset requirements under the federal Clean Water Act and uses a watershed approach to maximize the environmental returns of mitigation investments.

31 Doyle.

32 Doyle.

33 Doyle.

34 Doyle.

The North Carolina Division of Mitigation Services (DMS), formerly named the Ecosystem Enhancement Program (EEP) (changed in 2015), was created out of a large amount of impact to wetlands the North Carolina Department of Transportation (NCDOT) was creating through the building of a large number of highways. In the late 1990s, NCDOT was experiencing a lot of delays in their project permits for their transportation infrastructure program because of the unavoidable impacts to the environment. They wanted to figure out a way to keep building roads without slowing them down, so they created a new subdivision of the Department of Environmental and Natural Resources (NCDENR) (now called the NC Department of Environmental Quality) called the Wetland Restoration Program (WRP). It was a way for the state to pay themselves (via different departments) to specialize in providing wetland offsets under the Clean Water Act and sell those offsets to NCDOT.³⁵ According to the state, “WRP gave permittees an alternative mitigation option and allowed the state to improve the science and success of mitigation projects and to utilize watershed planning to focus the projects in the areas of the state where they were most needed.”³⁶ This program allowed the state to move quicker on NCDOT projects and also provide better outcomes than what was seen by permittee responsible mitigation (as much as one-half of all projects failed to meet success criteria).

In 1999, NCDOT started utilizing the WRP program to meet some of its mitigation needs, however the NCDOT and NCDENR mitigation programs were functioning separately with different processes and “failed to meet the satisfaction of either federal and state regulatory agencies, or environmental interest groups.”³⁷ The state recognized this failure and contracted the DYE Management Group to study merging the programs and also pulled together 10 state agencies to identify obstacles and map a path forward. Ultimately it was recommended that:

“Mitigation for NCDOT should be provided years in advance of project impact, and be designed to replace unavoidable functional losses to wetlands and riparian buffers. The panel also conceived and set into motion events leading to the creation of the Ecosystem Enhancement Program (EEP).”³⁸

This led to the full creation of the EEP program in 2003. As the system evolved a number of things were implemented well as well as poorly. This system evolved into EEP predicting where future impact will be and build ahead of time the offsets they suspect will be demanded in the future, which for the most part is good, except when projects expected don’t come to fruition which leads to a huge waste of money. Additionally, the state needed to price the credits and were effectively subsidizing this ILF program with taxpayer money and therefore pricing credits lower than what could be bought on the market, so a program designed to be a backstop was undercutting the private market. Mitigation bankers knew this was happening and so were able to lobby for a change of law in 2009 and a new In-Lieu Fee Instrument was published in 2010 attempting to fix some of these problems. Another criticism that came up was poor data collection, there was no system to understand where the restoration sites were or understanding where all the state assets were.

They eventually shifted to a process called full delivery. The state agency would do all the planning work and then put out an RFP for mitigation bankers to sell credits to DMS. This incorporates many of the benefits that come from the specialization mitigation bankers have with many of the benefits of a ILF system and the simplicity of how it works for developers while still delivering outcomes.

35 Todd BenDor, February 7, 2023.

36 “DMS History,” accessed March 26, 2023, <https://deq.nc.gov/about/divisions/mitigation-services/about-dms/history>.

37 “DMS History.”

38 “DMS History.”

5.3 Program Analysis

To many professionals in the restoration field, North Carolina is viewed as an example of a state that has created a very successful In-Lieu Fee (ILF) program that also incorporates the idea of Pay for Success (PFS) into its model. The North Carolina system has done a good job of reducing a number of the risks of ILF programs discussed in Section 5.1 and can be used as an example of an ILF program that evolved into a well-functioning program that creates gains for the environment while also not stifling development.

North Carolina's decades-strong program has restored and/or protected over 4 million feet of stream and 29,000 acres of wetlands, meeting the compliance needs of over 650 development projects.³⁹ When stream or wetland credits are unavailable from mitigation banks in an area, a permittee can submit a request for mitigation from the state ILF. After collating these requests, the DMS determines where and how much mitigation is needed.⁴⁰ The PFS aspect of the ILF program lies in the way the DMS creates ILF credits. The majority of the state's cumulative \$508 million in contracting for their ILF is for full delivery of restoration outcomes (\$398 million, or 78%), and another \$5.6 million (1%) is the purchase of outcomes from mitigation banks.⁴¹ The state is required by law to avoid competing with credits from existing mitigation banks,⁴² ensuring that private restoration investment is not hindered or undercut by the ILF program. The ILF program creates strong demand for restoration outcomes and provides an easy way for permittees to comply with mitigation requirements. For example, the North Carolina Department of Transportation (NCDOT), the largest buyer of ILF restoration credits (at one point up to 85%),⁴³ claims the ILF has resulted in higher quality restoration as well as faster project timelines, which both NCDOT and the regulator appreciate. Another key feature of the North Carolina program is that prices for the ILF program are reviewed annually and there is a predictable mechanism for updating the price on a regular schedule for all parties involved.⁴⁴

39 Periann Russell, "Compensatory Mitigation in North Carolina & Challenges in Urban Settings" (Division of Mitigation Services, North Carolina Department of Environmental Quality, March 16, 2022), <https://www.deq.nc.gov/mitigation-services/publicfolder/learn-about/core-processes/science-and-analysis-section/presentation2022webinar-russellperiann/open>.

40 "Vendors | NC DEQ," accessed April 4, 2023, <https://www.deq.nc.gov/about/divisions/mitigation-services/vendors>.

41 "Processes and Awards | NC DEQ," accessed April 4, 2023, <https://www.deq.nc.gov/about/divisions/mitigation-services/dms-vendors/processes-and-awards>.

