Title: Biodiversity net gain and local nature recovery strategies **IA No:** **RPC Reference No:** RPC-4277(1)-DEFRA-EA **Lead department or agency:** Defra **Other departments or agencies:** Natural England	Impact Assessment (IA) **Date:** 15/10/2019 **Stage:** Final **Source of intervention:** Domestic **Type of measure:** Primary legislation **Contact for enquiries:**

Summary: Intervention and Options

RPC Opinion: GREEN

Cost of Preferred (or more likely) Option (£m) (2016 prices, 2017 present value)				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANDCB in 2016 prices)	**One-In, Three-Out**	**Business Impact Target Status**
8,176.2	-1,469.1	170.7	In scope	Qualifying provision

What is the problem under consideration? Why is government intervention necessary?

The negative environmental externalities of development (e.g. habitat loss) and associated social and economic impacts are not fully internalised in development decisions, leading to overall loss and damage of habitat, biodiversity and other environmental goods. The current planning system does not provide a level-playing field for developers to deliver biodiversity 'net gain', defined as an overall increase in habitat area and/or quality following a new development. While there is some adoption of biodiversity net gain approaches, there is insufficient evidence to suggest a voluntary approach (albeit one supported by planning policy) will deliver net gain at a national level. Current government ambitions on house building and infrastructure are likely to accelerate land use change, with implications for habitat and the wider environment. Placing the environment at the heart of planning and development will support the Government's 25 Year Environment Plan ambitions and wider agenda.

What are the policy objectives and the intended effects?

The primary aim is to secure a measurable improvement in habitat for biodiversity whilst streamlining development processes. The objectives that have guided policy development to date are that net gain: (1) delivers habitat creation and/or enhancement, meeting the government's ambition to leave the environment in a better state than it inherited it; (2) is simple, streamlined and certain for developers, easy to understand and will not prevent, delay or reduce housebuilding; and (3) is of clear benefit to people and local communities.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option

Baseline – Business as usual (voluntary approach): existing voluntary approaches continue, in line with the National Planning Policy Framework.

Chosen approach – Mandatory requirement with biodiversity metric: this approach mandates net gain through the use of a specified biodiversity metric to development in scope of the Town and Country Planning Act 1990. Developers will have the option, once mitigation hierarchy has been demonstrated, to pay for the offset of remaining units through a biodiversity units market. Net gain activities undertaken will contribute to and be part of a wider strategic framework to recover nature at the local authority spatial scale. **Section 4** outlines the policy objectives, while **Section 5** sets out the options above in more detail and summary of the options considered at the long list stage in the consultation IA.

Will the policy be reviewed? It will/will not be reviewed. **If applicable, set review date:** Month/Year

Does implementation go beyond minimum EU requirements?		N/A		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** N/A	**Non-traded:** N/A	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: ..... Date: .....

Summary: Analysis & Evidence

Chosen approach

Description: Mandatory requirement with biodiversity metric

FULL ECONOMIC ASSESSMENT

Price Base Year 2017	PV Base Year 2021	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -5,878.4	**High:** 14,715.3	**Best Estimate:** 9,566.8

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	9.5	2	54.5	**478.2**
High	9.5		681.9	**5,878.4**
Best Estimate	9.5		211.3	**1,828.2**

Description and scale of key monetised costs by 'main affected groups'

Developers: delivery of on-site and off-site habitat creation as part of their developments. The estimated direct cost is £199.0m per year (2017 prices). This falls to £19.9m, once a 90% pass-through of costs to landowners through land prices has been considered – as is anticipated on the basis of industry evidence and economic theory. This is considered to be an indirect effect for our analysis and not additional to the direct effects. These values are contained within the direct impacts reported in the headline figures. In addition, there are also familiarisation costs to developers estimated to be £6.3m in the first year only.
Local government and central government: familiarisation, training, monitoring and enforcement costs of policy delivery. New burdens assessment and information provided by Natural England captures transition and ongoing FTEs requirement. Ongoing costs to local government are £9.5m per year, of which includes transition costs of £4.8m per year for the first 2 years. For central government, the estimated ongoing costs are £1.8m for Natural England, and £1.3m for Defra with one-off capital costs of £0.5m.

Other key non-monetised costs by 'main affected groups'

Local government: there may be an impact on developer contributions such as Section 106, which is currently used to deliver environmental improvements in a discretionary manner.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0.0	0	0.0	**0.0**
High	0.0		1,860.9	**15,193.4**
Best Estimate	0.0		1,395.7	**11,395.1**

Description and scale of key monetised benefits by 'main affected groups'

Environment: Benefits of habitat creation and avoided habitat loss, as set out in ONS ecosystem accounts for urban areas, are captured through the (partial and imperfect) proxy of private benefits perceived by residents living near greenspace. The benefits of prevented counterfactual loss of distinctive habitat (reflected in 'high' and 'best estimate' benefits only), resulting from developments being steered towards the least environmentally damaging areas and design practice, are realised immediately. **The benefits of new habitat creation (reflected in 'low' and 'best estimate' benefits only) are fully realised after 20 years, and therefore these benefits fall entirely outside of the 10 year appraisal period**. Net habitat creation, and therefore annual benefits, increase over time.

Other key non-monetised benefits by 'main affected groups'

Habitat creation will deliver a range of natural capital benefits to people and local communities beyond those benefits that are privately valued. Developers and local planning authorities will benefit from greater certainty and a level playing field, resulting from a consistent approach to demonstrating biodiversity net gain. This process consistency could result in savings for developers.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5

The analysis assumes that developments do not change in location and size in response to net gain. The central estimate is derived by assuming that delivery of net gain is a proportion of the upper and lower bound scenarios. Consultation responses indicate the majority of habitat shall be delivered on site. It is likely to be more difficult, however, to deliver habitat on constrained sites. We assume that land prices absorb 90% of costs imposed on developers. Please see **Section 6** and the **Annex 1-2** for more details.

BUSINESS ASSESSMENT (Chosen approach)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only): 853.4
Costs: 199.7	**Benefits:** 0.0	**Net: 199.7**	

CONTENTS

1 Introduction

1.1 Background

This Final Stage Impact Assessment (IA) represents a major update of the Consultation IA, which was published alongside the consultation proposals and a report on the proposed updates to the Defra Biodiversity Metric in December 2018.[1] The consultation sought views on whether we should introduce mandatory requirements to the planning system in England, so that development must deliver biodiversity net gain. It also set out proposed next steps for our longer term ambition to embed environmental net gain.

The Consultation IA set out our policy development to date, which includes setting out the strategic context and rationale for intervention, outlining a range of intervention options, and a preliminary cost-benefit analysis for our preferred option **'Mandatory tariff with biodiversity metric'**. We also outlined our evidence gaps to be addressed through the consultation process and further research and analysis. In addition, Natural England published a report on the proposed updates to the Defra biodiversity metric, which includes new consideration of ecological connectivity, improved coverage of habitat types, and a forthcoming spreadsheet-based tool to support the application of the metric in practice.

The Final IA represents a significant update to reflect latest policy development to date, and incorporates information gathered during the consultation. This includes, but is not limited to:

- an overview of the updated biodiversity metric (**Section 2.3.1**)
- detailed description of our chosen policy approach (**Mandatory requirement with biodiversity metric**, see **Section 5**) which has been developed with consideration of the views received through consultation. Further evidence on key policy components (level of net gain and permanence of offsets) is provided in **Annex 3**
- a detailed cost benefit analysis (**Section 6**) on the impacts of biodiversity net gain on residential and non-residential development. It captures a range of costs to businesses, central and local government (including New Burdens Assessment), and the wider public (i.e. natural capital) benefits of habitat creation and avoided habitat loss. Key assumptions are tested through sensitivity analysis (**Section 6.11**), with detailed methodology and calculation steps presented in **Annex 1 and 2**
- updates to the Small and Micro Business Assessment (**Section 7**)
- inclusion of the Justice Impact Test (**Section 8**).

1.2 Summary of consultation period

1.2.1 Overview of activities

The consultation period ran from Sunday 2 December 2018, and closed Sunday 10 February 2019. We received 470 written responses from a range of interested stakeholders including, developers, industry groups, local government, habitat brokers and environmental NGOs. During this period, we also held a policy workshop attended by around 70 experts from the aforementioned stakeholder groups, in collaboration with the Ministry for Housing, Communities and Local Government (MHCLG). Natural England also held a separate conference/webinar on the updated Defra biodiversity metric. We also discussed proposals with several key

[1] https://consult.defra.gov.uk/land-use/net-gain/

stakeholders on a one-to-one basis.

1.2.2 Summary of consultation response

The government response to the consultation was published in July 2019.[2] **Sections 1.2.2.1-6** provide a brief summary of the key conclusions, and we refer to the published document for further details. Policy recommendations from this are incorporated in **Section 5**, and additional evidence is captured throughout.

1.2.2.1 Scope

The response states that the government will:

- legislate in the Environment Bill to require development to achieve a 10% net gain for biodiversity
- not introduce broad exemptions from delivering biodiversity net gain, beyond those exemptions already proposed for permitted development and householder applications such as extensions. Instead, we will introduce narrow and targeted exemptions for the most constrained types of development, and consider process easements for minor developments
- not include nationally significant infrastructure and net gain for marine development within the scope of the mandatory requirement in the Environment Bill.

Analysis of stakeholder responses suggests strong support for a mandatory approach in the consultation responses (>70%) based on a clear requirement delivering a level playing field, process certainty and environmental outcomes. Reservations were raised by a significant minority of developers regarding additional costs and viability on challenging sites, as well as the capacity of local planning authorities (LPAs) to support delivery. Some developers did not express these concerns, but instead used the response to reiterate requests that the final policy be robust and that the requirement must be defined clearly.

The consultation proposed including all Town and Country Planning Act 1990 (TCPA)[3] development, excluding nationally significant infrastructure, permitted development and householder applications. Consultation responses generally opposed wide exemptions (aside from householder applications such as extensions, conservatories, garages), with some support for process easements for small developments. A small number of consultation responses raise general concerns about the viability of post-industrial sites and capacity to bear additional costs, although there was little or no quantitative or anecdotal evidence presented to substantiate these concerns.

1.2.2.2 Measuring biodiversity

The response states that the government:

- will use the Defra biodiversity metric to measure changes to biodiversity under the 10% net gain requirements established in the Environment Bill
- does not intend to exclude any development from the application of the mitigation hierarchy, or from the incentives for delivering any necessary compensation on site or

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819823/net-gain-consult-sum-resp.pdf

[3] https://www.legislation.gov.uk/ukpga/1990/8/contents

locally. Government will instead use guidance to stress the need for planning authorities to continue to be proportionate in their application of planning policy.

Stakeholders broadly supported a clear and consistent requirement for a percentage gain, however some questioned the evidence base for 10% while often accepting any single figure is necessarily arbitrary to some extent. NGOs broadly call for 20+% gain, some developers have asked for a 1-5% requirement, and/or a minimum requirement subject to testing and review. Evidence on the implications of 5/10/20% net gain is captured in **Annex 3**, and subject to sensitivity analysis in **Section 6.11.**

There was general consensus that the Defra metric is the best means of setting obligations, and that the recent update is helpful. There was a general call for further guidance in how to use the metric. Many respondents wanted to see it become more robust (and possibly onerous) with regard to species impacts and wider natural capital effects.

1.2.2.3 Delivering biodiversity outcomes

The response states that the government will:

- will introduce new duties to support better spatial planning for nature through the creation of Local Nature Recovery Strategies (LNRSs)
- provide data, guidance and support but each LNRS will be produced locally, with a relevant public body appointed as the responsible authority by the Secretary of State
- require net gain outcomes, through habitat creation or enhancement as part of delivering mandatory biodiversity net gain, to be maintained for a minimum of 30 years, and will encourage longer term protection where this is acceptable to the landowner
- (following a separate consultation) legislate for the creation, monitoring and enforcement, modification and discharge of conservation covenants. Conservation covenants are private, voluntary agreements that can secure long-term conservation and environmental benefits, with obvious potential application for net gain.

There was strong stakeholder support for net gain activities and planning decisions more broadly to be guided by a strategic nature improvement framework at a local level. Such a framework should include baseline habitat maps and other relevant environmental information so that net gain actions can make the greatest contribution towards nature improvement priorities, and that there is effective coordination / planning to help ensure this is realised in practice.

1.2.2.4 Calculating and delivering net gain compensation

The response states that the government will:

- not introduce a new tariff on loss of biodiversity, in recognition of respondents' preference for the local collection and spending of net gain compensation, as well as concerns about the potential bureaucracy inherent in a new charging scheme
- address the risk that the market supply of habitat creation will not meet demand by providing a supply of statutory biodiversity credits into the compensation market.

The consultation presented a range of options on different aspects of tariff design and an indicative range of tariff costs. Many respondents favoured local operation of the tariff, principally with the view that the tariff should ensure it delivers benefits to local communities

affected by development. Respondents were largely indifferent about the mechanism itself as long as spending is accountable and ring-fenced for biodiversity projects.

1.2.2.5 Delivering net gain in the planning system

The response states that the government will:

- make provision in the Environment Bill to set a transition period of two years
- quantify any additional burdens on local authorities as a result of biodiversity net gain, and will work with local authorities and professional organisations to make sure that planning authorities have access to the right training, ecological expertise and systems required to deliver biodiversity net gain.

Our consultation proposed a transition period of at least one year, and asked about the benefits of doing so. Several respondents, including LPAs and professional associations as well as developers, requested a longer transition period (e.g. at least 2-3 years) before implementation to accommodate training and land purchase cycles. The suggested transition periods also varied in structure, with some suggesting an initial 0% (no net loss) or 5% requirement that increased to 10% after 5 years.

1.2.2.6 Enforcement, monitoring and evaluation

The response states that the government will:

- work with local authorities to make sure that any reporting mechanisms align with existing processes as far as possible, and that guidance and support are available
- establish a publicly available habitat register of compensatory habitat sites that is regularly updated
- continue to explore what technological or other innovative mechanisms could facilitate the delivery and monitoring (at a local and national scale) of biodiversity net gain both now and in the future as technologies develop, and will provide clear guidance to support implementation
- not introduce new enforcement mechanisms for net gain; enforcement will be through the planning system.

Our consultation proposed that we introduce monitoring of the quality of delivery on the ground and measures to help ensure that outcomes are achieved. Many responses were clear that robust monitoring, for an appropriate length of time, would be key to ensuring effective delivery of net gain. There was strong support for local authorities being required to provide information on habitat losses and gains, but we also heard that those responsible for monitoring, whether local authorities or national bodies, will need the right funding and expertise in place to ensure they can deliver. We heard that data collection and reporting mechanisms should be straightforward and consistent across all local authorities, and that there would be advantages to aligning monitoring with existing local authority processes.

2 Problem under consideration

2.1 The strategic context: 25 Year Environment Plan

The UK Government's 25 Year Environment Plan (25YEP) sets out how the government will achieve its ambition to leave the environment in a better state than it inherited it for the next generation.[4] As we leave the European Union, we have a once-in-a-generation chance to change our approach to managing our land so that we secure and enhance the benefits of the environment far into the future. The 25YEP puts forward new approaches, which recognise good practice, to using and managing land sustainably that build up and bolster natural assets. It will account for the negative effects of various land uses and activities, and require a balance of incentives and regulations. This will influence decisions so that we use land in a way that supports cost-effective sustainable growth.

The 25YEP recognises government ambitions in housebuilding, as set out in the Housing White Paper.[5] The Autumn Budget 2017[6] announced a package of measures designed to raise housing supply (300,000 new homes per year by the middle of next decade), which would represent a major increase compared to recent trends (see **Section 2.2** for more information). This is in addition to significant infrastructure investment in transport, energy and utilities, outlined in the National Infrastructure and Construction Pipeline.[7] While these have considerable importance for people's lives and economic growth, this development represents a significant land use change and will directly impact the environment.

In addition, the 25YEP sets out commitments on protecting and restoring nature, given the significant habitat loss over the last 50 years. This is driven in large part by historic land use change and pollution. To help leave the environment in a better condition for the next generation, we need to restore and create areas of wetland, woodland, grassland and coastal habitat to provide the greatest opportunity for wildlife to flourish and to promote the wider economic and social benefits that healthy ecosystems offer. The 25YEP sets out commitments for publishing a new strategy for nature (building on Biodiversity 2020[8] commitments), developing a Nature Recovery Network, and introducing conservation covenants.[9] Finally, the 25YEP recognises that there is unequal access to nature and green spaces, and sets out commitments to better connect people with the environment to improve health and wellbeing.

Overall, the aim is to put the environment at the heart of planning and development to create better places for people to live and work, whilst supporting government's wider objectives on nature development.