42 "Division of Mitigation Services: Compensatory Mitigation," G.S. 143-214.11 § (n.d.).

43 Tim Baumgartner, "North Carolina Division of Mitigation Services," https://www.nawm.org/state_meeting/2017/pp/baumgartner_041117.pdf.

44 "Current Rate Schedules," North Carolina Department of Environmental Quality, accessed March 26, 2023, <https://deq.nc.gov/about/divisions/mitigation-services/customers/current-rate-schedules>.



6. KEY FINDINGS

6.1 Secondary Legislation & Implementation

The secondary legislation that will determine many of the details of the BNG policy has yet to be passed and so various stakeholders are having to operate off of best available information to set up the systems and processes necessary for when BNG will become mandatory in November of 2023 – including DEFRA and Natural England. Part of what has made this two-year implementation period challenging has been the state of politics in the UK and the high amount of turnover of administrations and prime ministers that cause a lot of political uncertainty. This caused delays in guidance and documents put out publicly which has caused a lot of uncertainty for the private market trying to figure out how to invest and set up offsetting schemes that will be profitable and worth the investment. Additionally, secondary legislation will dictate how things like the registry are created, the credit sales service for statutory credits, tax implications for landowners, government grant program for the Natural Environment Readiness Fund (designed to give money to projects to get ready for the market), etc. This means that there may be more reliance on the statutory credit scheme early on to serve as a backstop for credits should the private market not be ready by November 2023, however starting off with a heavy reliance on this backstop could be dangerous for developing a private market and the pricing of the statutory credits will play an important role in this process too.

6.2 Early Efforts to Create Offsets

There are a number of different approaches to creating offsets that have started to surface as the mandatory net gain period approaches including a mitigation bank model, brokerage model, creating large scale nature reserves, and an in-lieu fee approach.

6.2.1 Mitigation Bank Model

The mitigation bank model is very similar to the approaches in the US where a company creates a mitigation bank that predicts demand for credits, carries out restoration projects, and sells those credits into the market. The Environment Bank is striving to do this in the UK. They're creating a business model that delivers habitat banking at scale and will be able to produce credits from ecosystem restoration that can be sold in a private market. They will guarantee all the upfront capital costs and incorporate 30 years of management funding into the cost of a credit. The Environment Bank is creating credits by working with landowners to complete restoration on their land for credits and create a guaranteed source of income to these landowners for 30 years. They will be creating a system to insure themselves and create a restorative fund that kicks in if a project is not performing as anticipated.

6.2.2 Brokerage Model

Fischer German is creating a brokerage model to connect landowners that can serve as a site for offsets with developers that will need to offset their development. According to their website "For Offset Providers we offer a simple way to market land for provision of offset sites and other opportunities. For Offset Seekers we offer a simple and low cost way to search for offset sites and other land requirements."⁴⁵ They are working to try and create a transparent marketplace so that the market is providing the right type of habitat units and that there is a marketplace with competition and eventually work towards creating a registry of land that's available to be turned into credits, but also credits that are already created and can be bought for projects in development.

6.2.3 Large Scale Nature Reserve

Another approach being tested out is to create large-scale, high-quality restoration projects to create nature reserves that are strategically significant. One example of this is the Wendling Beck Environment

45 Saravanan, "Green Offset," Fisher German, accessed March 28, 2023, <https://www.fishergerman.co.uk/green-offset>.

Project. The Wendling Beck Environment Project is a “habitat creation, nature restoration and regenerative farming project, spanning almost 2,000 acres of land.”⁴⁶ This restoration project is transforming farmland into enhanced grasslands, woodlands, wetlands, and other habitat that can be sold as biodiversity credits and is a collaboration between four farmer landowners, Norfolk Rivers Trust, Norfolk Wildlife Trust, Norfolk FWAG and Norfolk County Council. The project is also supported by The Nature Conservancy, Natural England, and Anglian Water (the largest water utility in the UK and a buyer of some of the credits generated out of this project). This project intends to sell credits both to the private marketplace, but also sell to Natural England to serve as statutory credits.

6.2.4 In-Lieu Fee Program

Statutory Credit Scheme

Part of the original legislation that passed requires the Secretary of State to create a statutory credit scheme that can sell credits to developers should they not be able to meet the net gain requirements onsite or through the offsite offsets market. The government has tapped Natural England to run this statutory credit scheme and this scheme will effectively be an in-lieu fee program where developers can purchase credits and the ILF program will use that money to carry out or purchase large scale restoration that is not tied to where the harm to biodiversity was created. Natural England is a quasi-governmental, quasi-NGO organization that is technically described as a “an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs” and is independent from the government.⁴⁷ They are the government’s “adviser for the natural environment in England” and they “help to protect and restore our natural world.”⁴⁸ Natural England will be the “shop front” of the Secretary of State Statutory Credit Scheme that will sell credits as a backstop to the market. Additionally, Natural England will have a role in creating and hosting the registry of offsets and are also working on creating a plan for the monitoring and evaluation of the policy as a whole.

The timeframe for when statutory credits are purchased to when investment into habitat will be made has yet to be determined. When talking to folks at Natural England, they said that the longer the policy is implemented for the less time there will be between purchase and habitat creation. But, at the moment do not have a good sense of how long it will take or the volume of credits that will be purchased through the statutory credit scheme. They do recognize the risk, especially reputational risk, to that time lag being long, but don’t seem to have a good sense of how it will play out. Additionally, it seems like the desire was to have projects in the pipeline, but in terms of having actual credits ready, they don’t plan on actually creating credits until mandatory net gain is in place.