2.2 Trends in development and land use change

With a land surface of 13 million hectares, England is the largest country of the United Kingdom (53.5% of the UK land area). It is also home to more than 55 million people, making it one of the

[4] https://www.gov.uk/government/publications/25-year-environment-plan

[5] https://www.gov.uk/government/collections/housing-white-paper

[6] https://www.gov.uk/government/publications/autumn-budget-2017-documents

[7] https://www.gov.uk/government/publications/national-infrastructure-and-construction-pipeline-2018

[8] https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services

[9] https://www.gov.uk/government/news/gove-unveils-new-covenants-to-protect-nature

most densely populated countries in Europe. Uplands cover approximately 17% of England, improved agricultural land covers 52%, woodland 10%, and urban areas 11%.[10]

Development for housing, commercial, industry, and infrastructure makes a significant contribution to land use change and to the loss of natural habitats that reduces biodiversity. The State of Nature Partnership rates development as one of the greatest pressures on biodiversity, with significant losses in biodiversity, including the extent and quality of habitat, over the past 50 years.[11,12] Furthermore, habitat loss often occurs most rapidly near urban populations, where natural capital is most valuable. 'Natural capital' refers to the physical natural resources and the benefits that these resources provide through ecosystem services. Ecosystems provide many services which contribute to human well-being, such as food, water, air filtration and recreation.[13]

2.2.1 Recent trends in land use and housebuilding

Recent trends in land use change and house building (i.e. net additional dwellings) in England are shown in **Tables 1, 2, 3** and **4**.

Table 1: Average annual land use change in England between 2013-14 and 2016-17 (hectares)

	Land use changing to:	
Land use changing from:	Developed Uses (ha)	Non-Developed Uses (ha)
Developed Uses (ha)	13,700	4,400
Non-Developed Uses (ha)	15,900	111,700

Total average annual land use change (ha)	**145,700**

All figures are rounded, so sub-totals may not equate to stated totals and averages.

Definitions

- **Developed land use:** This includes, but not limited to: residential, transport, utilities, industry, commerce, defence and community buildings.
- **Non-developed land use:** This includes: agriculture land and buildings, forestry and woodland, rough grassland and bracken, natural and semi-natural land, water, outdoor recreation, vacant land not previously developed, residential gardens, and undeveloped land in urban areas.

Data source

MHCLG, Live tables on land use change statistics, Table P360. https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics

Table 2: Annual land use change to developed uses in England (hectares)

Year	**Residential** (ha)	**Industry and Commerce** (ha)	**Transport and utilities** (ha)	**Other** (ha)	**Total** (ha)
2013-14	3,600	7,100	2,400	13,900	**26,900**
2014-15	4,800	8,300	2,800	20,200	**36,200**
2015-16	4,600	5,800	3,700	14,700	**28,800**
2016-17	6,000	5,200	2,900	12,300	**26,300**
Annual average	4,700	6,600	3,000	15,300	**29,600**[1]

All figures are rounded, so sub-totals may not equate to stated totals and averages. Data from Table P351 - see **Table 1** for sources and definitions. [1]*annual average is equivalent to the sum of changes to "developed uses" column in Table 1 (13,700 + 15,900 = 29,600).*

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/673492/25-year-environment-plan-annex1.pdf. All data in this paragraph is taken from the 25YEP evidence report. Please see Section 2.6 on land, soil and geological assets.

[11] https://www.rspb.org.uk/globalassets/downloads/documents/conservation-projects/state-of-nature/state-of-nature-uk-report-2016.pdf

[12] http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx. See Chapter 4 on biodiversity in the context of ecosystem services.

[13] https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/naturalcapital.

Table 3: Land use change from non-developed to developed uses in England (hectares)

Year	**Residential** (ha)	**Non-residential** (ha)	**Total** (ha)
2013-14	2,100	11,400	**13,500**
2014-15	3,100	18,400	**21,400**
2015-16	3,300	12,100	**15,400**
2016-17	3,300	9,700	**13,100**
Annual average	3,000	12,900	**15,900**[1]

All figures are rounded, so sub-totals may not equate to stated totals and averages. Data from Table P361 - see **Table 1** for sources and definitions. [1]*annual average matches with non-developed to developed used average (15,900) in Table 1.*

Table 4: Net additional dwellings in England

Year	Per Local Authority	All Local Authorities
2012-13	385	124,700
2013-14	420	136,600
2014-15	525	170,700
2015-16	580	189,600
2016-17	665	217,300
2017-18	680	222,230
Annual Average	545	176,900
% change over whole period (2012-13 to 2017-18)		78.2%
% annual change (2012-13 to 2017-18)		12.2%

All figures are rounded. Reflects net additional dwellings for all 326 local authority districts in England. The range of net dwellings delivered varies considerably across local authorities and over the period analysed.

Data source

MHCLG, Live tables on housing supply: net additional dwellings, Table LT122.
https://www.gov.uk/government/statistical-data-sets/live-tables-on-net-supply-of-housing

Recent trends show that:

- although average annual land use change is around 145,700 ha (similar to the size of Greater London, or around 1% of total England land area),[14] around 75% of this change is within non-developed uses (111,700 ha per annum)
- over three times more non-developed land is developed annually on average (15,900 ha) compared to vice versa (4,400 ha
- 4,700 ha of land is developed for residential uses annually, an area equivalent in size to that within the boundaries of the local authority of Exeter.[15] Around 65% of that (3,000 ha per annum) takes place on previously non-developed land;
- average annual land use change to all developed uses is 29,600ha, an area similar in size to that within the boundaries of the local authority of Milton Keynes.[16] Around 55% of that (15,900 per annum) occurs on previously non-developed land

[14] https://ons.maps.arcgis.com/home/item.html?id=a79de233ad254a6d9f76298e666abb2b. ONS, Standard Area Measurements (SAM) for the administrative areas in the United Kingdom as at 31 December 2016. The size of Greater London is 157,351 ha, based on the sum of Inner London (31,928 ha) and Outer London (125,423 ha). 145,700 ha (annual average land use change) divided by 13,046,190 ha (total England land area) is 0.8%.

[15] https://ons.maps.arcgis.com/home/item.html?id=a79de233ad254a6d9f76298e666abb2b. ONS, Standard Area Measurements (SAM) for the administrative areas in the United Kingdom as at 31 December 2016. The size of the local authority of Exeter is 4,704 ha.

[16] https://ons.maps.arcgis.com/home/item.html?id=a79de233ad254a6d9f76298e666abb2b. ONS, Standard Area Measurements (SAM) for the administrative areas in the United Kingdom as at 31 December 2016. The size of the local authority of Milton Keynes is 30,863 ha.

- house building has increased significantly (12.2% per year) in the last 6 years, and is set to increase further in line with government ambitions.

Development on previously non-developed and developed uses has different impacts on the environment. **Section 2.3.1** discusses how the biodiversity impact specifically can be measured, and **Table A1.1** in **Annex 1** provides estimated scores using this method for the land use types in **Tables 1-3**.

2.2.2 Land cover map analysis

We presented provisional geospatial analysis in the consultation IA,[17] where Land Cover Map[18] data to assess habitat loss from urban development between 2007 and 2015. One of the early conclusions was that while the majority of individual habitat loss from urban development tends to be at the micro level (less than 1ha or 0.01km^2 level), this has occurred in a very large number of areas across England.

We have carried out further analysis[19] to increase our understanding of the habitat baseline (one of our evidence gaps), the distribution of development sizes (e.g. minor and major development[20]), and spatial variations in habitat losses. We also used postcode data to verify the non-urban to urban land cover changes, which reduces the risk of classification errors.[21] The key conclusions, which build on existing land use change statistics presented in **Section 2.2.1** are:

- the majority of urban expansion has taken place on land that was previously farmland (arable and pasture). Other semi-natural land cover types such as broadleaved woodland and rough grassland have also been lost, but not to the same extent as farmland. The analysis also shows that the types and amount of habitat loss to urban development varies between regions
- around 80% of land use change from non-urban to urban land cover are from developments that are between 0.5 and 20 ha in size. In other words, the majority of the non-urban to urban land cover change is due to major developments
- individual cases of habitat loss are small in scale (less than 0.5 ha) but many in number. However, this makes up a small proportion of land use change (less than 20% of total area change) during the period overall
- by using the postcode data to verify non-urban to urban land cover changes, the aggregate land cover change to urban development over the period is within the bounds of the MHCLG land use change statistics,[22] demonstrating the robustness of the approach.

Some additional analysis was carried out on habitat losses in urban conurbations (i.e. built-up areas) - areas where natural capital is most valuable as it is close to people (e.g. for recreation, health and wellbeing). Early analysis suggests habitat losses within the urban boundary are proportionately higher when compared to their respective region as a whole, which captures

[17] https://consult.defra.gov.uk/land-use/net-gain/supporting_documents/181121%20%20Biodiversity%20Net%20Gain%20Consultation%20IA%20FINAL%20for%20publication.pdf. Please see Section 1.2 (page 5).

[18] https://www.ceh.ac.uk/services/information-products. Land Cover Map 2007 and 2015, available from the Centre for Ecology & Hydrology.

[19] Internal Defra, Natural England and Joint Nature Conservation Committee analysis of Land Cover Map data.

[20] See **Table 29** in **Section 7.1** for definitions of minor and major developments.

[21] Where changes in land cover are as a result of misclassification (e.g. an urban area is incorrectly classified as grassland in the 2007 map, but not in the 2015 one), as oppose to real changes in land cover (e.g. a previous area of grassland in 2007 is now an urban area in 2015).

[22] https://www.gov.uk/government/collections/land-use-change-statistics

both rural and urban areas. However, this aspect of the analysis has significant methodological limitations. Work is ongoing to improve the robustness of the methodology and conclusions, and to incorporate other datasets to provide further insights.

2.2.3 Conclusions

Considering recent trends, and in light of the strategic context (300,000 new homes per year by the middle of next decade), pressure on land, habitat and biodiversity is likely to increase. The land cover map analysis shows that previous losses are not only frequent, but also diverse in terms of habitat type and variation across regions. The trends support the necessity of the 25YEP ambitions (outlined in **Section 2.1**) to preserve and enhance nature and create better places for people, and to help reverse recent declines in nature by alleviating the pressure from development.[23,24]

2.3 Net gain and development

The National Planning Policy Framework[25] (NPPF) provides protections for important sites and wildlife (e.g. Sites of Special Scientific Interest (SSSIs), species licensing), and makes provisions for the delivery of biodiversity net gain. The government recently published a revised version of the NPPF, which strengthens policy wording on biodiversity net gain[26,27] as well as incorporating policy proposals from the Housing White Paper and Planning for the right homes in the right places.[28] The consultation proposals published in December 2018 sought views on introducing mandatory requirements to the planning system in England so that development must deliver biodiversity net gain.

2.3.1 Definitions: Biodiversity net gain and the metric

Biodiversity net gain in development is a means of ensuring that, for a given site, there is an overall increase in habitat area or quality following a new development. This is often assessed using a metric, such as a Defra biodiversity metric,[29] which uses habitats as a proxy for biodiversity. It was originally designed to support the offsetting pilots,[30] which ran between 2012 and 2014.

At consultation, Natural England published a proposed update to the metric,[31] which is an improved version of the metric piloted by Defra in 2012 and incorporates many of the changes since made or requested by industry experts. Since then, Natural England have published a 'beta' version of the metric called the 'The Biodiversity Metric 2.0' to enabled wider user testing.[32] The beta was developed with input from a wide range of interested stakeholders (e.g. NGOs, developers, land managers, government agencies).

---

[23] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[24] https://www.nationaltrust.org.uk/documents/assessing-the-costs-of-environmental-land-management-in-the-uk-final-report-dec-2017.pdf. A joint report by the Natural Trust, RSPB and The Wildlife Trusts estimate the annual need for habitat creation is around 27,000 ha.

[25] https://www.gov.uk/government/publications/national-planning-policy-framework--2.

[26] https://www.gov.uk/government/publications/national-planning-policy-framework--2. Key references in paragraph 8, 32, 170(d), 174(b), and 175(a).

[27] http://webarchive.nationalarchives.gov.uk/20180608214848/https://www.gov.uk/guidance/national-planning-policy-framework/11-conserving-and-enhancing-the-natural-environment. The previous NPPF refers to biodiversity net gain in paragraph 109: "*...minimising impacts on biodiversity and providing net gains in biodiversity where possible".*

[28] https://www.gov.uk/government/consultations/planning-for-the-right-homes-in-the-right-places-consultation-proposals

[29] https://www.gov.uk/government/publications/technical-paper-the-metric-for-the-biodiversity-offsetting-pilot-in-england

[30] https://www.gov.uk/government/collections/biodiversity-offsetting

[31] http://publications.naturalengland.org.uk/publication/6020204538888192

[32] http://publications.naturalengland.org.uk/publication/5850908674228224

Using the metric, biodiversity scores are calculated (usually by the developer or an appointed consultant) for pre-development habitats by assessing:

- **area:** simply the area, generally in hectares, that the habitat occupies

- **distinctiveness:** whether the habitat is of high (e.g. native broadleaf woodland) or low (e.g. improved/amenity grassland) value to wildlife. This is scored between 0 (very low distinctiveness) and 8 (very high distinctiveness)

- **condition:** whether the habitat is a good example of its type. For example whether a woodland is in peak condition (which might mean it can better support rare species) or whether it is full of invasive species or is overcrowded. This is generally scored between 1 (poor condition or agricultural) and 3 (good condition)

- **strategic significance:** gives extra value to habitats that are located in optimal locations to meet biodiversity and other environmental objectives. This could include areas identified as suitable for protected species compensation. This is scored between 1 (low strategic significance) and 1.15 (high strategic significance)

- **habitat connectivity:** the relationship of a particular habitat patch to other surrounding similar or related semi-natural habitats, which could be facilitating flows of species and ecosystem services. This is scored between 1 (low connectivity) and 1.15 (high connectivity).

The scores for post-development habitats are estimated by accounting for the characteristics above, as well as additional factors to account for the risk[33] associated with creating, restoring or enhancing habitats:

- **difficulty of creating and restoring habitat:** recognises how difficult it is to create or restore a given habitat type and the related uncertainty of outcome this creates. The level of risk will differ between habitat types because of ecological factors and the availability of techniques or know-how to create habitats in a realistic timeframe. This is scored between 0.1 (very high difficulty) and 1 (very low difficulty)

- **spatial risk (i.e. location relative to development):** a simple reflection of the fact that habitat created at a great distance from the site of habitat losses carries a risk of depleting local areas of natural habitats and of depriving the communities experiencing development of the associated benefits. This is scored between 0.5 (compensation outside local authority of impact site), and 1 (compensation deemed sufficiently local to impact site)

- **temporal risk (i.e. time to target condition):** If there is a mismatch between a negative impact on biodiversity and compensation habitat reaching the required quality or level of maturity, there will be a loss of biodiversity for a period of time. This is scored between

[33] Risk multipliers are less relevant in cases where habitats is created in advance of the development (e.g. via a habitat bank).

0.343 (30 years) and 0.965 (1 year) where the values reflect time discounting at 3.5% as recommended by the HM Treasury Green Book.[34]

To achieve net gain, a development must have a higher biodiversity unit post-development compared to the baseline score pre-development. However, there are a number of underlying principles and rules when using the metric:

- **the use of the metric does not change wider policy or the existing protections afforded to biodiversity**: existing levels of protection afforded to protected species and to habitats (such as irreplaceable and statutory designated sites) are not affected by the use of this metric

- **the metric sits within a decision framework based on the mitigation hierarchy.[35]** It informs decision-making where application of the mitigation hierarchy and good practice principles indicate that compensation for habitat losses is justified

- **the metric is a proxy for biodiversity.** While it is underpinned by ecological evidence, the metric measures habitats and is only a proxy for biodiversity. It has been kept deliberately straightforward to make it of practical use and maintain transparency

- **the metric focuses on habitats.** It is considered a suitable proxy for widespread species found in typical examples of different habitats. Scarce and protected species are likely to need separate consideration to the biodiversity metric

- **the metric recognises the importance of place and connectivity.** It seeks to enhance biodiversity in the locality of impacts so far as possible as well as contributing to wider ecological networks by creating more, bigger, better and joined areas for biodiversity, in line with the Lawton principles[36,37]

- **the metric is used consistently and informs decisions.** Decisions and management interventions should be based on a consistent use of the metric, as well as expert ecological advice and other relevant factors (e.g. habitat significance, relevant planning policies)

- **compensation for habitat losses can be provided by creation and by restoration or enhancement of existing habitats.** Measures taken to improve existing habitats must provide a significant and demonstrable uplift in distinctiveness and/or condition

- **'trading down' is not permitted.** Newly created or restored habitats should result in an improvement in the extent or quality of the habitat affected. New or restored habitats should aim to achieve a higher distinctiveness and / or condition than those lost. At no

[34] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[35] https://www.gov.uk/government/publications/national-planning-policy-framework--2. Please see paragraph 175(a) which states: *"if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused".*

[36] https://www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today

[37] https://webarchive.nationalarchives.gov.uk/20130402170324/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf

time should compensation measures result in “trading down” of habitat of high distinctiveness with creation or restoration of a habitat of a lower distinctiveness

- **differences in size between impacted site and compensation habitat is permitted using the metric.** A difference can occur because of a difference in quality. For example, if a habitat of low distinctiveness is impacted and is compensated for by the creation of habitat of high distinctiveness, the area needed to compensate for losses can theoretically be less than the area impacted. If a habitat of high distinctiveness is lost, a greater area may be required in compensation to address the temporary loss of habitat and risk of habitat creation failing (through multipliers in the biodiversity metric)

- **local and special characteristics need to be considered**. Those creating and restoring habitats should aim to replicate the characteristics of the habitats that have been lost to achieve a similar community of characteristic species, and to take account of particular species in a locality that give habitats their local distinctiveness.

The developer conducts a baseline assessment of the development site using a biodiversity metric. For example, if a developer were to build on 1 ha of woodland the following might apply:

Figure 1: Pre-development biodiversity score

Size of habitat parcel	x	Distinctiveness	x	Condition	x	Strategic location	x	Connectivity	=	**Biodiversity units**
1 ha	x	6 (high)	x	3 (good)	x	1.10 (moderate significance)	x	1.15 (high connectivity)	=	**22.8**

The above is based on principles of the Defra biodiversity metric methodology and is strictly illustrative.

Assuming that the local authority would require developers to provide 10% net gain, the developer therefore needs to achieve a total of 25 biodiversity units. The developer can undertake a number of actions to satisfy this requirement including:

- changing the spatial configuration of the site to retain more habitat
- improving the condition or size of the woodland on site
- finding a local site on which to enhance / create equal or more valuable habitat (possibly another of the developer’s sites)
- paying compensation (i.e. a tariff) to a habitat delivery body.

Assuming the developer decides to create compensatory habitat on- or off-site, **Figure 2** demonstrates how the risk factor reduces the biodiversity score for the creation of 1 ha of new woodland habitat with the same attributes set out in **Figure 1**.

Figure 2: 1 ha of habitat creation of similar quality

Previous score (from **Figure 1**)	x	Time to target condition	x	Difficulty	x	Spatial risks	=	**Biodiversity units**
22.8	x	0.343 (30 years)	x	0.67 (medium)	x	1 (habitat is local to site)	=	**5.2**

The above is based on principles of the Defra biodiversity metric methodology and is strictly illustrative.

The implication here is that for every 1 ha of habitat lost, more than 1 ha of the same habitat would need to be created to compensate. In this scenario, 4.8 ha of new woodland would be required to achieve the total biodiversity units owed to achieve a net gain in biodiversity.[38] It should be noted that this example describes an atypical (and undesirable) loss of distinctive (but not irreplaceable) habitat that would in practice likely be avoided, and that the area ratio of 4.8 to 1 is therefore higher than it would be for the loss of less distinctive habitat.

2.3.2 Current policy and practice

Net gain is implemented in various ways by local planning authorities (LPAs).[39] In most cases net gains are sought in a discretionary manner through LPA negotiation, and usually secured through conditions and Section 106 (S106) agreements.[40] This can create uncertainty for developers, who are unable to plan accurately to meet requirements, and who can face requests for additional surveys or modifications later in the process due to their unfamiliarity with local planning approaches.[41] This sometimes becomes a protracted negotiation, with staggered design changes and reporting requirements throughout the scheme's delivery.

At consultation, two of the significant reasons respondents cited in support of a mandatory approach (that it will create a level playing field for developers and that consistency could increase certainty thereby saving time and money) reflect these issues in the current system. An industry body, reflecting the views of its members, stated the following as part of their written consultation feedback:

> *"The virtues of simplicity and consistency in any approach to net gain have been strongly emphasised, providing potential efficiency savings for developers and consultants. We agree that the existing system and obligations surrounding biodiversity are unclear and cumbersome, and we believe current proposals represent a significant improvement."*

To provide consistency, a small number of LPAs, including Warwickshire and Lichfield, have introduced mandatory net gain policies. Other public and private bodies have also created voluntary policies.

2.3.2.1 Public infrastructure bodies

Network Rail[42] has implemented a net positive biodiversity scheme for their major infrastructure projects. Examples of application are the Bermondsey Dive Under Project, the Thameslink programme and a commission for WSP Parsons Brinckerhoff to implement 10% biodiversity net gain for phase 2 of the East West Rail project. Highways England[43] has committed to no net loss in biodiversity by 2020 and a net gain by 2040.

---

[38] The previous score (22.8) is multiplied by 1.1 to account for 10% net gain, then divided by the biodiversity unit value of 1 ha of newly created woodland (5.2). Therefore, (22.8*1.1) / 5.2 = 4.8.

[39] Local planning authorities are the public authority whose duty it is to carry out specific planning functions in a particular area. The planning system includes three tiers of local government in England, but in this instance the focus is on district councils and London borough councils (whether two tier or unitary authorities) as Local Planning Authorities (county councils, Broads authority, national park authorities and the Greater London Authority are identified separately).

[40] Refers to Section 106 of the Town and Country Planning Act 1990. This is the primary legislation under which local planning authorities are able to secure planning obligations as a signed agreement between the developer and the LPA.

[41] https://webarchive.nationalarchives.gov.uk/20121029113805/http://www.communities.gov.uk/documents/507390/pdf/1436960.pdf. Figure 18 (page 52) highlights a number of factors that affect development management which can cause delays. Those identified by developers include: authorities seeking unrealistic obligations in Section 106 agreements; capacity of planning departments; and unclear local planning policies. Those identified by LPAs include quality of applications and capacity of planning departments.

[42] https://www.cieem.net/news/161/network-rail-launch-first-net-positive-biodiversity-offset-scheme

[43] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf

2.3.2.2 Industry

Of the nine largest housing developers (which together account for 52% of residential completions), six have some form of habitat mitigation and creation policy,[44] ranging from partial to comprehensive. These six account for an estimated 29% of residential completions in England.

Redrow and Barratt have developed net gain policies. Berkley Group[45] committed in May 2017 to provide on-site net gain in biodiversity, stating that "*there will be more nature on every site afterwards than before we began"* and *"Of the developments that completed during 2016/17, 86% were on brownfield land and 91% incorporated features designed to enhance ecology".* For non-residential development, an average 15.4% of sites assessed between 2000 and 2012 achieved BREEAM (Building Research Establishment Environmental Assessment Method) excellent rating, a score which requires scoring very highly across a range of criteria including biodiversity.[46]

In 2016, Balfour Beatty, Construction Industry Research and Information Association (CIRIA), Institute of Environmental Management & Assessment (IEMA) and Chartered Institute of Ecology and Environmental Management (CIEEM) created a set of good practice principles.[47] These emphasise the mitigation hierarchy, funding long-term management, and true additionality. Balfour Beatty is already applying a net gain model and in April 2018 published *A Better Balance: A Roadmap to Biodiversity Net Gain.*[48]

A UK Green Business Council (UKGBC) report, *'Insights into Nature and Biodiversity: Industry trends, commitments and best practice examples'*[49] features a snapshot of current ecological metrics; an overview of the UK policy context; and best practice examples of the integration of biodiversity into development. It also features key learnings from the charity's Gold Leaf members, a group of high-profile construction and property businesses committed to being at the leading edge of sustainability. Headline findings include:

- in 2018, 22% of UKGBC's Gold Leaf members had a commitment to biodiversity net gain (up from 9% in 2017)
- 44% of UKGBC's Gold Leaf members have a nature and biodiversity strategy in place.

UKGBC also comment that *"increased natural space can increase property and land values by as much as 25%"*.[50] In addition: *"developments with biodiversity strategies have a greater chance of planning approval from local authorities, enjoy greater inward investment and faster property sales, and even reduced building energy costs"*.

Currently, there is no formal mechanism for monitoring whether net gain negotiated through planning consents is delivered in practice. There is data on the value of environmental improvements secured through S106 agreements, worth £115m in 2016-17.[51] However, there is

---

[44] Completion figures and policies taken from 2017 annual reports from Barratt, Bellway, Berkley, Bovis, Crest Nicholson and Redrow.

[45] https://www.berkeleygroup.co.uk/sustainability/sustainable-development-goals

[46] https://tools.breeam.com/filelibrary/Briefing%20Papers/BREEAM-Annual-Digest---August-2014.pdf

[47] https://www.cieem.net/data/files/Publications/Biodiversity_Net_Gain_Principles.pdf

[48] https://www.balfourbeatty.com/media/317352/balfour-beatty-a-better-balance-a-roadmap-to-biodiversity-net-gain.pdf

[49] https://www.ukgbc.org/news/ukgbc-launches-insights-into-nature-and-biodiversity-in-built-environment-at-major-industry-event/

[50] https://www.ukgbc.org/news/ukgbc-launches-insights-into-nature-and-biodiversity-in-built-environment-at-major-industry-event/

[51] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685301/Section_106_and_CIL_research_report.pdf See Table 3.1.

no breakdown of this sum by type and location of improvement or on the losses that trigger these contributions. This means it is difficult to determine whether net gain is delivered or whether small losses in habitat add up to a significant loss of habitat, both at a local and national level.

2.3.2.3 International current practice

Currently, 69 countries have a national policy in place or under development for biodiversity offsetting.[52] In 2016 France introduced a law requiring no net loss.[53] German law has required avoidance and mandatory offsetting since 1976.

Several territories in Australia have offsetting laws,[54] including Victoria's 14-year-old system of mandatory traded offset credits. A consultation paper shows that this has improved developer behaviour - developers cite 'reducing offset costs' as a major reason for their actions to minimise biodiversity impacts.[55] Habitat banks sell 'over the counter' credits, and developer reports suggests this has streamlined the process.

Wetland habitat compensation has been mandatory in the USA since 1972. There is a developed credits-based system with over 1,000 wetland banks. Third parties also help developers with the offsetting process.[56]

2.4 Summary of key issues

The evidence shows a lack of policy certainty and regulatory 'level playing-field' for delivering net gain – that is to say that there is a wide variation in how developers, industry bodies and LPAs have adopted net gain policies (some have clear policies, while many do not). The inconsistencies can also create delays and uncertainty for developers. The lack of policy certainty is specifically cited by planners and ecologists when discussing barriers to delivering net gain. While there is some adoption of net gain approaches, it is unlikely to be sufficient to deliver net gain at a national level. The recent trends outlined in **Section 2.2** demonstrate the contribution of development to the overall loss and damage of habitat, biodiversity and other environmental goods due to development.[57,58]

Furthermore, the current government ambitions on house building and infrastructure are likely to accelerate land use change, with implications for habitat and the wider environment. Placing the environment at the heart of planning and development will support our 25YEP ambition to create better places for people to live and work, as well as the wider government agenda on house building and infrastructure.

---

[52] http://www.wsp-pb.com/GlobalN/UK/WSP%20Biodiversity%20whitepaper.pdf

[53] http://www.environmentbank.com/news/post.php?s=2016-10-15-frances-new-biodiversity-law

[54] Biodiversity Offsetting Green Paper, 2013

[55] http://www.wsp-pb.com/GlobalN/UK/WSP%20Biodiversity%20whitepaper.pdf

[56] http://www.wsp-pb.com/GlobalN/UK/WSP%20Biodiversity%20whitepaper.pdf

[57] https://www.rspb.org.uk/globalassets/downloads/documents/conservation-projects/state-of-nature/state-of-nature-uk-report-2016.pdf

[58] http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx . See Chapter 4 on biodiversity in the context of ecosystem services.

3 Rationale for intervention

This section outlines the key market failures with reference to supporting evidence in **Section 2**, and summarises the government's rationale for intervention.

3.1 Public goods

Definition: *goods and services that are non-rivalrous and non-excludable are subject to non-provision by the market alone.*

Habitats are a major component of our natural capital, with the biodiversity they support underpinning the delivery of many ecosystem services.[59] Many ecosystem services are non-excludable (i.e. you cannot prevent someone else enjoying the benefits of carbon sequestration) and non-rivalrous (i.e. the benefit you derive from improved water quality does not affect the benefit derived by someone else), and are not usually directly rewarded financially by the market (e.g. if you created one hectare of habitat, you are much more likely to be paid at market rate for habitat creation rather than the full economic value, which would include the environmental benefits). Lack of coordination and incentives leads to significant under provision (or no provision) by the market. Habitat creation is likely to be underprovided by developers, as demonstrated by the inconsistent adoption of net gain approaches across the planning system, and the adverse impact of development on biodiversity to date.

3.2 Externalities

Definition: *there are wider positive (negative) impacts on others which are not taken into account by the individual making the decision, leading to under (over) provision.*

Land use change through development imposes a range of positive and negative environmental externalities (e.g. habitat provision/loss, remediation/pollution) with consequent social and economic impacts. These impacts are not fully internalised in development decisions, leading to a tendency towards habitat loss and other environmental damage. This is demonstrated by historical trends in biodiversity and habitat loss outlined in **Section 2.2**.

Habitat creation and biodiversity deliver ecosystem services (e.g. carbon sequestration, water quality, pollination) that both mitigate negative externalities and deliver positive externalities.[60] While the delivery of net gain has financial costs (e.g. on site habitat creation) and potential financial benefit (e.g. through house prices), the non-financial benefits (i.e. ecosystem services) are not fully internalised in development decisions, leading to under provision. The adoption of net gain policies by some developers, industry bodies and LPAs shows some recognition of the environment in development decisions, but the adoption is inconsistent and not widespread enough for it to be fully internalised.

3.3 Information asymmetries

Definition: *people lack good information about the quality of relevant goods or services which may cause them to make choices that are not in the best interest (i.e. suboptimal) for society as a whole.*

The lack of consistent accounting and reporting of habitat impacts across the planning system means that economically suboptimal choices are more likely to be made. The current system of

[59] http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx. See Chapter 4 on biodiversity in the context of ecosystem services.

[60] http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

inconsistent and optional developer reporting measures reduces market efficiency by creating information asymmetries and increasing transaction costs. For example, LPAs and developers often have different information on site characteristics, expectation and potential for habitat delivery, and development viability (i.e. financial constraints). This is demonstrated by the fact that few LPAs and developers have adopted variations of net gain approaches, with differing uses of the Defra biodiversity metric. In addition, industry guidance that advocates net gain approaches is voluntary.

In summary, full and transparent information on habitat gains and losses is not always supplied to decision makers in the planning system and this asymmetry facilitates habitat loss and environmental damage from development.

3.4 Equity

Definition: *inequalities exist that have not been addressed by the market. Refers to differential impacts on individuals across a range of socioeconomic and demographic characteristics.*

Unequal access to nature and greenspace most affects those who live in the most deprived areas of England.[61] This extends to access where people live as well as visit. This is demonstrated by the variations in net gain approaches across the planning system, which leads to inconsistent provision of on-site (and local) creation of nature and green spaces through developments. This further exacerbates inequality of access to nature.

3.5 Summary

Overall, the provision and conservation of habitats and biodiversity suffer from the above market failures. They are public goods and produce positive externalities whilst mitigating negative externalities produced by development. These characteristics lead to too little new habitat creation and too much habitat loss and damage respectively. The current system of inconsistent and optional developer measures not only fails to internalise the externalities outlined, it also reduces market efficiency by creating information asymmetries and increasing transaction costs, and in some cases may create perverse incentives against creating habitat-rich places.

There is a clear rationale for government to create a level playing field across the planning system, ensuring the socially optimal delivery of habitats, mitigating and preventing unnecessary habitat loss and providing more equitable access to nature.

4 Policy objectives

The primary aim is to secure a measurable improvement in habitats for biodiversity whilst streamlining development processes. A measurable net gain is necessary to achieve both the conservation outcomes (i.e. to improve the environment in a generation) and to deliver the streamlining and community support objectives (i.e. support for development is unlikely to grow if the aggregate impact of development on nature remains negative).[62] Net gains for biodiversity are also already sought, but not always delivered, through planning policy in the NPPF and so any weaker objective would be counterproductive. For further information on why a marginal gain, as opposed to 'no net loss', is required see **Annex 3**.

[61] https://www.gov.uk/government/publications/25-year-environment-plan

[62] http://www.bsa.natcen.ac.uk/media/38952/bsa28_8housing.pdf. See Table 8.3. The survey suggests that improving amenities such as green space and parks is the second best incentive (after employment opportunities) that could persuade those initially opposed to local house building (or uncommitted) to support it.

The objectives that have guided policy development to date are that net gain:

- delivers habitat creation, meeting government's ambition to leave the environment in a better state than it inherited it for the next generation
- is simple, streamlined and certain for developers. It is easy to understand and will not prevent, delay or reduce housebuilding
- is of clear benefit to people and local communities.

A successful policy requiring net gain in habitat from development could correct the market failures outlined in **Section 3**. It would require market participants to internalise the costs and benefits of land use change in decision making and restore and create habitats that add value to society.[63] It would also improve market efficiency through greater transparency and certainty in planning processes, creating a level playing field with standardised requirements and better information, potentially saving developers time and money. Finally, it could facilitate significant growth in the market for offset credits (i.e. habitat banking) to allow 'off the shelf' offsetting, which has potential to be an efficient and scalable option for developers.