Local Planning Authority ILF Programs

There has been some talk that individual LPAs might also create and sell their own credits and operate a localized ILF Program. This will likely be some of the LPAs that have very extensive and ambitious local nature recovery strategies. One example of this is the Trust for Oxfordshire’s Environment is a non-profit that has been set up with strong relationships to the LPAs in the area and “developers can make Biodiversity Net Gain payments direct to TOE as a way to meet their planning commitments.”⁴⁹ Some of the LPAs are doing this to ensure that there is a sufficient supply of credits in their area to ensure economic development is not being hampered in their area. Additionally, some of the LPAs might have a lot of land that is not providing the LPA with much return so selling credits is a potential to generate income off this land they hold.

46 “Wendling Beck Environment Project,” accessed March 28, 2023, <https://www.wendlingbeck.org/>.

47 “Natural England,” GOV.UK, March 9, 2023, <https://www.gov.uk/government/organisations/natural-england>.

48 “Natural England.”

49 “Biodiversity Net Gain,” Trust for Oxfordshire’s Environment, accessed April 1, 2023, <https://www.trustforoxfordshire.org.uk/biodiversity-net-gain>.

6.3 Demands for Offsets

Housing developers seem to be taking more land than need at the outset, so they have space for onsite offsetting or already have greenspace worked into plans. Majority of housing offsets are expected to deliver most of it within the “redline boundary.” It will be the bespoke offset projects that really need smaller amounts of credits that can turn to habitat banks or brokerage firms to try and find the credits they need.

6.4 Market Drivers

A farmer and landowner suggested some of the reasons he and other farmers are choosing to convert his land from agricultural land to conservation land.

1. **Brexit & CAP Subsidies:** One of the main reasons to turn land into BNG credits is an understanding that a post-Brexit UK would mean that the EU common agricultural policy (CAP) subsidies would disappear. Subsidies are what underwrite the risk of production for farmers. The Environment Act and BNG provides an opportunity to explore private markets and get out of a practice of relying on subsidies.
2. **Climate Change:** A lot of farmland in the UK is on sandy land that will be particularly susceptible to the impacts of climate change and droughts. Glenn had been experiencing this more and more and it was causing a significant amount of financial stress.
3. **National Farmer Union Net Zero by 2040 Goal:** The National Farmers’ Union announced a goal to get to net zero emissions of their farms by 2040. When doing a carbon audit, it became clear that to achieve this goal would require a radical change to current business models.

One thing that might be preventing some farmers and landowners from entering the market is the tax implications. Currently, agricultural land is free of inheritance tax and so as land is passed down to next generations there is agricultural property tax relief. If agricultural land turns into conservation land, it will no longer have that relief. There are also various other tax implications that a landowner would have to think about when considering if they should participate in BNG credit creation including capital gains tax, value added tax, rates, Stamp Duty Land Tax (SDLT), and the inheritance tax. Some are predicting that this could lead to an effective overall tax rate of 51% on a BNG payment, which is a high price to pay for a landowner trying to switch from agricultural practices to ecosystem restoration for environmental benefit.⁵⁰ Conversations are being had with the Treasury Department and HM Revenue & Customs about potentially creating some sort of conservation property tax relief scheme, however this had yet to be figured out, but could have significant implications on farmers’ willingness to enter the biodiversity offsets market.

6.5 Registry, Reporting, Monitoring, and Evaluation

Natural England will be developing a strategy to monitor and evaluate the policy. The learnings that come from Natural England’s monitoring will feed into DEFRA and DEFRA will be doing reviews of the metric every three to five years. Additionally, Natural England will be in charge of creating the registry for the offsetting as required by the legislation. At the moment, secondary legislation has not yet been passed determining the specific requirements of the registry, however they are working to create the registry on best available information. Additionally, the registry will only track offsite offsetting that occurs and will not keep track of onsite mitigation efforts.

In terms of monitoring the offsets and ensuring that the restoration is maintained for 30 years, it’s unclear who will primarily be in charge. The LPAs are the government body that is primarily in charge of

⁵⁰ Nature Finance - Tax Implications, 2022, <https://vimeo.com/783190361/39196ebbd3>.

implementing BNG however, some seem to be concerned about their capacity to implement and also their technical expertise. Additionally, it's unclear who will be responsible in the future if habitat is not in the condition it should be in. By law, the LPAs and local councils have step in rights, but they don't necessarily have the capacity or desire to actually enforce this.

6.6 Pilot Program Learnings

Natural England had a big part in carrying out the pilot programs run, and they viewed the pilot program as a way to test out different aspects of the biodiversity net gain scheme, payment structure, metric, unit calculations, etc. In a call with Natural England, they shared a few of the learnings that came from the pilot programs regarding the metric and working with landowners. The spatial risk multiplier needed to be revised because some areas that were bigger would have a larger minus and at a certain distance certain habitat would never provide units. Needed to reassess how to work in the spatial risk. Consortiums of landowners were difficult to work with and stakeholder engagement is an important piece of all this.

6.7 Biodiversity Metric

Creating a metric to quantify biodiversity that can be applied to a policy and system like this requires a balance between complexity and simplicity. A metric needs to be sufficiently complex that it captures the true nature of the complexity of biodiversity, but simple enough that people can use it, politicians can understand it, and government can implement it on a large scale. The metric was designed to apply to residual losses only and be applied to the offsets step only. Because of the simplifications necessary to create a quantification metric, when applying the metric to an entire project before and after changes to a habitat, it amplifies the simplifications across an entire land area rather than to just the losses. Also, for large projects, applying the metric to an entire project is very tedious and it makes more sense to just quantify the residual impacts of the project that need to be offset rather than the entire project. Additionally, it should not be possible to deliver BNG in an area smaller than the original or deliver net gain on site. Part of this comes from a tension between wanting to do what's best for nature and the environment and wanting to do what's best for people and their access to nature, greenspace, and the fact that nature and greenspace increases property value.