5 Policy design

5.1 Background

The consultation IA assessed a range of regulatory and non-regulatory options:

- **Option 0: Business as usual (voluntary approach)**
- Option 1: National schedule tariff
- **Option 2: Mandatory tariff with biodiversity metric (preferred)**
- Option 3: Regulatory approach (no tariff)
- Option 4: Enhanced voluntary approach

We took forward **Option 2** as our preferred option for further development and consultation. **Option 0** was retained for comparison and as a baseline for the cost benefit analysis. Options 1, 3 and 4 were discounted following multi-criteria analysis, which means we did not take forward options that:

- augment or enhance existing voluntary approaches, as this does not support the wider delivery of net gain, provide a level playing field, or adopt the recommendation from the evaluation of the Biodiversity Offsetting pilots for a mandatory approach
- add burdensome regulation(s) that would not easily be mitigated by streamlining processes elsewhere and could potentially add new and unfamiliar processes
- are not compatible with or undermine the mitigation hierarchy.

Following consultation and further policy development, the approach taken forward for the final impact assessment is a **mandatory requirement with biodiversity metric (preferred)**. This approach mandates net gain through the use of a specified biodiversity metric to development in scope of the Town and Country Planning Act 1990 (TCPA).[64] Developers will have the option, once the mitigation hierarchy has been demonstrated, to pay for remaining units through a market for biodiversity units, which will include statutory biodiversity credits provided by

[63] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemserviceaccounts1997to2015. The latest (release date 30th January 2018) partial asset value of UK natural capital is estimated to be £761 billion in 2015.

[64] https://www.legislation.gov.uk/ukpga/1990/8/contents

government. Net gain activities undertaken will contribute to and be part of a wider strategic framework to recover nature at the local authority spatial scale.

For the purposes of demonstrating the costs and benefits of this chosen approach, we assume the baseline comparator is **business as usual,** which assumes that existing voluntary approaches continue, in line with the NPPF.

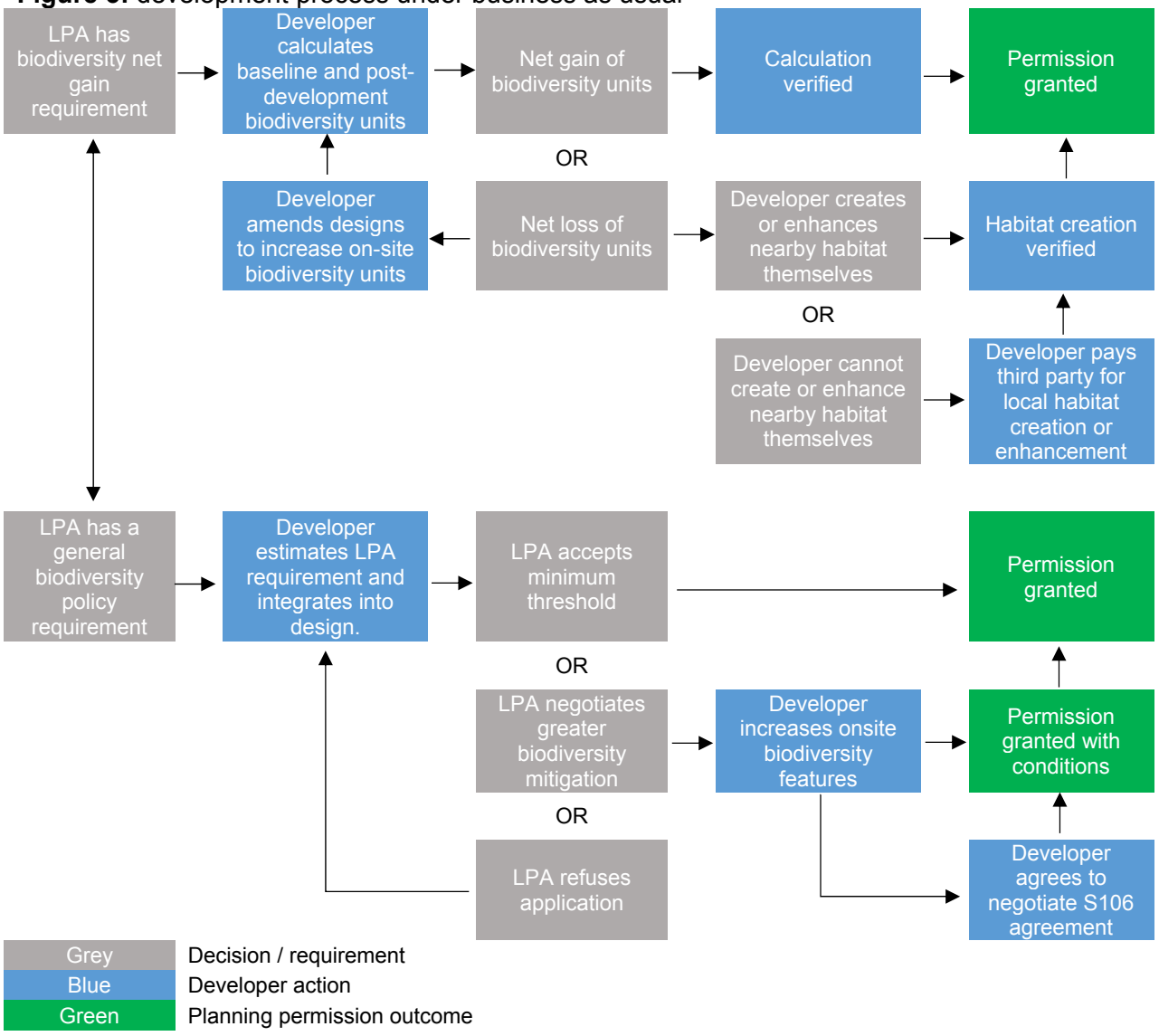
The preferred approach is explained in more detail in **Section 5.2.2**. Variations in policy assumptions (e.g. scope, level of net gain), are tested via sensitivity analysis in **Section 6.11**.

5.2 Description of policy approach

5.2.1 Baseline comparator: business as usual (voluntary approach)

Existing voluntary approaches continue, in line with the NPPF. This strengthened wording drives provision of net gain in the planning system, and supports the use of metrics (albeit not a specific one) by calling for measurable change in biodiversity. The development process is summarised in **Figure 3**.

Figure 3: development process under business as usual



However, many of the issues discussed in **Sections 2 and 3** remain, particularly the lack of a level playing field (under inconsistent requirements, a developer looking to comply fully with planning policy might be outbid for land by a less ambitious or scrupulous developer. Net gain policy and metrics can vary widely across LPA boundaries meaning that process costs are greater for developers and LPAs than in a consistent system). Continuing with business as usual is unlikely to achieve the policy objectives set out in **Section 4**. Furthermore, it would still mean the majority of LPAs have a general biodiversity policy rather than specific requirements to achieve net gain.

5.2.2 Chosen approach: mandatory requirement with biodiversity metric

Delivering net gain for biodiversity is mandated for new development in scope of the TCPA. **Sections 5.2.2.1-6** describes the policy components for this approach. The underlying policy assumptions are:

- mandatory biodiversity net gain is implemented through legislation, to secure biodiversity outcomes when planning permission is granted
- the new requirement will apply to development under the TCPA with exemptions for permitted development, householder development including extensions, some targeted brownfield sites with viability issues. A simplified process will be used for small sites (see **Section 5.2.2.2** for further details)
- a national mandatory level of net gain will be established. Following consultation, we propose that 10% is the right level to demonstrate net gain (see **Annex 3** for further evidence on the level of net gain)
- planning applicants will demonstrate to decision makers that proposals will deliver net gain by providing an assessment that can be scrutinised through the planning process. This will be informed by mandating the use of the Defra biodiversity metric to assess habitats before and after development
- the net gain activities undertaken will contribute to and be part of a wider strategic framework to recover nature at the local authority spatial scale
- development will still follow the biodiversity mitigation hierarchy and the spatial preference is for compensation to be provided near to where losses occur
- outcomes can be delivered on-site, off-site (e.g. via an identified local compensation site) or via payment to government who will provide statutory biodiversity credits into the compensation market , which will go towards local/strategic delivery, in adherence with the mitigation hierarchy
- the policy will apply in **England** only.

Changes to the policy components (e.g. scope, level of net gain) may impact the effectiveness as well as cost and benefits of the policy. Variations in policy assumptions are tested via sensitivity analysis in **Section 6.11**.

5.2.2.1 Scope

Delivering net gain for biodiversity will be mandated for new development in scope of the TCPA. This includes buildings and structures for any use including commercial, industrial, institutional, leisure and housing or other accommodation, where these require permission from local planning authorities.

The scope does not include permitted development[65] such as specific development on infrastructure land by providers (statutory undertakers); it also does not include nationally significant infrastructure, which falls within scope of the Planning Act 2008[66] rather than the TCPA. Developments that would not result in measurable loss or degradation of habitat, for instance change of use of or alterations to buildings, would also not be in scope.

The duty to ensure net gain will apply to all LPAs as defined by the TCPA, which includes (but is not limited to) District Councils, National Park Authorities and various joint planning boards and committees. It will also apply to decisions to grant planning permission by a Secretary of State, at least in some cases, such as on appeal, on call-in and under certain orders.

5.2.2.2 Exemptions

The consultation asked whether exemptions to a mandatory biodiversity net gain policy might be made to developments by size, sector or site location. Some types of development are likely to have a typically smaller effect on biodiversity such as small-scale alterations that do not significantly change habitat cover (e.g. change of use, home extensions not covered by permitted development rights). Permitted development has been granted permission in advance by Secretary of State and the policy does not seek to reverse that decision. Permitted development is not subject to a similar application process to other permissions through which to measure biodiversity impacts and secure gains. These exemptions are outlined in **Section 5.2.2.1** under our chosen approach.

Exemptions have a significant influence on the likely impact and/or effectiveness of the policy. Exemptions would either prevent net gain from being achieved across the system (thereby preclude development from contributing as a whole to government's ambition to leave the environment in a better state) or require other development types to deliver higher gains to offset the exemptions. Exemptions might create additional complexity which in turn may create extra burdens on LPAs in delivering net gain. However, exemptions or process leniencies might reduce costs to business (particularly to small developers) and may reduce viability concerns for certain sites (e.g. sites with marginal viability and substantial constraints).

At consultation, the majority of stakeholders felt that broad exemptions such as those for small or brownfield sites would undermine the effectiveness of the policy in terms of achieving biodiversity outcomes. However, a number of stakeholders expressed support for a form of targeted exemption that might reduce requirements for those sites which are most costly to develop, such as those on post-industrial or contaminated land. Support was also expressed for process easements for small sites that could reduce the administrative burden of responding to the net gain requirement. This issue is further explored in the Small and Micro Business Assessment (**Section 7**), with respect to the interaction between small sites and small and large developers.

In addition to an exemption for permitted development, we have decided to take forward additional exemptions which were cited by consultation respondents as sites where a net gain requirement would add a disproportionate cost or process burden in relation to the environmental outcomes achieved:

- householder development, including extensions

[65] Development does not in all instances require a planning application to be made for permission to carry out the development. In some cases development will be permitted under national permitted development rights. http://www.legislation.gov.uk/uksi/2015/596/contents/made

[66] https://www.legislation.gov.uk/ukpga/2008/29/contents

- some **brownfield sites** with marginal viability and substantial constraints. We expect full details to be set out in secondary legislation but considerations are likely to include where sites contain a high proportion of derelict land and buildings and only a small percentage of the site is undeveloped, land values are significantly lower than average, and the site does not contain any protected habitats.

In addition, government proposes to introduce process leniencies for **small sites** (see **Table 29** in **Section 7.1** for definitions of minor and major development), whereby such sites are accorded a default condition score in the Defra metric of "2", negating the need for small sites to undertake new habitat surveys which might add a disproportionate cost and process burden. Means of managing survey burdens for developments up to a hectare in size, or of fewer than 40 residential units, will also be considered to ensure that significant or disproportionate new administrative requirements are not put in place where this is not justified.

5.2.2.3 Assessment

In practice, LPAs will grant planning permission only when they are satisfied that biodiversity net gain will be achieved alongside construction of development (with habitats to be managed for up to around 25-30 years, see **Annex 3** on permanence). This option assumes that biodiversity net gain is delivered through the following broad mechanisms:

- **scenario A:** the developer is able to avoid significant loss of distinctive habitats, so mitigates and enhances on site
- **scenario B:** The developer is unable to avoid, mitigate and compensate all impacts on site but is able to secure local compensatory habitat creation. This is usually identified by the developer, their consultants, a broker or an LPA. This scenario sits between Scenario A and C
- **scenario C:** The developer is unable to avoid, mitigate and compensate on site and unable to find local compensatory habitat to invest in. The government will provide a supply of statutory biodiversity credits into the compensation market to fund cost-effective habitat creation projects according to local and national conservation and natural capital priorities (see **Section 5.2.2.4** for details).

The aim is to ensure that as a result of any development the number of biodiversity units provided is at least 10% greater than the number of biodiversity units present on the development site prior to development (please see **Annex 3** about why 10% was selected as an appropriate level of net gain). In determining how many biodiversity units are provided as a result of the development, the LPA needs to take account of:

- the number of biodiversity units on site as a result of the development; these include pre-existing units unaffected by the development and new units being created by the developer
- new units provided off site by the developer, either created by them or provided through an agreement with a third party (the expectation is that some form of conservation covenant might also be available to help secure offsite units)
- units for which the developer pays government who will provide for statutory biodiversity credits into the compensation market.

This would apply to both area (e.g. woodland) and linear (e.g. hedgerows) based features as outlined in **Section 2.3.1**.

Achieving a consistent approach to assessing biodiversity is facilitated by using a single system or metric. This consistency will help to improve common understanding of this approach, scrutiny by communities and stakeholders, the ability of markets to operate across administrative boundaries and the operation of any national, county or local compensation system. Therefore, the preferred option's intention is that biodiversity is assessed consistently using the updated Defra biodiversity metric with a planning application, as outlined in **Section 2.3.1**, with minimum requirements for the assessment specified. Stakeholders supported a consistent approach to assessing biodiversity and considered the updates to the Defra metric to be broadly helpful improvements.

We define the variables in the metric outlined in **Section 2.3.1** below.

Habitat extent
This expresses the area in hectares for the habitat being assessed so does not require formal definition or categorisation beyond this.

Distinctiveness
Definitions are set out in **Table 5**.

In practice, identifying the correct habitat type will require some level of ecological understanding, and professional expertise when semi-natural habitats of biodiversity value are present.

Table 5: Distinctiveness categories

Category	Score	Example of habitat type
Very High	8	Priority habitats as defined in Section 41 of the Natural Environment and Rural Communities Act 2006[67] (NERC) that are highly threatened, internationally scarce and require conservation action e.g. blanket bog
High	6	Priority habitats as defined in Section 41 of NERC requiring conservation action e.g. lowland fens
Medium	4	Semi-natural vegetation not classed as a Priority habitat such as semi-improved grassland
Low	2	Lower value semi-natural vegetation e.g. temporary grass and clover ley; intensive orchard; rhododendron scrub
Very Low	0	Little or no biodiversity value e.g. Developed land; sealed surfaces

[67] https://www.legislation.gov.uk/ukpga/2006/16/contents

Condition
Definitions are set out in **Table 6**.

Table 6: Condition categories

Category	Score
Good	3
Fairly good	2.5
Moderate	2
Fairly poor	1.5
Poor	1
N/A – Agriculture	1
N/A – No biodiversity value	0

Determining condition involves a significant element of judgement, albeit with prescriptive criteria, requiring some ecological expertise to match present habitats to the described criteria. Guidance will be produced to support and standardise condition assessment for each habitat type. However, the intention is that small developers will simply use a default multiplier of 2 for this part of the metric assessment. It will, in some cases, be more cost effective for a small developer to accept this default figure than to carry out a survey of condition.

Strategic Significance of Location
Definitions are set out in **Table 7**. As there are both strong ecological and socio-economic drivers for compensation habitat to be local to where losses occur, it is a rule of this metric that compensation is penalised through multipliers unless it is located in the same LPA or local area.

Table 7: Strategic Significance categories

Category	Score
High strategic significance *Within area formally identified in the local policy*	1.15
Medium strategic significance *Not in area defined in local the policy*	1.1
Low Strategic Significance *Not in area defined in the local policy (or compensation not within area of local policy), or where no local environmental spatial policy is in place*	1

Determining strategic significance is dependent on the mapping of ecological networks including areas for enhancement, restoration or creation and would be facilitated by the production of local nature priority statements (LNPS) (see **Section 5.2.2.5 on spatial planning)**. Therefore, this categorisation of land parcels by a strategic significance score will need to be a mandatory part of every LNPS. In the absence of a LNPS and a suitable map of strategic significance, the default value for strategic significance could be set at “1” in the metric; this might also incentivise the creation of LNPSs.

Connectivity
Definitions are set out in **Table 8**.

Table 8: Connectivity categories	
Category	**Score**
Highly aggregated / connected	1.15
Moderate aggregation / connectivity	1.1
Low aggregation / connectivity	1

The calculation will be automated using a freely available GIS tool to generate output that can be fed into the metric calculation. A simple alternative approach will be available to make the system proportionate for smaller developments (e.g. defining a default value) and further engagement will define how this operates.

Difficulty of creation or restoration
Definitions are set out in **Table 9**.

Table 9: Difficulty categories	
Category	**Multiplier**
Low	1
Medium	0.67
High	0.33
Very High	0.1

The level of risk will differ between habitat types because of ecological factors and the availability of techniques or know-how to create habitats in a realistic time-frame. Guidance will be produced to determine how difficult creating each type of habitat is.

Location relative to development
Definitions are set out in **Table 10**.

This component is a simple reflection of the fact that habitat created at a great distance from the site of habitat losses carries a risk of depleting local areas of natural habitats and of depriving the communities experiencing development of the associated benefits. The definitions are set with respect to LPAs.

Table 10: Location relative to development	
Category	**Multiplier**
Compensation inside LPA, or deemed to be sufficiently local, to site of biodiversity loss	1
Compensation outside LPA of impact site but in neighbouring LPA	0.75
Compensation outside LPA of impact site and beyond neighbouring LPA	0.5

Time to target condition
Definitions are set out in **Table 11**. Where there is a temporal mismatch between a negative impact on biodiversity and compensation habitat reaching the required quality or level of maturity, there will be a loss of biodiversity for a period of time.

Table 11: Time to target condition categories

Number of years	Multiplier
1 year	0.965
5 years	0.837
10 years	0.700
20 years	0.490
30 years	0.343

This issue can be managed by the creation of compensation habitat ahead of the impact taking place, either though the setting up of habitat banks or, for projects with a long lead in, by starting the offset work ahead of the development. However, this is not always possible and even where the management to create compensation habitat starts in advance, the time taken for habitats to mature means that there will almost inevitably be a time lag. Where a time lag does occur, a multiplier is applied to take account of it. This is referred to as the 'Time to target condition' multiplier.

Where time discounting is used in compensation schemes a standard discount rate of 3.5% is used, as recommended in the HM Treasury Green Book.[68] The maximum multiplier taking account of temporal risk increases the compensation required almost three-fold, which equates to approximately 32 years. Estimating how long it will take to reach the desired habitat type is again currently a matter of expert judgment of an ecologist, albeit with the assistance of guidance. Updated guidance is intended to give much greater clarity and certainty on this factor.

Linear features, such as hedgerows, tree lines, rivers and trees are also accounted for in biodiversity net gain metrics. Because these operate with regard to linear features, their mitigation and compensation should not require additional land on development sites and we would not expect significant losses to occur on the vast majority of development sites (linear features are typically retained as perimeters or as features in developments). The metrics for linear features work on similar frameworks to the area-based metric but operate on length of features rather than area. Engagement work on the wider biodiversity metric has led to some requests for developers to be able to count linear units towards their 10% area-based target, suggesting that a surplus of linear units is achievable on a well-designed project. Where linear features are lost or damaged, it is assumed in this Impact Assessment that their replacement is incorporated into on-site habitat creation.

Protected species, on the other hand, require specific provision to meet legal requirements including, for some, development licences. District licensing is, for now, distinct from a biodiversity net gain approach. However, habitats created or enhanced to meet a species licensing requirement can be included in biodiversity net gain calculations.

Role of LPAs and national delivery bodies
LPAs will use existing powers to validate and scrutinise applications through development management procedures, with rights to refuse permission (and the accompanying appeals process) acting as an incentive to agree an assessment. Guidance and related tools for the

[68] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

metric will be provided to LPAs and developers, with targeted training offered to LPAs and the Planning Inspectorate (PINS) whose role in the planning process includes examining local plans and dealing with planning appeals.[69]

With these tools and training in place it is anticipated that the main resource that will be needed by LPAs to implement the policy effectively is access to sufficient expert ecological advice. At present this is provided through different models including in-house ecologists, shared services or buying in advice from other authorities, NGOs or consultancies. The level of advice available to planning departments is variable and LPAs report capacity is stretched. A local authority new burdens assessment is in progress and draft assumptions have been shared with LPAs alongside the consultation to test the related set-up and ongoing costs (see **Section 6.8** for more details).

A voluntary accreditation scheme might be established building on best practice principles and standards that have been developed by the environmental assessment sector. This will allow LPAs to have greater confidence in assessments by accredited organisations submitted with development proposals and focus scrutiny on those from non-accredited assessors.

It is also envisaged that Natural England, the government's advisor for the natural environment in England, will provide support and advice to Local Authorities and developers to enable them to implement the biodiversity net gain requirement. The anticipated costs and details of their responsibilities are explored in **Section 6.8**.

Irreplaceable habitats

In the case of irreplaceable habitats and protected sites, planning policy will continue to apply.[70] On irreplaceable habitats, the NPPF[71] states: *"development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists"*.

In the case of statutory protected sites and irreplaceable habitats, the biodiversity metric as used by this policy is not considered sufficient (in its normal operation) to define what suitable compensation for losses would be, given that habitat types such as ancient woodland cannot be recreated. In this light, such habitats would not be included within the mandatory net gain policy. Should loss of, or damage to, irreplaceable habitats occur within a scheme, compensation arrangements would need to be agreed between the developer and relevant parties according to existing planning policy and guidance.

5.2.2.4 Government delivery of statutory biodiversity credits

It is anticipated that, in time, a functioning market in biodiversity units will develop which will enable developers to source offsite enhancements themselves directly from the market in order to meet the net gain requirement where it is not possible to enhance or create sufficient habitats on site. However, a market may take time to develop so that it offers the right opportunities for habitat compensation in the right areas.

Some local authorities already use the planning system and developer contributions, for example through S106 agreements, to secure funding to ensure net gains can be delivered in respect of all developments. At consultation, we asked whether a tariff was required to secure

[69] https://www.gov.uk/government/organisations/planning-inspectorate/about

[70] Relates to the 2017 regulations that transpose the requirements of Article 6(4) of the Habitats Directive.

[71] 2018 NPPF. Please see paragraph 175(c).

habitat enhancement in order to facilitate development where net gain opportunities could not be secured onsite or locally via the market.

Responses were mixed in terms of whether such a tariff would be required and whether it should be collected locally or nationally. A number of respondents supported a tariff mechanism that would facilitate development even where habitats could not be improved on site or locally but the majority of responses on this issue favoured delivery of habitat enhancement locally and transparently. As local authorities can already use the planning system to secure funds and have demonstrated in some areas that they can establish local delivery arrangements (e.g. Warwickshire), we believe the best way to encourage this is through the establishment of a system that can support implementation of the policy (by reducing the risk that development is held up by a lack of local habitat creation opportunities) while incentivising local markets for the delivery of compensatory habitats.

Government therefore intends to ensure development can proceed, and funding for offsite habitat enhancement can be secured, by taking steps to support the market for habitat compensation through the provision of biodiversity credits. In recognition of respondents' preference for the local collection and spending of net gain compensation, as well as concerns about the potential bureaucracy inherent in a new charging scheme, government will not introduce a new tariff on loss of biodiversity. Instead, the risk that the market supply of habitat creation will not meet demand will be addressed by government's plan to provide a supply of statutory biodiversity units, in the form of equivalent biodiversity credits, into the compensation market. By not instating a rigid tariff mechanism, government will make it easier for local authorities, landowners and organisations to set up habitat compensation schemes locally where they wish to do so, and will still provide a last-resort supply of credits from government where this is not the case.

Revenue from the sale of statutory biodiversity credits will, where possible, be invested directly into pre-determined local habitat creation projects, and government will design the system to discourage any long-term pooling of revenue. Projects for investment will be selected on the basis of their additionality, their long-term environmental benefits and their contribution to strategic ecological networks. Investment will be made transparently and a public record of government habitat creation projects maintained for transparency and audit purposes.

Government will apply its principles for setting a cost for a tariff, which were set out in the net gain consultation, in setting the standard cost of statutory biodiversity credits. We will also consider the administrative costs of delivering habitat compensation schemes and the interaction between habitat creation costs for net gain and government payment for environmental land management.

For the purposes of this IA, we assume a cost of £11,000 per biodiversity unit for typical off-site habitat creation. This value is within bounds of the 'tariff' value proposed at consultation (between £9,000 and £15,000), as well as evidence of existing compensation schemes (usually charge between £6,000 and £25,000 per unit) plus a small uplift for administration.[72] This should provide an incentive for developers to use a local compensation schemes including those operated by Local Authorities. The intention is that, as the market for biodiversity units grows, the need will diminish for government-backed provision of statutory biodiversity credits.

[72] The value does not refer directly to the cost of the units provided by government, but is within the range of biodiversity unit costs outlined at consultation and from subsequent evidence gathered through consultation on cost of units offered for bespoke off-sets or habitat banking.

Whilst government still considers the consultation's proposed range for the cost per biodiversity unit broadly appropriate, some respondents raised concerns that it was too low and would stifle habitat creation markets, and some that it was too high. Several respondents asked for further evidence and work to refine this cost per unit, so government will undertake a review of the rate and further stakeholder engagement on this subject before announcing a specific cost per statutory biodiversity credit.

5.2.2.5 Spatial planning for nature improvement

The biodiversity net gain public consultation revealed strong support for habitat opportunity maps to guide provision of compensatory habitat so that it delivers the greatest benefit. In the Environment Bill, government will introduce new duties to support better spatial planning for nature through the creation of Local Nature Recovery Strategies (LNRSs). The intention is that the whole of England will be covered by LNRSs with no gaps or overlaps. Each LNRS will include a statement of biodiversity priorities for the area covered by the strategy and a local habitat map that identifies opportunities for recovering or enhancing biodiversity.

National government will provide data, guidance and support but each LNRS will be produced locally, with a relevant public body appointed as the responsible authority by the Secretary of State. This will achieve the best combination of local ownership and knowledge and national consistency and strategy which consultation responses supported. LNRSs will be produced collaboratively with input from a broad range of partners. The intention is that LNRSs will encourage the consideration of the wider benefits of habitats (e.g. carbon sequestration and flood mitigation) and promote greater connectivity between areas of habitat. Our intention is that LNRSs will also be a tool to support delivery of existing duties on local and public authorities to protect and enhance biodiversity; putting biodiversity net gain at the heart of a more strategic approach to nature recovery.

We envisage that LNRSs will inform the town and country planning process by providing an important source of evidence to support plan-making, and underpinning actions local planning authorities or neighbourhood planning groups choose to take to protect and enhance biodiversity in their areas. It will continue to be the case that the development plan itself is the principal document at the heart of the planning system, and that planning decisions must be taken in line with the development plan unless material considerations indicate otherwise.

5.2.2.6 Monitoring and evaluation

An effective monitoring and evaluation strategy will ensure that:

- we can assess whether the policy has achieved the environmental outcomes sought at a local and national level, as well as the impacts on developers and local communities
- there is a mechanism for reviewing and improving the implementation of net gain policy.

The consultation proposes a series of measures that will be secured as part of a monitoring and evaluation strategy, including accreditation for those creating habitats, standards for digital data, area-wide baseline data and the review of random samples of development and compensation sites. Existing habitat improvement schemes typically include some funding for the monitoring of progress on site, and we would expect this practice to continue under a mandatory approach.

By its nature, the policy will facilitate improved understanding of habitat change through development. Consistent application of the biodiversity metric will increase the transparency of habitat change reporting and will create a stream of quantitative data on habitat losses and gains which will allow LPAs, local environment record centres, NGOs or Defra group to provide enhanced oversight of the outcomes of planning decisions.

Specifically, data will be captured via a combination of:

- LPAs reporting on net gain delivered in their areas for approved developments or summary statistics and submit these to central government, in line with wider reporting requirements
- full remote capture (for example, by machine reading of assessments published as part of successful planning applications)
- sampling of online assessments
- in the future, the potential to introduce automated reporting through metric tools or a web-based metric that allows for spatially explicit recording of habitat gains and losses (a number of consultation responses expressed support for this type of function)

This data will allow government to understand the types of habitat reportedly being lost and gained through development, with the potential for spatially disaggregated datasets to highlight local areas that are performing well in terms of avoiding impacts to high quality habitat and achieving positive outcomes through development. This data from submitted net gain assessments might inform adjustments to the metric (if for example, certain habitats are unjustly favoured for creation through the action of metric multipliers) and to the wider policy. Data from assessments and wider project reporting could also be compared with remote sensing data to provide broad oversight of standards.

The measures described above will help government to understand what is being planned for net gain but will not necessarily give an accurate indication of what is delivered in practice. Normal enforcement procedures at the local authority level, along with transparent site planning documents and habitat management plans, will provide some confidence that on-site habitat delivery will be faithfully carried out.

However, for enforcement to be more effective than it is now, there will need to be greater transparency of planned mitigation actions and suitable means of making off-site compensation projects visible to communities and development control staff. NGOs and Local Environment Records Centres have experience of collecting monitoring data directly from local schemes, providing assurance or oversight and have indicated that they could play a greater role. Improvements of monitoring and data reporting standards within the habitat market will facilitate monitoring by public bodies and provide communities, NGOs and Local Environment Records Centres with mechanisms to quickly verify planned enhancements.

Improved baseline habitat mapping is expected to become available in the near future, which will greatly assist in verifying losses and the value of gains (i.e. is high value habitat truly being created or simply said to be created where it already exists?). A robust baseline habitat map with an appropriate digital portal could allow data collected through the metric to be marked on habitat maps, opening created habitats to closer public scrutiny and more feasible monitoring by local authorities. Over a longer time period, updates to habitat maps will reveal total habitat changes. Evaluation projects could, in due course, review remotely sensed (and those verified by ground surveys) habitat maps over time for evidence of habitat change at compensation sites in national mapping. A less complete system of monitoring could be achieved through the inspection of random (potentially stratified by LPA) samples of developments and off-site habitat creation projects by government or its contractors.

The results of this delivery monitoring would be fed into policy evaluation and could inform future decisions to revise: the level of net gain required (if delivery monitoring reveals that even a 10% increase is insufficient to achieve real gains for wildlife, or if 10% is delivering large gains due to high standards and good industry practice then government might wish to review this rate downwards accordingly); revision of enforcement mechanisms and resourcing; and means of increasing scrutiny by the public and key decision makers of the habitat creation process.

6 Cost benefit analysis

This section sets out the cost benefit analysis of our preferred approach outlined in **Section 5.2.2** against the baseline comparator outlined in **Section 5.2.1**. While informed by consultation responses and research, considerable uncertainty remains in the analysis, reflected by the range of outcomes analysed. Monetised impacts include: those on developers; the new burdens placed on LPAs; additional costs to Defra and Natural England; and the environmental benefits from new habitat creation and avoided habitat loss. All other costs and benefits are stated qualitatively. A summary of the assumptions and outputs of the analysis are set out in **Section 6.1**, a description of the methodology and other considerations are set out in **Sections 6.2 to 6.4** (further details in **Annex 1 and 2**), the costs and benefits are set out in **Sections 6.5 to 6.10**, and sensitivity analysis is presented in **Section 6.11**.

The cost benefit analysis captures development under the TCPA: residential, industry and commerce (i.e. commercial), and transport and utilities, as shown in **Tables 1-3** in **Section 2.2.1**. We use an indicative value of the biodiversity units for the purpose of calculating costs (£11,000) incurred through the offsetting market, as well as Government-backed provision at a fixed price.

We expect there will be a wide distribution of impacts, given that the costs and benefits will be highly dependent on the location and design of individual developments. In our analysis we assume that developers either: (1) already deliver net gain (entirely as we have proposed) or (2) do not deliver net gain (or even ‘no net loss’) and do little to mitigate or compensate habitat damage caused by their developments.

Given this, those currently doing the most to benefit the environment should find that this provides certainty. Since these developers already incur all or most of the costs of net gain, the most significant change for them (within our analysis) will be benefits associated with greater consistency in net gain within the planning process and greater consistency in expectations. The developers who currently cause high levels of environmental damage and do little to compensate for this will face the highest additional costs. This means, in practice, it is likely that the costs will fall unevenly across developers.

Biodiversity net gain should, therefore, steer development towards the least environmentally damaging areas and design practices. A significant proportion of costs imposed on developers are likely, in the medium to long term, to be ‘passed through’ to developable land prices, thereby affecting landowners. This issue is further explored in **Section 6.4**.

6.1 Summary tables

Please see **Sections 6.2-4** for a description of the assumptions and risks, and **Annex 1 and 2** for details for further details on key assumptions and cost-benefit analysis calculations.