7. RISKS TO IMPLEMENTATION & RECOMMENDATIONS

As government officials go about implementing BNG in the UK there is going to be a disparity between how the policy is implemented and the stated policy goal. This section aims to identify some of the risk to implementation of BNG and recommendations for how to mitigate those risks or evolve how the policy is implemented over time to address those challenges.

There are nine main risk areas identified through this research that are detailed in this section:

- Underpricing Statutory and LPA Credits
- Onsite offsetting risk
- LPA Capacity and Technical Expertise
- Monitoring, Evaluation, and Noncompliance Risk
- Metric Oversimplification Risk
- Longevity and Durability
- Temporal Risk
- Conflicting priorities
- Chilling Development

Understanding that the government has limited capacity and needs to prioritize interventions to address risks to implementation, the greatest risks are:

- *the risk of underpricing the statutory credits,*
- *the capacity and technical expertise of the LPAs to implement BNG, and*
- *the risk of the amount of onsite offsetting that will occur.*

I recommend that the government focus on these three risk areas and the recommendations discussed in each of the sections below for these categories.



7.1 Risks of Underpricing the Statutory Credits

7.1.1 Risk

One of the concerns that came up time and time again was either the emphasis of how problematic state programs underpricing credits can be or the concern that the statutory credits administered by Natural England that will serve as a backstop in the UK will be severely underpriced. Underpricing these credits will undercut the private market and could hamper the development of a private offsets market if prices are set too low since private companies will not be able to compete with the

government credit prices.

7.1.2 Examples of this Risk in Other Contexts

In the US, from the Clean Water Act nutrient pollution offset program, Clean Water Act stream and wetland offset program, and Endangered Species Act habitat offset program, there are repeated examples of government agencies (typically the regulators themselves) taking on the responsibility – but often not the liability – of providing and maintaining offset supplies. Those regulators typically have little to no expertise in market pricing or in pricing ecological restoration and protection in any form and are unfamiliar with legal liabilities for long-term maintenance typically required in mitigation programs. In addition, staff face direct and indirect political pressure to make sure that fees are low or ‘at cost’ and the US experience has been that this results in offsets being dramatically underfunded. The underfunding problem is severe – many programs cannot even finance the initial offsets they are supposed to provide, let alone provide long-term management funding.

The problems of regulator-run, fee-based programs are predictable. DEFRA, Natural England, and local development authorities can potentially experience these same issues, because they come from a similar set of bureaucratic constraints, biases, and cultural issues that you share. Many of the same experiences that have played out repeatedly in U.S.-based fee programs are already foreshadowed in the pilot biodiversity credit program DEFRA and development authorities tested over the last few years.

Duke University carried out a comprehensive review of in-lieu-fee programs and found numerous failures in pricing offset costs. Their focus is especially on wetland/stream offset programs in the State of North Carolina where regulators spent about 10 years underpricing offset costs before they reformed the program. The authors conclude:

“ Even if there is a requirement for fees to reflect full costs of mitigation, those personnel actually running the program can find it difficult to fully understand the actual cost of mitigation delivery, what the business structure of the industry they are regulating entails, and the broader drivers of mitigation costs (e.g., land acquisition costs). This can result in a surprisingly hollow, qualitative debate on what the fee structure should be to achieve the programs goals rather than detailed, hard analysis and rapidly responding reality-check of what fees actually need to be.”⁵¹

England’s position in launching offset approaches is similar to the position that the US was in with its wetland offset programs in the early 2000s. A legal review identified a number of ways that America’s early fee-based programs frequently went wrong, including by charging fees that were too low.⁵² The other major issue is that fee programs fail to spend the money, meaning that the environment is damaged but the damage is not replaced for years or even decades. This is often because understaffed agencies just don’t have the time to do this work, but also because they have tended to design complex projects and have had difficulty negotiating for the use of the private lands that often should be the required locations for offset projects.

A national regulation in 2008⁵³, often referred to as the “2008 Rule”, fixed some of these problems, requiring government agencies to use ‘full cost accounting’ when setting fees and that required agencies to consider land costs, restoration costs, and long-term management costs and a number of credit and program pricing took different forms after this regulation change.⁵⁴ Note that even though the 2008 regulation improved government credit pricing policies, program staff continue to report that “cumbersome processes” continue to prevent them from increasing prices as frequently as needed and continue to report challenges in getting prices right.

In a case involving an endangered bird, a consortium of regional (state) wildlife agencies proposed and was given license to run a \$65million offset program for energy development (including electricity transmission) in the American Midwest. The state effort was proposed as an alternative to higher national regulation of the species. The program largely failed to achieve its objectives and ran out of funding. An audit carried out in 2019 by an independent auditor contracted by those state governments found “an organizational culture that prevents an effective management of the program,” “does not track its liabilities properly and may not have enough assets to cover its future potential liabilities,” “program spending on temporary

51 Doyle, “The Financial and Environmental Risks of In Lieu Fee Programs for Compensatory Mitigation.”

52 Royal C. Gardner, “Money for Nothing? The Rise of Wetland Fee Mitigation,” *Virginia Environmental Law Journal* 19, no. 1 (2000): 1–56.

53 “Compensatory Mitigation for Losses of Aquatic Resources; Final Rule,” 73 § 70 (2008).

54 Rebecca Kihslinger et al., “In-Lieu Fee Mitigation: Review of Program Instruments and Implementation Across the Country,” SSRN Scholarly Paper (Rochester, NY, July 1, 2019), <https://doi.org/10.2139/ssrn.3619484>.

mitigation is unsustainable;“does not properly administer the program from a financial standpoint” and fell short of providing “a net gain in conservation” objectives.⁵⁵ In addition, the state program drove higher priced, private habitat bank projects out of the market and almost out of business. One of the documented problems for this program was that regulators set a pre-assigned value to mitigation fees and had no flexibility to change them (and would have lacked political support to do so if they had tried). The audit estimated that the agency had committed to \$95-\$110 million in offset needs but only collected \$65 million for that purpose, a 32-40% underestimate of the price at which offset credits should have been set.

7.1.3 Recommendations

There should be a preference for private environmental banks take on the responsibilities and liabilities of providing offsets. In limited cases, such as those DEFRA faces with a new market with inadequate offset supply it makes sense to set up government-run fee programs, but those programs and fees should be designed to ‘sunset’ to avoid predictable problems described above.

Another solution (and one adopted by the State of North Carolina) is that regulators collect fees but then use a competitive bidding process to select offset projects on which to use them. Feedback is then provided from the auction on the prices bid by offset suppliers and that information is used to change the fee structure set by the state on future projects, which they change up to four times a year.⁵⁶ This allows the program to be more responsive to market realities, actual ecological restoration costs, and simple changes like inflation.

Systems can be put in place to ensure the long-term future of the program could be to require periodic public disclosure statements and occasional third-party audits of the accounts in which the offset fees are deposited. Additionally, this audit should require that offset credit liabilities which have been accepted but not yet provided should be disclosed not just as number of credit liabilities unmet but the financial burden on the agency or Natural England to provide those offsets.

In many ILF programs what appears to happen sometimes – and this is opaque and hard to document – is that the entities blend other taxpayer funds or philanthropic donations into the account in order to deliver the restoration required at what appears to be the market price for offsets but what they are actually doing is raiding other conservation fund budgets to satisfy what is supposed to be an expense that permittees bear. This is a pernicious form of non-additionality that is really hard to track. Requiring financial accounting of estimated and documented restoration and land protection costs to provide missing offset credits is one way to narrow this risk.



7.2 Onsite Offsetting Risk

7.2.1 Risk

The way the metric is set-up, developers can purchase extra land or create some greenspace within their designs and feasibly create a plan that will not require any offsite offsetting. At a first glance, this seems like a good thing as it seemingly follows the mitigation hierarchy and adheres to principle one of the Biodiversity Offsetting Principles⁵⁷ discussed earlier in this paper. However, there are two main risks with onsite offsetting in the UK BNG program: the registry of offsets will not

include onsite offsetting and onsite offsetting will lead to lower quality restoration and less connected

⁵⁵ “2019 CCAA Annual Report” (Western Association of Fish and Wildlife Agencies, April 20, 2020), <https://bloximages.newyork1.vip.townnews.com/santafenewmexican.com/content/tncms/assets/v3/editorial/a/27/a27af17e-97e3-11eb-88f0-dbc2b23d6e87/606e1c7159190.pdf.pdf>.

⁵⁶ “Current Rate Schedules.”

⁵⁷ “The BBOP Principles on Biodiversity Offsets.”

habitats. Additionally, not including onsite offsets in the registry will making monitoring and long-term maintenance of these onsite offsets hard to carry out.

An early paper evaluating the program is estimating that 91% of units will be delivered onsite.⁵⁸ Given the ambiguity and lack of commitment to enforcement of onsite offsets, this presents a huge risk. Additionally, studies have shown that compliance with onsite mitigation in the UK is low.⁵⁹

7.2.2 Examples of this Risk in Other Contexts

In the case of the US Clean Water Act, initially permits encouraged developers to site as many of the offsets as possible on the development site or immediately nearby. This resulted in nature being restored in places that were more valuable for development and extremely difficult areas in which to maintain nature. For example, a highway damaging wetlands would be allowed to construct a wetland that was completely surrounded by the highway (and receive all the runoff from the highway), producing a wetland full of invasive species and completely isolated from most biodiversity.

One study looked at 20 restoration projects that were placed on or close to development sites in rapidly developing regions and found that after 13 years, the habitats were persisting but with no improving trend in conditions and were affected by extreme conditions (e.g., flooding) caused by nearby developed lands.⁶⁰

Recognizing these failures, the US Congress charged the National Academies of Science to look into ways to build a better offset and mitigation program.⁶¹ A major finding of the review was that placing offset credit projects using a watershed approach was more likely to produce the long-term ecological benefits required by the law. For example, this review found that off-site, third-party offsets provided advantages and concluded:

“On-site compensation is typically constrained by hydrological conditions that are likely to have been or are being modified by the developments requiring mitigation... The more degraded the local site and the more degraded the watershed, the less likely it will support a high-quality project. Thus, opportunities for in-kind compensation need to be sought within a larger landscape context.”

This report as well as changes made in the “2008 Rule”⁶³ have dramatically improved the ecological and economic outcomes from offset policies while also expanding them to cover not just wetlands but all rivers and most streams in the US.

The new regulations created a strong, mandatory preference for offsets to be provided in different locations from development and strong, mandatory preferences for offsets to have to prove their benefits to nature before they could be sold to a permit-holding developer. The regulation did this by making proven, ‘government-certified’ completed restoration projects that included permanent land protection

58 Sophus O. S. E. zu Ermgassen et al., “Exploring the Ecological Outcomes of Mandatory Biodiversity Net Gain 58 Using Evidence from Early-Adopter Jurisdictions in England,” *Conservation Letters* 14, no. 6 (2021): e12820, <https://doi.org/10.1111/conl.12820>.