Table 12: Summary of cost benefit analysis assumptions by scenario

Assumptions	**Description** *(assumptions are the same across scenarios unless stated)*
Policy assumptions (figures not rounded)	
% level of biodiversity net gain	10%
% biodiversity net gain achieved onsite	**Scenario A** *(low cost)***:** 100% **Scenario B** *(central estimate)***:** 75% **Scenario C** *(high cost)***:** 0%
Years of habitat maintenance required	30 years
Baseline residential biodiversity net gain delivery *(% of developments)*	29%
Baseline non-residential biodiversity net gain delivery *(% of developments)*	15%
Additional cost pass-through to land prices (%)	90%
Estimated residential development per year	6,701 ha
Estimated non-residential development per year *(Developments which are categorised as industry and commerce, and transport and utilities, as shown in **Tables 1-3** in **Section 2.2.1**)*	9,530 ha
Estimated total development per year *(in scope of the policy)*	16,232 ha
Unit values - Costs (2017 prices, figures not rounded)	
Costs of habitat creation (per ha): survey	£900
Costs of habitat creation (per ha): net present value of 30 years' creation and maintenance costs	£19,698
Unit values - Benefits (2017 prices, figures not rounded)	
Average social value of habitat per residence, based on ONS ecosystem accounts for urban areas *(annual, national average)*	£4,800 per residence
Range of natural capital benefits per ha of habitat, derived from average social value of habitat per residence *(for regional values used in analysis see **Table A1.2** in **Annex 1**).*	£3,696 - £89,248 per ha

Table 13: Outputs and cost benefit analysis summary by scenario

Item	Scenario A	Central	Scenario C
	£ millions (2017 prices), unless stated otherwise		
Net direct cost to developers (*annual)*	42.1	199.0	669.5
Net indirect cost to developers *(annual, including 90% pass through to land prices)*	4.2	19.9	66.9
Annual costs to local government *(Ongoing, excludes transition costs)*	9.5	9.5	9.5
Annual costs to central government *(Ongoing, excludes transition costs)*	3.1	3.1	3.1
Avoided habitat loss *(Annual, ha)*	12,859	9,644	0.0
Habitat creation *(Annual, ha)*	1,551	5,428	17,060
Annual social (i.e. natural capital) benefits (10 year average)	1,860.9	1,395.7	0.0
Present value of costs *(10 year appraisal period, total costs to developers and government)*	478.2	1,828.2	5,878.4
Present value of benefits *(10 year appraisal period, social benefits derived from local avoided habitat loss and local habitat creation)*	15,193.4	11,395.1	0.0
Net present value (benefits – costs) (*10 year appraisal period)*	14,715.3	9,566.8	-5,878.4

6.2 Key assumptions

For an overview of numeric assumptions see the summary tables in **Section 6.1**. Selected key assumptions are tested in the sensitivity analysis presented in **Section 6.11**.

6.2.1 Biodiversity net gain delivery scenarios

The analysis is based around three scenarios, which each represent **a version** of the options available to developers under biodiversity net gain:

- **scenario A**, the developer is able to avoid significant loss of distinctive habitats, and therefore mitigates and enhances on site. We assume ‘no net loss’ is achieved via site

design and 10% net gain achieved through habitat creation on-site. This scenario is modelled and reflects the expected minimum cost of the policy

- **scenario B**, the developer is unable to compensate all impacts on-site, but is able to secure local compensatory habitat creation including purchasing statutory biodiversity credits provided by government-backed provision. This scenario is not modelled explicitly, as this would require making assumptions for what an individual development, which are subject to site specific and spatial variation, might look like
- **scenario C**, the developer is unable to compensate on site and is unable to find local compensatory habitat in which to invest. Instead they have to pay for their units through the biodiversity unit offsetting market, which may involve paying for statutory biodiversity credits offered by government for a fixed price. This scenario is modelled and reflects the likely maximum cost of the policy, and provides a ceiling to offset market prices. We assume that the biodiversity unit price is applied to the total biodiversity unit loss plus 10% net gain.

The realisation of the upper and lower bounds is extremely unlikely. **Scenario A** necessitates that it is possible for developers to completely avoid the loss of distinctive habitats (i.e. by building around the habitat) while also creating habitat in the development. It is improbable that this would be effective or even possible for all developments. **Scenario C** would only occur if developers failed to respond to incentives and did not actively work to mitigate on site or to decrease costs. It is reasonable to assume that developers would carry out on-site and/or off-site mitigation when it is more time and resource effective to do so than solely relying on the market to mitigate their developments.

In summary, the key uncertainty is the extent to which developers mitigate their developments on site or off site. In reality, we expect costs to be within this distribution, and evidence from existing biodiversity off-setting schemes suggests that the majority of mitigation will take place onsite. This also supports the assumption we made in the consultation IA where we assumed 75% of net gain would be delivered on-site – this was not challenged in consultation responses and was supported anecdotally. **In light of this, our central estimate assumes that Scenario A occurs 75% of the time and Scenario C 25%. Therefore, Scenario B is captured implicitly in the range between scenario A and C**.

6.2.2 Land use change: residential and non-residential development

The analysis splits the rate of land use change into residential and non-residential development. For residential development, the current rate of new dwellings created is 176,900 per year.[73] **Our headline analysis assumes that the housebuilding rate is constant and in line with assessed housing need data, which is estimated at 267,000 per annum.[74]** An increase of this scale is to be expected given that the ambition is to increase housebuilding to 300,000 new homes per year (see **Section 2**). **We test the impact of the target through sensitivity analysis (Section 6.11).**

We split the housebuilding rate into greenfield and brownfield residences according to previous land use change. Using the average size of these types of residences, we multiplied accordingly to get **the size of residential development, which we estimate is 6,701 ha per year**.

[73] See **Table 4** in **Section 2.2.1**.

[74] https://www.gov.uk/government/consultations/planning-for-the-right-homes-in-the-right-places-consultation-proposals

Non-residential developments are much more dependent on business cycles compared to housing development rates. Given this, our analysis assumes that the non-residential development trends continue at the same rate as in the land use change data between 2013 and 2017.[75] **We estimate the size of non-residential development is 9,530 ha per year.**

6.2.3 Baseline delivery of biodiversity net gain

We assume 29% of residential developments already deliver net gain. Of the nine largest housing developers (which together account for 52% of residential completions), six have some form of habitat mitigation and creation policy[76], ranging from partial to comprehensive. These six developers account for 29% of residential completions which forms our assumption. This does not include any measures taken by the 48% of completions unaccounted for by the nine developers considered, or the monetary value of current Community Infrastructure Levy[77] (CIL) and S106 agreement payments to LPAs. The model makes the highly conservative assumption that all other residential developments are not mitigating or compensating their impacts at all (i.e. 100% habitat loss).

We assume that 15% of non-residential developments already deliver net gain. From 2000 to 2012, on average 15.4% of assessed non-residential developments achieved BREEAM excellent – which requires scoring very highly across a range of criteria including biodiversity.[78] This, and the fact that some LPAs are already delivering net gain (see **Section 2.3.2**), suggests that the proportion of non-residential development already delivering net gain is between 15% and 25%. We take the most conservative estimate (15%). The model makes the highly conservative assumption that the other 85% of non-residential developments are not mitigating or compensating their impacts at all (i.e. 100% habitat loss).

The conservative nature of the baseline reflects what we outlined in **Sections 2-3** - the adoption of net gain policies by some developers, industry bodies and LPAs shows some recognition of the environment in development decisions, but the adoption is inconsistent and not widespread enough for it to be fully internalised, despite it being part of planning policy in the NPPF.

6.2.4 Estimating policy impact on habitat creation and avoided habitat loss

To calculate the effect of the policy a variety of steps are required. First, the average units lost from 1 ha of both greenfield and brownfield development is calculated at the local authority level, based on previous land use change data and adapting Warwickshire's estimations of a habitats' metric scores so that it aligns with the updated Defra biodiversity metric (please see **Table A1.1** in **Annex 1** for further details).[79,80,81] This is applied to the size of their respective developments (equivalent to the size of habitat lost) to calculate units owed by developers in each local authority. This increases by 10% when the net gain uplift is included.

To calculate the size of habitat created, the amount of units owed is taken through the inverse of the method above but also multiplied by a scalar to factor in the time and risk component of

[75] https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics

[76] Completion figures and policies taken from 2017 annual reports from Barratt, Bellway, Berkley, Bovis, Crest Nicholson and Redrow.

[77] The Community Infrastructure Levy is a tool for local authorities in England and Wales to help deliver infrastructure to support the development of the area.

[78] https://tools.breeam.com/filelibrary/Briefing%20Papers/BREEAM-Annual-Digest---August-2014.pdf

[79] https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics

[80] https://www.warwickshire.gov.uk/biodiversityoffsetting

[81] Non-residential data is only available at the national level, local authority estimates are approximates.

the metric. These components incentivise developers to make up for: (a) the temporary loss of natural capital benefits and; (b) the risk that habitat created does not reach the condition agreed by having to create a greater amount of habitat. See **Section 5.2.2.3** for full details on the updated Defra biodiversity metric.

This scalar is set at 1.14 using calculations from 1ha example development and habitat creation. This assumes that: (a) the habitat created is of high distinctiveness and condition as per the updated Defra biodiversity metric[82]; (b) the scalar is representative of how development and habitat creation shall occur; and (c) developer behaviour does not change. **In the sensitivity analysis (Section 6.11) we test the impact on the scalar and outputs if developers created the least distinctive habitat allowed, or if they developed on less biodiverse habitat than anticipated.**

Finally, **to estimate the avoided loss of distinctive habitat in Scenario A, we assume it is equivalent to the amount of development not already delivering net gain**. This reflects the assumption made in this scenario that the developer is able to avoid significant loss of distinctive habitats, and therefore mitigates and enhances on site. See **Annex 1 and 2** for full details on the methodology.

6.2.5 Monetising cost and benefits

To estimate the costs to developers, we assume that the costs for both on-site and off-site habitat creation are **£900 per ha for site surveys[83]** and **£19,698 per ha for 30 years' creation and maintenance costs** taken from a joint RSPB, National Trust and Wildlife Trusts study.[84] The latter is discounted to a net present value (NPV) lump sum at the HM Treasury Green Book[85] rate of 3.5%. **For where a developer is required to offset through the market for biodiversity units, the indicative price for a biodiversity unit is assumed to be £11,000**. For comparison, if a developer were to pay this to offset the biodiversity units they accumulated from an average 1 ha development (4.46 units, see **line (B3) in Annex 2**), they would pay £49,060 per ha. The cost per biodiversity unit (£11,000), does not refer directly to the cost of the units provided by government, but is within the range of biodiversity unit costs outlined at consultation and from subsequent evidence gathered through consultation on cost of units offered for bespoke off-sets or habitat banking.

To calculate the environmental benefits of net gain we adapt a market value and use it as a proxy. **The ONS ecosystem accounts for urban areas values green space within 100m of a residence at £4,800 per residence.**[86] This is calculated through hedonic pricing, a method which deduces the value of environmental components of a market good (i.e. houses) by comparing the price change of the market good when that component is or is not present, with all else held constant.[87] To derive a per hectare value, we multiply this by persons per hectare

[82] High distinctiveness has a metric score of 6 and fairly good condition has a metric score of 2.5. Including high strategic significance (1.15) and connectedness (1.15) this gives 1ha created habitat a unit score of 19.84.

[83] Estimate provided by Natural England that assumes conducting a Phase 1 habitat survey on a 1 ha site would take 1 -1.5 days of an ecologists time, plus half a day for report writing.

[84] https://www.nationaltrust.org.uk/documents/assessing-the-costs-of-environmental-land-management-in-the-uk-final-report-dec-2017.pdf.

[85] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[86] https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/valueofnatureimplicitinpropertypriceshedonicpricingmethodhpmmethodologynote

[87] There are a range of other problems with hedonic pricing: It assumes that the housing market is highly liquid/competitive; that purchasers have complete knowledge of the local environmental; and several methodological difficulties isolating environmental value.

by region, and divide it by persons per residence (assumed to be 3).[88,89] These regional values can be found in **Table A1.2** in **Annex 1**. These values are conservative compared to those which we could have otherwise selected (see **Section 6.9.1**).

The literature shows that natural capital provides a wide range of services and benefits, and is especially valuable close to people in urban and suburban areas (e.g. for recreation, health and wellbeing, landscape, air quality). The value we use is an imperfect proxy that partially reflects the value that private individuals place on the range of natural capital benefits they receive from local green space and nature. This method is conservative since it provides lower estimates for the benefits derived compared to other valuation methods (for example NEVO and ORVal).[90] Additionally, this only measures private value and is likely to be an underestimate. **Section 6.9.1** explores the natural capital valuation literature further in the context of the estimated benefits.

6.3 Key risks

Assumptions in the cost benefit analysis, which enables outputs to be quantified, means that the insights provided come with risks attached. Where possible the more conservative assumption was taken, which means these risks are implicit in the outputs. The key risks outlined below are tested through sensitivity analysis in **Section 6.11**.

Developer behaviour, in regards to where and how much they build, is assumed to remain mostly unchanged in response to the policy. This enabled the use of previous land use data to estimate habitat loss and resulting biodiversity units owed. While there is evidence to suggest that developers have opted to build on less distinctive site from voluntary adoption of net gain, we do not feel that the evidence is sufficient to extrapolate from. For that reason, we took the more conservative assumption for the purposes of this analysis. We would expect, under a mandatory biodiversity net gain requirement, that less biodiverse habitats (on average) would be brought forward in future and promoted by local authorities (e.g. through spatial planning) for development.

Similarly, we also expect that developers will create more distinctive habitat, 'trading up' from the previous habitat type, which is one of principles of using the biodiversity metric (see **Section 2.3.1**). In our analysis we explicitly assume that developers will create habitat that is high distinctiveness, of fairly good condition, is connected and is strategically significant. This gives a biodiversity unit score of 19.8 per hectare before factoring baseline, time and risk components. This assumption is held constant across region and time. If this was not reflected in reality then the quality of the habitat would be inferior to that estimated. However, it would mean that developers would still need to deliver the same number of biodiversity units, so would have to create more habitat as a result.

We also assume that the majority of net gain is delivered on site, and in our central estimate we assume that Scenario A occurs 75% of the time and Scenario C 25%. In reality, for any given development the costs are likely to fall within the range between scenario A and C, subject to site specific characteristics. Therefore, if Scenario A or C was more likely at an aggregate level,

[88] https://lginform.local.gov.uk/reports/lgastandard?mod-metric=176&mod-period=1&mod-area=E92000001&mod-group=AllSingleTierInCountry_England&mod-type=namedComparisonGroup

[89] Example: West Midlands – 1.49 persons per ha; divide by 3 equals 0.5 residences per ha; multiplied to value per residence (£4,800) gives value per ha (£2,400).

[90] Natural Environment Valuation Online (NEVO) and Outdoor Recreation Valuation (ORVal) are online tools, produced by Exeter University, to estimate the benefits derived from a particular site to changes made to an area. They focus on ecosystem services and recreational benefits respectively.

this would have implications for the costs to developers (e.g. if Scenario C occurred it would be more costly to developers) and the environmental benefits (e.g. if Scenario C occurred it would reduce the benefits from avoided habitat loss, but increase the benefits (albeit longer term) of habitat creation).

We assume biodiversity unit values for land use types (see **Table A1.1** in **Annex 1**). This enabled the calculation of biodiversity lost from 1ha of development per local authority by multiplying these values to land use change proportions. If the true values are less than represented then the unit burden on developers would be less. This would reduce the amount of biodiversity units developers would need to compensate but also the amount of habitat (and therefore benefits) produced. The smaller the true biodiversity unit values of land use types are, the smaller the cost to developers in all scenarios. The opposite impact would occur if the biodiversity unit value is higher than assumed. To provide confidence in our estimated values, we have aligned them with those predicted for similar habitat by the Warwickshire's biodiversity impact calculator. In addition, there are similar risks in our assumption that land use change remains constant across the appraisal period.

In addition, we assume that residential development increases at a rate based on assessed housing need. However, there is a scenario where residential development is equivalent to the Government's housebuilding target of 300,000 per annum. Moreover, we assume that non-residential development trends continue at the same rate as 2013-17. These assumptions have a low risk of influencing the analysis since we assume development remains at a constant rate – higher rates of development would simply increase the magnitude of the costs and benefits. However, we do test the impact of the housebuilding target through sensitivity analysis.

Finally, there may be an impact on developer contributions such as S106 and CIL, which are currently used to deliver net gain, and other environmental and local improvements in a discretionary manner. As outlined in **Section 2.3.2**, the existing data does not provide a breakdown (e.g. type, location) of current spend on environmental improvement (£115m in 2016-17 through S106) or on the losses that trigger these contributions. A mandatory policy would diversify the mechanisms to deliver net gain (e.g. retaining more habitat on site, use off-setting market) which may change how much of this is delivered though S106 directly. That said, the overall spend on environmental improvement (via contributions and other means) should increase. While we do not monetise the impact on S106 in our analysis (it is difficult to assess from the available data), we note the considerable uncertainty around the nature of the impact.

6.4 Pass-through of costs to land prices

When we impose mandatory requirements that are transparent and clearly defined across all developers, developable land prices should fall to absorb the policy cost as developers 'pass through' the cost. Evidence from industry and academia supports the theory, showing that development costs are passed back through to land prices once the market has adjusted to the new policy. House prices and developer profits appear inelastic with respect to extra costs, with land prices absorbing the change.[91,92,93] An exemption for developments that are in progress before (and potentially for some time after) the implementation of mandatory biodiversity net

[91] https://www.savills.co.uk/research_articles/229130/240942-0

[92] https://www.citymetric.com/politics/granting-planning-permission-massively-increases-land-values-shouldnt-state-get-share-1154

[93] https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1759-3441.1999.tb00944.x

gain will be put in place to manage the costs incurred which cannot be passed through into land valuation.