59 Katherine Drayson and Stewart Thompson, “Ecological Mitigation Measures in English Environmental Impact Assessment,” *Journal of Environmental Management* 119 (April 15, 2013): 103–10, <https://doi.org/10.1016/j.jenvman.2012.12.050>.

60 Morgan Robertson, Susan M. Galatowitsch, and Jeffrey W. Matthews, “Wetland Compensation and Landscape Change in a Rapidly Urbanizing Context,” *Environmental Management* 67, no. 2 (February 1, 2021): 355–70, <https://doi.org/10.1007/s00267-020-01380-8>.

61 *Compensating for Wetland Losses Under the Clean Water Act* (Washington, D.C.: National Academies Press, 2001), <https://doi.org/10.17226/10134>.

62 *Compensating for Wetland Losses Under the Clean Water Act*.

63 *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*.

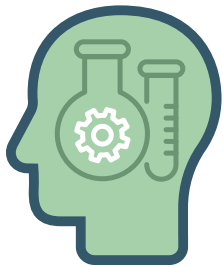
and perpetual management endowments the top preference and only allow permittees to choose on-site simultaneous nature restoration projects as the last resort of five options.⁶⁴

After these regulations, levels of avoidance of impacts to aquatic habitats have declined and offset success has improved. For example, by 2015, the regulatory agency was issuing 56,000 approvals per year of which 90% were fully avoiding any significant impact to aquatic habitats and of the ones that needed to offset impacts, more than 60% were now using off-site restoration projects.⁶⁵ The use of off-site restoration has continued to increase since 2015.

7.2.3 Recommendations

The use of advance projects in conjunction with off-site requirements is particularly important. Any onsite offsetting should be included in the national registry of offsets to improve the ability to audit the BNG program as a whole and carry out monitoring. The UK should consider creating regulation similar to the “2008 Rule” that creates strong, mandatory preference for offsets to be provided in different locations from development and strong, mandatory preferences for offsets to have to prove their benefits to nature before they could be sold to a permit-holding developer.

Incentivizing the delivery of offsite offsets could be done by mandating that a certain percentage of the units be delivered offsite in a way that aligns with the regional biodiversity priorities or local nature recovery strategies. “Another mechanism might be capping how much urban land take is permitted by the policy. When the Metric was first designed, the authors recommended a 1:1 minimum area be established, so that a loss of habitat area could not solely be compensated for through promises of future condition increases. On the other hand, a mandatory area target might disincentivize delivering higher condition habitats.”⁶⁶



7.3 LPA Capacity and Technical Expertise

7.3.1 Risk

In a survey conducted by the BBC, local planning authorities were asked if they had a chartered ecologist on staff. Out of the 333 local planning authorities, 247 responded and only one in five did. “Liz Milne, the chair of the Association for Local Government Ecologists, says the lack of expertise in councils may mean biodiversity net gain simply isn’t achieved. We’re still looking at the majority of planning authorities having little or no expertise in reference to ecology.”⁶⁷ Another research project found that “the majority of responding LPAs (56%) report that it is currently practical to deliver biodiversity NNL/NG, but for the remainder, lack of resourcing is the primary obstacle to its delivery.”⁶⁸ This study found that “only 39% of LPAs have in-house ecological expertise, about 82% respondents provide advice to only one LPA, meaning that expertise is thin and decentralised.”⁶⁹ A lack of resources and expertise may hinder BNG from being implemented properly and many LPAs will be relying on national guidance.

64 Sheppard Mullin, “Corps And EPA Issue Important New Mitigation Rule,” Real Estate, Land Use & Environmental Law Blog, April 16, 2008, <https://www.realestatelanduseandenvironmentallaw.com/corps-and-epa-issue-important-new-mitigation-rule.html>.

65 “The Mitigation Rule Retrospective: A Review of the 2008 Regulations Governing Compensatory Mitigation for Losses of Aquatic Resources,” n.d.

66 zu Ermgassen et al., “Exploring the Ecological Outcomes of Mandatory Biodiversity Net Gain Using Evidence from Early-Adopter Jurisdictions in England.”

67 “BBC One - Countryfile, Coniston,” BBC, accessed April 2, 2023, <https://www.bbc.co.uk/programmes/m000ywg1>.

68 Dr Morgan Robertson, “The State of No Net Loss/Net Gain and Biodiversity Offsetting Policy in English Local Planning Authorities: Full Report,” In Practice, September 2021, <https://cieem.net/wp-content/uploads/2021/09/LPA-Survey-Full-Report-Aug-23-2021-FINAL.pdf>.

69 Robertson.

7.3.2 Recommendations

DEFRA should be prepared to provide more technical assistance and guidance to LPAs in charge of implementing BNG. Additionally, LPAs that do not have ecologists on staff, especially smaller LPAs, should consider sharing ecologists or contractors who can help provide the ecological knowledge necessary to implement this policy.



7.4 Monitoring, Evaluation, and Noncompliance Risk

7.4.1 Risk

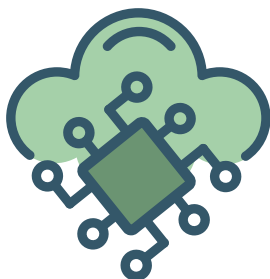
While Natural England will be carrying out monitoring of the policy as a whole and feed that information to DEFRA, a large question that remains is who will be in charge of monitoring the actual condition and compliance of the offsets and net gains. In theory, this will be the LPAs, however as mentioned there is a significant lack of capacity from the LPA side to carry out this monitoring. In the event an LPA actually does do a good job of monitoring, it is unclear that should they find noncompliance they would actually have the desire or proper incentives to exercise their “step-in” rights and take over the maintenance of these restoration sites.

7.4.2 Examples of this Risk in Other Contexts

In the US stream and wetlands market, this was a big risk and an insurance market as well as a system created to set aside maintenance funds has evolved. Every offset that is sold is insured so that if something were to happen (like a fire, etc.) there is insurance to recreate that habitat. Additionally, all of the maintenance funds required for the upkeep of the habitat are required to be set aside into a third-party account and a system has developed where eventually after a mitigation bank has gone in and created the offset and built the habitat up after about 10 years it’s transferred to another party to handle the management of the land after the initial creation.

7.4.3 Recommendations

Creating an insurance market and requiring a certain amount of funds to be set aside for long term maintenance is a way to mitigate against an LPA ever having to step in in the first place. Should the LPA have to step in, they could gain access to the funds that were tied up in an escrow account and not having funding for maintenance would not be a deciding factor in an LPA choosing to not exercise their step-in rights.



7.5 Metric Oversimplification Risk

7.5.1 Risk

There are a large range of criticisms⁷⁰ of the metric and while these criticisms are important, any environmental market that strives to function needs a common language and currency to conduct transactions with. In the case of BNG, DEFRA’s biodiversity metric was created to be a common unit by which biodiversity can be quantified and traded. Biodiversity is an incredibly complex thing that will inevitably be oversimplified when reduced down to a number. Additionally, as mentioned in Section 6.7, the metric is being applied in a way that it was not intended to which magnifies the effects of

70 Phoebe Weston, “New Biodiversity Algorithm ‘Will Blight Range of Natural Habitats in England,’” *The Guardian*, July 21, 2021, sec. Environment, <https://www.theguardian.com/environment/2021/jul/21/biodiversity-metric-algorithm-natural-england-developers-blight-valuable-habitats-aoe>; “Metric 3.0: Why DEFRA Is Taking Flak over the Latest Version of Its Biodiversity Tool,” accessed April 3, 2023, https://www.endsreport.com/article/1724651?utm_source=website&utm_medium=social.

71 “Biodiversity Net Gain – What to Expect under the New Conservation Covenant Regime,” *Gowling WLG*, accessed April 3, 2023, <https://gowlingwlg.com/en/insights-resources/articles/2022/the-new-conservation-covenant-regime/>.

the oversimplification.

7.5.2 Recommendations

While this is a risk, a quantification system is necessary and will inherently cause oversimplifications. Additionally, a quantification has to balance capturing complexity, but also remaining simple enough to be implemented widely. DEFRA already plans to update the metric every 3-5 years. To ensure stability in the market, there should be a predictable schedule that the metric is updated on and a process to get input, review, and update the metric.



7.6 Longevity and Durability

7.6.1 Risk

There is a risk that the habitat restoration and biodiversity net gain will not be durable or last very long. The net gains are only required to be secured for 30 years due to the way conservation covenants are set up. The Environment Act created a new requirement that “requires that biodiversity improvements can only be taken into account by a planning authority (when considering the biodiversity gain plan), where the maintenance of that habitat enhancement is secured for 30 years by a planning obligation or a conservation covenant.”⁷¹ It is unclear what will happen after those 30 years and if the restoration that is carried out will continue to be protected and maintained. Some have responded to concerns about this stating that after 30 years due to how the planning authorities and zoning work it will be hard to change the use of that land later, but this is all speculation and is a big risk to the longevity of BNG in the UK.

7.6.2 Recommendations

Some more long-term planning and clarification could be really helpful, especially for landowners trying to decide if creating BNG credits and entering a conservation covenant is something they want to do. Creating more clear guidance and a long-term plan that is communicated clearly to all stakeholders would help reduce ambiguity in the market.



7.7 Temporal Risk

7.7.1 Risk

For credits that where money is paid in advance of restoration being delivered there is a big risk that stems from uncertainty as well as the temporal loss of biodiversity and the functions and ecosystem services that come from that habitat. This risk is particularly relevant to the statutory credit scheme because of the flexibility that is often given to ILF programs as discussed in Section 5.1.3.

7.7.2 Examples of this Risk in Other Contexts

In the US Stream and Wetlands Market, especially the ILF programs, permits allowed developers to pay into government funds that were supposed to – in the future – be used to restore wetlands. Experience routinely found that three things frequently happened:

1. other priorities prevented agencies from ever getting around to spending the money,
2. agencies spent the money on other priorities, or
3. restoration failed to provide the required benefits, leaving wetlands ‘net negative’ in overall condition.

⁷² Compensatory Mitigation for Losses of Aquatic Resources; Final Rule.

The “2008 Rule”⁷² addressed this challenge creating a clear preference for advance mitigation and most US policies have a preference for advance projects. Advance projects are restoration projects that have proven their ecological benefits by meeting quantified government standards.

7.7.3 Recommendations

While the temporal risk multiplier in the metric aims to incorporate this into the credits that are sold in the private market, temporal risk still remains for the ILF type programs that will come from the statutory credit scheme and potentially also the LPA run credits (although the risk multiplier in the metric may address this concern too). Natural England, the body in charge of implementing the statutory credit scheme should be working to better predict demand, start creating projects where they anticipate demand, and developing a pipeline of future projects. In addition, they should very transparently publish data and conduct an audit as described in the recommendations for the underpricing risk in Section 7.1.3.

7.8 Conflicting priorities



7.8.1 Risk

There is a risk that property developers primarily rely on onsite projects because doing so satisfies DEFRA’s requirements and also creates amenity values that increase property sale prices and profits for them. DEFRA policy encourages by layering a second goal into BNG of improving peoples’ access to green space.⁷³ However, creating more greenspace adjacent to areas of high human use and occupancy, will not necessarily achieve biodiversity net gain or create lasting habitat

of high value.