RICS data[94] gives a 2017 value for agricultural land of £21,947 per ha. The average value of residential land is £6.02 million per ha[95]. Once land is granted planning permission, there is often a value uplift of many multiples of the original value. The difference is largely due to significant differences in economic value from the goods or services provided by the land, although there is an element of 'scarcity rents' due to the highly inelastic (i.e. fixed) supply of land. Therefore, this uplift can be dampened (e.g. by new charges, costs of complying with new regulations) to a certain point (beyond this land would not be brought forward for development), with no deadweight loss to productive activity. If the money is used to produce goods that society values, the net result is an increase in economic efficiency.

Developable land is valued using a residual land value calculation: the maximum revenue a developer could expect to receive from sales, minus the minimum cost needed to achieve this, risk factors and a profit margin. The sale price is set externally by housing demand variables (including wages and interest rates). Profit margins are set largely by competition between developers. Therefore these things are unresponsive to cost increases and land prices adjust instead.

For this reason, we would expect to see most of the monetisable costs (and benefits) to developers passed through to the price of land that has planning permission, thereby impacted landowners. In the case of additional development costs, this will revise down the result of a residual land value calculation: there will be a dampening effect on the uplift to the price of land following planning permission. Therefore, we anticipate that developers or house buyers should not bear the cost of biodiversity measures if they are mandatory and apply uniformly to all developers for a given piece of land.

Based on the above, **we use a conservative assumption for this impact assessment that 90% of costs to developers are passed through to the post-planning-permission uplift in developable land values**, which represents a loss (i.e. a cost) to land owners. For the purposes of this analysis, we assume that the while the costs imposed on developers are **direct**, the pass through effect that impacts landowners is **indirect**. **This indirect effect is contained within the headlines figures since it is a pass through (i.e. a proportion) of direct effects.** Furthermore, the pass through effect is unlikely to be instantaneous and would take time to fully impact land prices. The costs to developers in context are explored in **Section 6.5.1**.

6.5 Costs to developers (monetised)

The net direct costs to developers under these assumptions falls in the range of £42.1m - £669.5m per year. The central estimate is £199.0m per year. After applying 90% pass-through of costs to land prices, the **indirect cost to developers is £19.9m per year,** where the range is between £4.2m and £66.9m. The calculations are set out in **Annex 2**.

Due to further evidence gathering, the cost benefit analysis now considers the impacts to both residential development and non-residential development. Our analysis holds development constant throughout the profile, at rates based on assessed housing need and land use change

[94] https://www.rics.org/uk/knowledge/market-analysis/ricsrau-rural-land-market-survey/. The mean of RICS rural land market survey transaction and opinion based estimates of 2017 prices for agricultural land, converted from acres to hectares.

[95] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/407155/February_2015_Land_value_publication_FINAL.pdf

for residential and non-residential development respectively. However, as there is only national level data available for non-residential development land use change, local approximations are estimated by assuming that proportions of national non-residential developments are the same as that for residential developments.

6.5.1 Others costs to developers (partially monetised)

Familiarisation costs to developers are calculated based on the time required for training and the hourly wage for the respective employees. The training could be done through formal sessions or on-the-job. Those requiring training would include a mix of ecological consultants, planners and landscapes architects, expected to last up to one working day.

97% of developers are sole proprietors or micro businesses, so while there are roughly 35,000 developers, they employ around 80,000 people (see **Section 7** for further details).[96] If every employee was trained, either on the job or through formal training, that would be equivalent to around two employees per developer. We expect that not every developer would complete training for their employees, and if they chose to it is unlikely to apply to all their employees. **We therefore assume one person per developer would require training**.

To estimate the familiarisation costs, we multiply the 35,000 expected to be trained by an average of the salaries relating to respective job roles (calculated to be £36,285 per year) and add 30% to consider overhead costs. **Our analysis estimates the total familiarisation costs to be roughly £6.3m in year one.** This is a highly conservative assumption, because in some instances developers will use sub-contractors (e.g. an ecological consultancy) to provide the necessary expertise to support net gain delivery.

6.5.2 Costs to developers in context

The estimated GVA of developers in England is £12.2bn, who have an annual turnover of £23.1bn.[97][98] In addition, the government's National Infrastructure and Construction Pipeline up to 2020/21 includes over 600 infrastructure projects worth over £425 billion[99], although not all of this infrastructure will be within the scope of this policy.

While the appraisal analyses the impact at an aggregate level, there will also be site and spatial specific impacts that could affect the viability of certain developments. We provide some provisional analysis below, but acknowledge that mandating biodiversity net gain is one of a number of upcoming government policies which could have a cumulative impact on viability (e.g. upon the residual land value for which a site can afford).[100] We are working across government to identify developments with specific characteristics (e.g. size, type) and/or areas that may be particularly impacted.

---

[96] https://www.nomisweb.co.uk/ . ONS data from Business Register and Employment Survey. Developers defined by the Standard Industrial Classification (Revised 2007) Section F 41.10: 'Development of building projects'. 2017 data.

[97] https://www.ons.gov.uk/methodology/classificationsandstandards/ukstandardindustrialclassificationofeconomicactivities/uksic2007. As defined by the Standard Industrial Classification (Revised 2007), Section F 41.10: 'Development of building projects'.

[98] https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/bulletins/uknonfinancialbusinesseconomy/previousReleases. Data missing for England on turnover, GVA and purchase of inputs, but available for the UK. UK values scaled down to 90.27% to estimate England values, as this is the ratio of England to UK number of enterprises (32,500 and 36,000 respectively).

[99] https://www.gov.uk/government/publications/national-infrastructure-and-construction-pipeline-2017

[100] https://www.gov.uk/government/topical-events/spring-statement-2019. Policy announcements at the Spring Statement include introducing a 'Future Homes Standard' by 2025, so that new build homes are future-proofed with low carbon heating and world-leading levels of energy efficiency.

Tables 14 and 15 show the regional average costs of delivering net gain per hectare to developers under each scenario for residential and non-residential developments respectively. The tables show that costs increase as the amount of off-site delivery completed rises, demonstrated by the increasing costs as one moves from Scenario A to the central estimate to Scenario C.

Delivery costs were calculated by averaging estimated local authority costs and dividing by the average estimated annual development[101] of that region. Costs included are site surveys and delivering biodiversity units owed (be it on site or off site delivery). Also included, for reference, is the estimated biodiversity unit lost per hectare of development and the annual extent of development. The biodiversity unit loss is estimated at a local authority level for residential development (hence the regional variation in biodiversity loss and costs presented), but is held constant for non-residential development to reflect the national level assumptions made in the analysis.

Tables 16 and 17 displays the regional average delivery costs per building unit to residential developers under each scenario, split by greenfield and brownfield. This follows the similar calculations described above, except the costs are divided by housing density[102] rather than annual development. This enables comparison against housing build costs and developer contributions.

Table 18 considers the build costs of residential development (£/m^2) by region.[103] The subsequent columns are estimated by multiplying according to average greenfield (0.033 ha) and brownfield (0.02 ha) residential development sizes respectively. These figures were used to find net gain delivery costs (**Tables 16 and 17**) as a proportion of build costs shown in **Tables 19 and 20** for greenfield and brownfield developments respectively. Our analysis demonstrates that, while there is a range of expected cost from delivery of net gain, relative to build costs they are relatively small for brownfield (between 0.1% and 0.8%) and greenfield (between 0.1% and 3.9%) developments. However, regions in the Midlands and the North have the highest potential costs as a percentage of build costs, but also have lower developable land prices which indicates potential for site specific housing viability issues.[104]

Figure 4 shows the average house price and the estimated average contributions from S106 and CIL per new home. While house prices have increased by around 20% since 2007-08, contributions have remained relatively constant. This implies that, per housing unit, developers have been making smaller contributions as a proportion of their revenue. Also of note is that even the highest estimate for delivery costs per housing unit (Scenario C, Yorkshire and The Humber, £4,242 per housing unit) is equivalent to 15% of average contributions in 2016-17. The value closest to the median (Scenario C, London, £278 per housing unit) amounts to around 1%, while the figure closet to the average (Scenario B, South East, £944 per housing unit) is equivalent to 5%.

Currently, data on non-residential developments[105], which covers a broader range of development types, is limited and not the same granularity as for residential so there is no

[101] That is expected annual net additional dwellings split by proportion that are greenfield and brownfield, multiplied by respective average dwelling size, and then totalled.

[102] https://www.gov.uk/government/collections/land-use-change-statistics. See Table P331.

[103] https://www.rics.org/uk/products/data-products/bcis-construction/bcis-review-online/

[104] https://www.gov.uk/government/publications/land-value-estimates-for-policy-appraisal-2017

[105] MHCLG provide some non-residential development data on planning applications, land use change and land values.

representative brownfield and greenfield example. However, we can use MHCLG data on land use values,[106] to estimate the cost of net gain delivery as a percentage proportion (%) of industrial and commercial[107] land values for around 70 towns in 38 different Local Enterprise Partnership (LEPs) areas. The range of costs are presented in **Tables 21-23**. **Figure 5** plots the distribution of all three scenarios as a proportion of land value for each town within a LEP.[108] The analysis **shows that the majority of the costs across scenarios are expected to be less than 5% of land value, and that regions with higher costs (i.e. implying a potential site specific viability issue) tend to be in the North**. A similar conclusion was reached on residential development.

Similarly, the London Plan Viability Study[109] provides build costs for some non-residential projects within central, inner and outer London. These costs range from £819 per m^2, for an industrial project in outer London, to £2,610 per m^2 for office accommodation in central London. To compare, the highest estimate of net gain delivery costs (scenario C) to non-residential developments is £4.79 per m^2 (£47,855 per ha) – equivalent to between 0.2% and 0.6% of London non-residential build costs.

There are two points worth noting. Firstly, London has the lowest average biodiversity loss per hectare of development (therefore lowest delivery costs) and is likely to have the highest build costs (demonstrated by costs decreasing as developments move from central to outer London). Net gain delivery costs as a proportion of builds costs, therefore, is likely to be higher outside of London. Secondly, build costs and net gain delivery costs would not be applied equally across a development (i.e. it would be inaccurate to scale the above values for a representative development size). This is because while proportional habitat delivery costs would be applied across the entire development space, proportional build cost only apply to a) the section of the development that is floor space, and b) can have multiple floors. Despite this, net gain delivery costs would still be a relatively small proportion of build costs.

Overall, the analysis indicates that net gain delivery costs are likely to be low as a proportion of key variables such as build costs and land prices. In addition, it is unlikely to lead to a significant increase on existing average developers contributions. While the analysis identifies regions where potential residential and non-residential viability issues may arise (e.g. Midlands, the North), **this analysis is not a prediction of where site specific viability issues may arise in reality**. We continue to work across government to identify particular areas and/or developments that may be adversely impacted by mandating biodiversity net gain and other related policies.

[106] https://www.gov.uk/government/publications/land-value-estimates-for-policy-appraisal-2017

[107] Commercial development has two definitions in the MHCLG land values data: (1) office edge of city centre and; (2) office out of town - business park.

[108] There are 594 observations in total, reflecting 198 different land values estimates across three land value categories (industrial, commercial office edge of city centre and office out of town / business park) and around 70 towns in 38 LEPs, which are each compared against the three net gain scenarios to estimate the delivery costs as a % of land value.

[109] https://www.london.gov.uk/sites/default/files/london_plan_viability_study_dec_2017.pdf (pg.46, table 7.2)

Table 14: Net gain delivery costs (residential)

			Costs per ha of development *(£, 2017 prices)*		
Region	**Estimated biodiversity unit loss per ha of development**	**Annual residential development not delivering net gain in the baseline (ha)**	**Scenario A**	**Central estimate**	**Scenario C**
East	4.4	643	3,445	18,329	62,983
East Midlands	5.2	365	3,427	19,951	69,522
London	2.7	1,158	3,585	13,157	41,872
North East	5.1	125	3,501	19,647	68,085
North West	4.5	386	3,515	18,952	65,265
South East	4.4	894	3,456	18,552	63,841
South West	4.6	509	3,424	18,470	63,610
West Midlands	4.8	373	3,461	18,527	63,725
Yorkshire and The Humber	4.9	304	3,519	19,282	66,570

Table 15: Net gain delivery costs (non-residential)

			Costs per ha of development *(£, 2017 prices)*		
Region	**Estimated biodiversity unit loss per ha of development**	**Annual non-residential development not delivering net gain in the baseline (ha)**	**Scenario A**	**Central estimate**	**Scenario C**
East	3.9	1,095	3,150	14,334	47,885
East Midlands	3.9	622	3,150	14,334	47,885
London	3.9	1,971	3,150	14,334	47,885
North East	3.9	213	3,150	14,334	47,885
North West	3.9	658	3,150	14,334	47,885
South East	3.9	1,522	3,150	14,334	47,885
South West	3.9	867	3,150	14,334	47,885
West Midlands	3.9	635	3,150	14,334	47,885
Yorkshire and The Humber	3.9	517	3,150	14,334	47,885

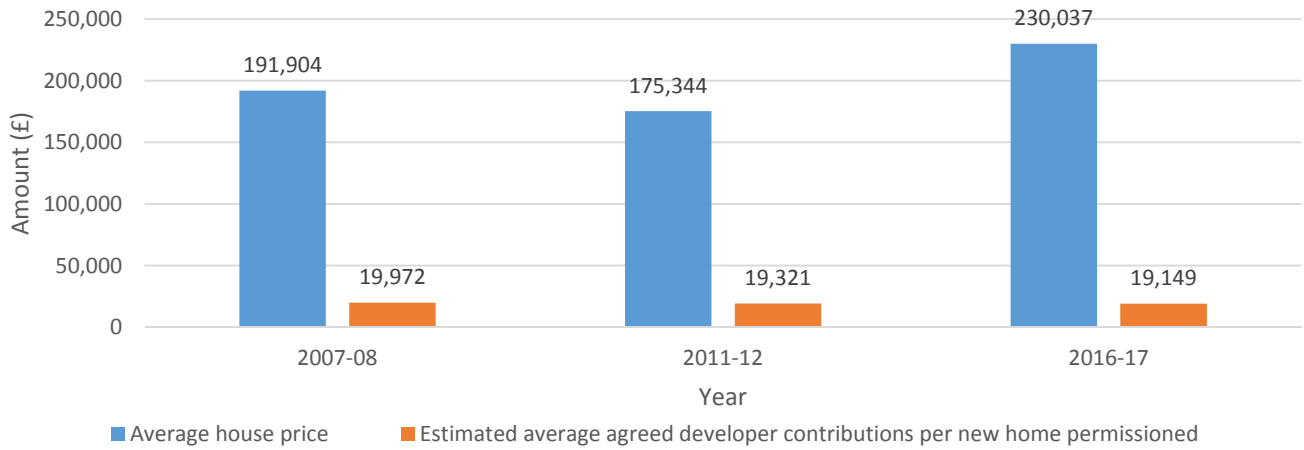
Table 16: Net gain delivery costs per greenfield development (residential)

			Costs per housing unit *(£, 2017 prices)*		
Region	**Estimated biodiversity unit loss per ha of development**	**Average housing density**	**Scenario A**	**Central estimate**	**Scenario C**
East	7.3	25	175	1,018	3,545
East Midlands	7.7	27	161	1,011	3,562
London	7.6	64	110	467	1,538
North East	8.2	24	192	1,159	4,059
North West	8.0	26	192	1,137	3,972
South East	7.4	27	162	948	3,305
South West	7.0	25	170	998	3,481
West Midlands	7.3	26	172	1,003	3,496
Yorkshire and The Humber	8.0	24	203	1,212	4,242

Table 17: Net gain delivery costs per brownfield development (residential)

Region	Estimated biodiversity unit loss per ha of development	Average housing density	Costs per housing unit *(£, 2017 prices)*		
			Scenario A	Central estimate	Scenario C
East	2.0	32	64	243	777
East Midlands	2.4	30	68	287	943
London	1.5	69	32	94	278
North East	1.9	31	59	233	757
North West	2.2	32	61	242	787
South East	1.9	35	56	207	660
South West	2.2	29	70	270	869
West Midlands	2.3	29	69	268	864
Yorkshire and The Humber	2.1	31	60	231	744

Figure 4: Average house prices and average contributions agreed with developers per new home (NAO report)



National Audit Office report: Planning for new homes[110]- Figure 13

Table 18: Residential build costs

Region	Build costs (£/m²)	Average m² of new dwelling	Build costs (£/ new dwelling, 2017 prices)
East	1,240	98	121,029
East Midlands	1,316	100	131,067
London	1,516	82	124,606
North East	1,228	93	113,951
North West	1,291	94	121,896
South East	1,391	101	140,287
South West	1,203	100	120,399
West Midlands	1,266	90	113,733
Yorkshire and The Humber	1,115	97	108,126