7.8.2 Recommendations

If the risk of onsite offsetting (discussed in Section 0) is appropriately addressed, this will be less of a risk. Additionally, monitoring the policy implementation and reviewing the metric regularly (discussed in Section 7.5.2) may address this risk too.



7.9 Chilling Development

7.9.1 Risk

The UK is facing a housing shortage and will need to build 340,000 houses a year to address the shortage.⁷⁴ If BNG creates significant barriers to development, there is a big risk that this policy will chill development and exacerbate the housing crisis.

7.9.2 Recommendations

The statutory credit scheme will serve as a backstop to help prevent this from happening, however does come with its own risks (particularly the underpricing risk discussed in Section 0).

73 “Biodiversity Net Gain and Local Nature Recovery Strategies,” Impact Assessment (DEFRA, October 15, 2019), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/839610/net-gain-ia.pdf.

74 Elisha Sketchley, “Tackling the Housing and Biodiversity Net Gain Crisis,” Planning, Building & Construction Today, March 16, 2020, <https://www.pbctoday.co.uk/news/planning-construction-news/housing-biodiversity-crisis/73324/>.

8. CONCLUSION

After conducting conversations with experts and stakeholders talking about both US environmental markets as well as the biodiversity market that is emerging from the biodiversity net gain policy in the UK, it is clear that there are commonalities between both programs. While the first iteration of mandatory BNG, that is set to start in November of 2023, will not be perfect, there are three main lessons that can be adopted from environmental markets around the world and in particular the US Stream and Wetlands markets:

- 1. *Pricing and managing the statutory credit scheme will be really crucial to fostering a private market for offsets and also ensuring that unintended consequences like chilling housing development does not occur.*** To ensure prices are set competitively, regulators should create a system and schedule to regularly update prices for the statutory credits. Prices can be determined by a system to collect competitive bids for the delivery of necessary credits so that the market price is taking into account the full cost of delivering the credits. Additionally, this program should be as transparent as possible and be audited frequently and include offset credit liabilities which have been accepted but not yet provided with information on the financial burden on Natural England to provide those offsets.
- 2. *Onsite offsets should be minimized and should be treated similarly to offsite offsets.*** Onsite offsets should be tracked in the national registry and be held to the same monitoring, reporting, and maintenance standards that offsite offsets are held to. Additionally, there should be a clear hierarchy of preferences for types of offsetting, and this should include a strong, mandatory preference for offsets to be provided in different locations from development.
- 3. *The local planning authorities in charge of implementing BNG on the ground should be supported with the proper resources and technical expertise to do so.*** More technical assistance should be given as guidance to LPAs, additionally capacity will need to be built up to be able to handle this additional step in the planning process. Lastly, for smaller LPAs who don't necessarily need a full-time ecologist on staff, a network of ecologists that can consult for multiple LPAs should be created to help ensure LPAs can get the technical expertise they need to effectively achieve BNG in their community.

Additionally, this report is largely focused on the US and UK, however lessons learned, and the risk areas can be extrapolated to many environmental markets around the world. The UK is a trailblazer for this particular policy, but the voluntary biodiversity market is gaining popularity and there are other environmental markets and policies that will be created, and the implementation and adaptation of the UK BNG policy can serve as a guide and case study to extract lessons from.

9. APPENDICES

9.1 Appendix A: List of Interviewees

- Tim Male, Executive Director, Environmental Policy Innovation Center
- Becca Masden, Director of Restoration Economy Center, Environmental Policy Innovation Center
- Jacquelyn Pless, Economist, MIT Sloan School of Management
- Brad Breslow, Senior Project Manager, Davey Mitigation
- David Hill, Chairman and Founder, The Environment Bank
- Jo Treweek, Freelance Consultant, Treweek Environmental Consultants
 - An original author of the biodiversity metric
- Giles Atkinson, Environmental Economist, London School of Economics
- Adam Riggsbee, Founder and President, Riverbank Conservation
- Gary Frazer, Assistant Director, US Fish and Wildlife Service
- Chris O'Meilia, Wildlife Biologist, US Fish and Wildlife Service
- Alex Watts, Associate, Fisher German
- Tom Beeley, Associate, Fisher German
- Kate Twynham, Senior Specialist, Natural England
- Isobel Shan, Lead Advisor, Natural England
- Glenn Anderson, Landowner, Wendling Beck Environmental Project
- Ian Bateman, Professor of Environmental Economics, Director of the Land, Environment, Economics and Policy Institute (LEEP) and Director of the South West Partnership for Environment & Economic Prosperity (SWEEP), University of Exeter
- Genevieve Bennett, Director of Communications and Strategic Outreach, Forest Trend Association
- Rob Stavins, A.J. Meyer Professor of Energy & Economic Development and Director of the Harvard Environmental Economics Program, Harvard University
- Laura Grant, Biodiversity Net Gain Market Policy Lead, Department for Environment, Food and Rural Affairs (DEFRA)
- Martin Doyle, Professor and Director of Western Policy Program, Duke University's Nicholas School of the Environment
- Matthew Hubbard, Director of Restoration, Ecotone, Inc.
- Scott Chiavacci, Ecologist, United States Geological Survey
- Sophus zu Ermgassen, Ecological Economist, University of Kent
- Stephen Gibson, Chair, UK Regulatory Policy Committee
- Todd Bendor, Distinguished Professor of Sustainable Community Design and Director, Odum Institute, University of North Carolina at Chapel Hill
- Troy Anderson, Director of Operations for Eastern US, Ecosystem Investment Partners
- Wayne Walker, Principal, Common Ground Capital, LLC
- Chris Skidmore, Member of Parliament, UK

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