[110] https://www.nao.org.uk/report/planning-for-new-homes/

Table 19: Greenfield delivery costs as proportion of build costs

Region	Scenario A	Central estimate	Scenario C
	(delivery costs by scenario, as a % of build costs)		
East	0.1	0.8	2.9
East Midlands	0.1	0.8	2.7
London	< 0.1	0.4	1.2
North East	0.2	1.0	3.6
North West	0.2	0.9	3.3
South East	0.1	0.7	2.4
South West	0.1	0.8	2.9
West Midlands	0.2	0.9	3.1
Yorkshire and The Humber	0.2	1.1	3.9

Table 20: Brownfield delivery costs as proportion of build costs

Region	Scenario A	Central estimate	Scenario C
	(delivery costs by scenario, as a % of build costs)		
East	< 0.1	0.2	0.6
East Midlands	< 0.1	0.2	0.7
London	< 0.1	0.1	0.2
North East	< 0.1	0.2	0.7
North West	< 0.1	0.2	0.6
South East	< 0.1	0.1	0.5
South West	< 0.1	0.2	0.7
West Midlands	< 0.1	0.2	0.8
Yorkshire and The Humber	< 0.1	0.2	0.7

Table 21: Costs of net gain delivery as a % of industrial land values

Region	Number of towns in sample	Average land values *(min - max range)* (£ millions)		Net gain delivery costs as a % of land value *(average)* Scenario A	Central Estimate	Scenario C
East	7	1.1	*(0.5 - 1.8)*	0.4	1.6	5.4
East Midlands	4	0.6	*(0.3 - 0.8)*	0.6	2.9	9.7
London	9	4.0	*(1.8 - 6.2)*	0.1	0.4	1.4
North East	4	0.3	*(0.2 - 0.3)*	1.3	6.0	20.1
North West	9	0.5	*(0.3 - 0.9)*	0.7	3.2	10.8
South East	9	1.7	*(1.1 - 2.4)*	0.2	0.9	3.0
South West	10	0.8	*(0.4 - 1.1)*	0.4	2.0	6.8
West Midlands	9	0.6	*(0.4 - 1.0)*	0.5	2.4	8.1
Yorkshire and The Humber	8	0.5	*(0.2 - 0.7)*	0.7	3.3	11.2

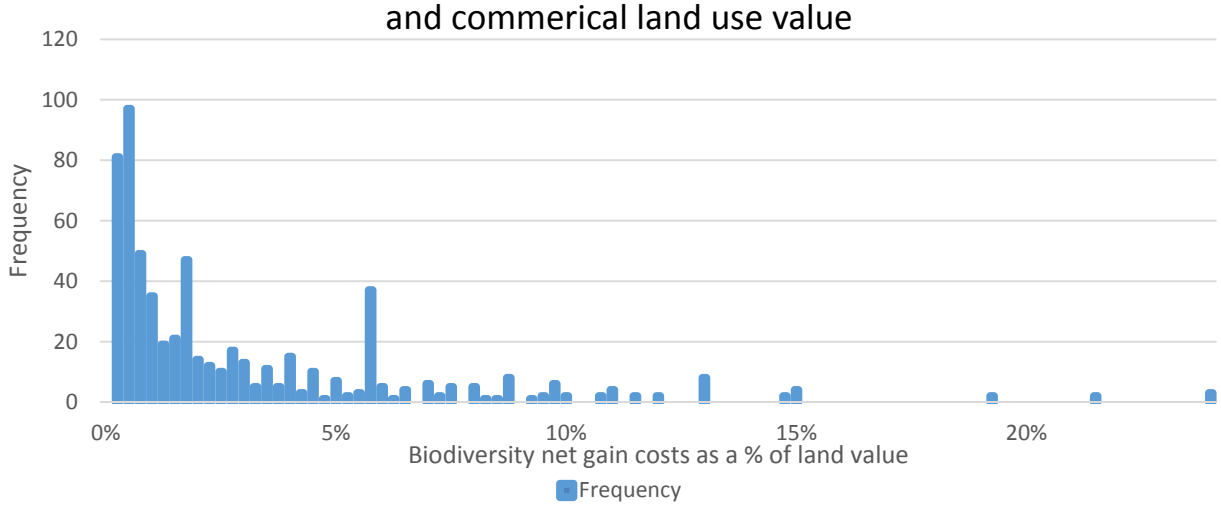
Table 22: Costs of net gain delivery as a % of commercial land values (office edge of city centre)

Region	Number of towns in sample	Average land values *(min - max range)* (£ millions)		Net gain delivery costs as a % of land value *(average)* Scenario A	Central Estimate	Scenario C
East	7	4.9	*(0.9 - 20.9)*	0.2	0.9	3.0
East Midlands	4	1.1	*(0.9 - 1.3)*	0.3	1.4	4.7
London	7	131.4	*(2.5 – 573)*	0.1	0.3	1.0
North East	4	0.9	*(0.9 - 1.1)*	0.3	1.6	5.3
North West	9	2.1	*(0.9 - 12.3)*	0.3	1.5	4.9
South East	9	5.9	*(0.9 - 21.7)*	0.2	0.7	2.3
South West	10	2.9	*(0.9 - 15.6)*	0.2	1.1	3.8
West Midlands	9	2.1	*(0.9 – 12.0)*	0.3	1.5	4.9
Yorkshire and The Humber	8	2.2	*(0.9 - 11.1)*	0.3	1.4	4.7

Table 23: Costs of net gain delivery as a % of commercial land values (office out of town - business park)

Region	Number of towns in sample	Average land values *(min - max range)* (£ millions)		Net gain delivery costs as a % of land value (average) Scenario A	Central Estimate	Scenario C
East	7	1.5	*(0.6 - 3.7)*	0.3	1.4	4.6
East Midlands	4	0.6	*(0.3 - 0.8)*	0.6	2.7	8.9
London	2	2.4	*(1.8 – 3.0)*	0.1	0.6	2.1
North East	4	0.4	*(0.2 - 0.5)*	1.0	4.5	15.0
North West	9	0.6	*(0.3 - 1.4)*	0.7	3.0	10.2
South East	9	2.6	*(1.1 - 8.7)*	0.2	0.8	2.6
South West	10	1.0	*(0.4 - 1.6)*	0.4	1.8	6.1
West Midlands	9	0.7	*(0.4 - 1.3)*	0.5	2.3	7.6
Yorkshire and The Humber	8	0.6	*(0.2 - 1.3)*	0.7	3.2	10.6

Figure 5: Distribution of net gain delivery costs as a % of industrial and commerical land use value



There are 594 observations in total, reflecting 198 different land values estimates across three land value categories (industrial, commercial office edge of city centre and office out of town / business park) and around 70 towns in 38 LEPs, which are each compared against the net gain scenarios to estimate the delivery costs as a % of land value.

6.6 Benefits to developers (not monetised)

Developers will benefit from certainty and a level playing field, resulting from a standardised approach to delivering biodiversity net gain across LPAs. The streamlining of the process could potentially result in savings for developers. A survey found that developers rate the overall complexity and associated costs of dealing with this as the most significant cause of extra cost in the planning process.[111] This is in addition to excessive and unpredictable delays. However, while consultation responses have supported this idea, we have little quantified evidence to robustly monetise these benefits.

6.7 Indirect benefits to market participants (not monetised)

As transaction costs and information asymmetries in the development industry fall, economic theory suggests that market efficiency will improve and there may be non-monetised **indirect benefits** to other market participants such as the construction sector. These may include reduced delays and uncertainty.

Mandating biodiversity net gain with the option to offset would create demand for habitats to be created by third parties to resolve excess biodiversity units owed by developers. Biodiversity banks and others who are cost-effective at creating habitat would be able to sell (excess) habitat at a price that would provide a profit. Due to limited evidence we are unable to gauge the size and demographics (i.e. biodiversity banks, land owners, other developers) of the current supply for a market for biodiversity units. We are also unable to judge how long it would take for the market to mature. For this reason we are unable to quantify these benefits.

Additionally, this could act as a redistribution of income towards developers who are environmentally proactive. This would work by environmentally proactive developers being incentivised to produce habitat greater than required by their biodiversity units liability. They would then be able to sell their excess units to the offset market for which there would be demand from environmentally harmful developments. As a result, redistribution occurs through the sale and purchase of biodiversity units between developers. As with the supply of biodiversity units, there is insufficient evidence to quantify this effect.

6.8 Costs and benefits to government (monetised)

There are transition and ongoing costs of policy delivery for central and local government to account for familiarisation, training, monitoring and enforcement. There may be an impact on developer contributions such as S106, which is currently used to deliver net gain and other environmental and local improvements in a discretionary manner (see **Section 2.3.2**). However, a nationally mandated policy will minimise ambiguity and create a level playing field for LPAs.

As part of consultation, we have tested assumptions for new burdens with local authorities to estimate the additional staffing (i.e. full-time equivalent / FTE) cost of delivering net gain. We directly engaged with the Local Government Association and the Association of Directors of Environment, Planning and Transport and invited individual authorities to discuss implementation. It was highlighted that the resource required was best arranged by unitary and county authorities (i.e. upper-tier authorities). We estimate that each upper-tier authority would require on average:

- 0.65 FTE (range between 0.5 and 2 FTE) ecologists for set up, lasting one to three years

[111] https://www.fmb.org.uk/media/35090/fmb-house-builders-survey-2017.pdf

- 0.65 FTE (range between 0.5 and 2 FTE) permanent ecologists, for monitoring after set up.
- 0.65 FTE (range between 0.5 and 2 FTE) permanent ecologists to advise authorities

Therefore, an upper-tier authority would require on average 1.3 FTE (1-4 FTE) ecologists in any given year. This totals to 197.6 FTE across 152 upper-tier authorities. Of this requirement, 22.8 FTE are needed for spatial planning, with skills in coordination, engagement and evidence use.

We expect that additional (fewer) resources would be required for upper-tier authorities with more (fewer) planning applications and environmental assets. Our analysis scales the representative resource requirement of LPAs according to the amount of development taking place within those areas.[112] We multiplied the FTE estimates by the current salary for a government ecologist (£37,096) and then added 30% as an approximation of overhead costs.[113]

For local government, our findings indicate that the initial annual costs total £9.5m throughout the first two years. Thereafter, costs are ongoing equalling £9.5m per year. Of these costs, £1.1m are associated with spatial planning.

To identify costs to central government we consulted with Natural England to understand the additional resource required to deliver net gain. They estimated additional ongoing resource requirement is around 38 FTE, the majority of which would be advisors (i.e. SEO grade) with a small proportion of managers (i.e. Grade 7). These jobs will generally cover: central oversight of net gain (project management, maintaining metric, light touch accreditation, monitoring and reporting); central co-ordination and financing of the government's biodiversity unit purchases; and provide support/training to LPAs and to engage in strategic sub-regional partnerships to facilitate strategic solutions. The estimated ongoing cost is £1.8m per annum, based on Natural England staff costs at those grades.

Furthermore there will be additional costs, to Defra Group, from the labour and capital requirement to improve spatial planning for nature. The labour requirement is estimated to be 21 FTE, the majority being senior advisors and the rest being advisors / analysts. Each senior advisor would be recruited at a Defra Group area level (probably based in Natural England) to support provide technical and logistical support to Local Authorities in their development of Local Nature Recovery Statement (LNRS). Using Defra staff costs, this is estimated to amount to £1.2m per year. The capital costs are estimated to be:

- £0.5m in the first year only, required to research and develop the appropriate data collection techniques
- £0.1m ongoing, for data operation.

In total, the expected cost of spatial mapping to central government equals £1.3m ongoing with a one-off £0.5m capital costs.

In summary, the estimated costs to local government are £9.5m per year ongoing and the costs to central government are £3.1m per year ongoing with an initial £0.5m capital cost. We continue to work with local authorities and our agencies to quantify any additional costs to deliver biodiversity net gain, in addition to professional organisations to make sure there is access to the right training, ecological expertise and systems required.

[112] Our analysis demonstrated that there is a strong correlation between the running costs of planning departments in local authorities and the amount of development within their boundaries.

[113] CIEEM salary and employment survey 2017-18

6.9 Benefits to society (monetised)

The most significant benefit is local and national habitat delivery and the accompanying natural capital benefits. This will contribute to delivering a clear benefit to people and local communities, and help achieve government ambitions on the environment. It will also alleviate the pressure of development on biodiversity and land use (i.e. slowing the overall rate of habitat and biodiversity loss).

The concepts of natural capital and ecosystem services[114] best illustrate the benefits that additional habitat and biodiversity, which underpin all ecosystem services, will bring:

- **provisioning:** energy, both renewable and non-renewable sources; wild animals; minerals; wild plants; timber; navigation – use of waterways for transportation; agricultural production and caught fish; water
- **regulating:** carbon sequestration; waste water cleaning; air pollution removed by vegetation; mediation of smell, noise and pollution removed by water; flood, erosion and landslide protection; temperature regulation; water flow control and water condition regulation
- **recreation and cultural services:** setting for outdoor recreation (day trips by UK residents); scientific and educational interactions; heritage and aesthetic interactions; value place on nature simply existing (non-use and symbolic values); settings for outdoor physical activity (health benefits).

Additionally, there is a growing body of literature exploring the mental health and wellbeing benefits of access to green space.[115,116] A recent Defra evidence review[117] finds the linkages between these natural environments and multiple direct health outcomes are increasingly well understood. In addition, there is *"strong and consistent evidence for mental health and wellbeing benefits arising from exposure to natural environment"*, which suggests the growing potential of the natural environment to contribute in various policy contexts (e.g. health and social care systems).

The key natural capital benefits are derived from avoided habitat loss and habitat creation. **From the analysis, the central estimate finds that 5,428 ha of habitat is created per year. Our range estimates habitat creation is between 1,551 (Scenario A) and 17,060 ha (Scenario C) per year. For avoided habitat damage (i.e. to distinctive habitats), our central estimate is 9,644 ha per year, with a range between 0 (Scenario C) and 12,859 ha (Scenario A) per year.** Detailed calculations can be found in **Annex 2**.

Figure 6 illustrates the accumulation or loss of habitat from the development sector under each scenario, including the counterfactual (where mandatory net gain is not implemented). **Figure 7** shows the net habitat creation, where each scenario is compared against the counterfactual (i.e. the counterfactual equals zero). Both graphs consider total habitat created and avoided habitat loss. **Figure 7** is derived from **Figure 6** by subtracting the counterfactual line from the scenario trends. This is illustrated on both graphs using Scenario C in 2024 as an example.

---

[114] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemserviceaccounts1997to2015

[115] Sandifer, Sutton-Grier, Ward, Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation, *Ecosystem Services*, Volume 12, 2015

[116] https://www.balfourbeatty.com/media/317352/balfour-beatty-a-better-balance-a-roadmap-to-biodiversity-net-gain.pdf. The paper indicates that: *"…places with high quality "green infrastructure" – such as public parks, green spaces, green roofs and trees – have a positive impact on physical and mental wellbeing, have better air quality, are less likely to flood, and attract more investment".*

[117] http://sciencesearch.defra.gov.uk/Document.aspx?Document=14290_HealthandtheNaturalEnvironment_FullReport_29.08.18.pdf

Our estimates show that on-site delivery produces greater net habitat in the short term – since no habitat is lost and off-site delivery would take some time. However, as we move towards the long term, off-site delivery is shown to produce more net habitat. This occurs because more habitat is produced from off-setting, since for all habitat destroyed more has to created (see **Section 2.3.1**), which eventually counteracts the initial loss of habitat. Note that **Figures 6 and 7** display habitat created rather than matured habitat (habitat at intended condition, 20-30 years after creation) created and are cumulative, not per annum, numbers. So while Scenario C is estimated to create the most habitat after 7 years, this does not translate to Scenario C will deliver the greatest benefits (i.e. natural capital) after 7 years.

Table A1.2 in **Annex 1** sets out the range of values (between £3,696 and £89,248 per ha), adapted regionally, derived from the ONS ecosystem services for urban, which we use as proxy for the value of matured habitat, which allows for the estimation of the benefits of the policy.

The (10 year) average social benefits of the policy falls in the range of £0m - £1,860.9m per year. The central estimate is £1,395.7m per year. Our analysis does not capture the benefits of habitat creation within a 10 year appraisal period as we expect it will take developers 20 years, on average, to create new habitat at the desired condition. This is what causes our benefits range to start from zero, since under Scenario C developers only create habitat to offset their development, with no mitigation on site. As a result, only avoided habitat loss is monetised in our analysis under a 10 year appraisal period. The sensitivity analysis (**Section 6.11**) investigates how these estimates change over a 40 year appraisal period. While the natural capital benefits delivered are highly dependent on the location and design of individual developments, such variation (beyond what is captured regionally) is difficult to capture at an aggregate level. Therefore, these benefits are likely to be undervalued (see **Section 6.9.1** for further discussion).

Figure 6: Cumulative habitat trend by scenario (ha, creation and loss)

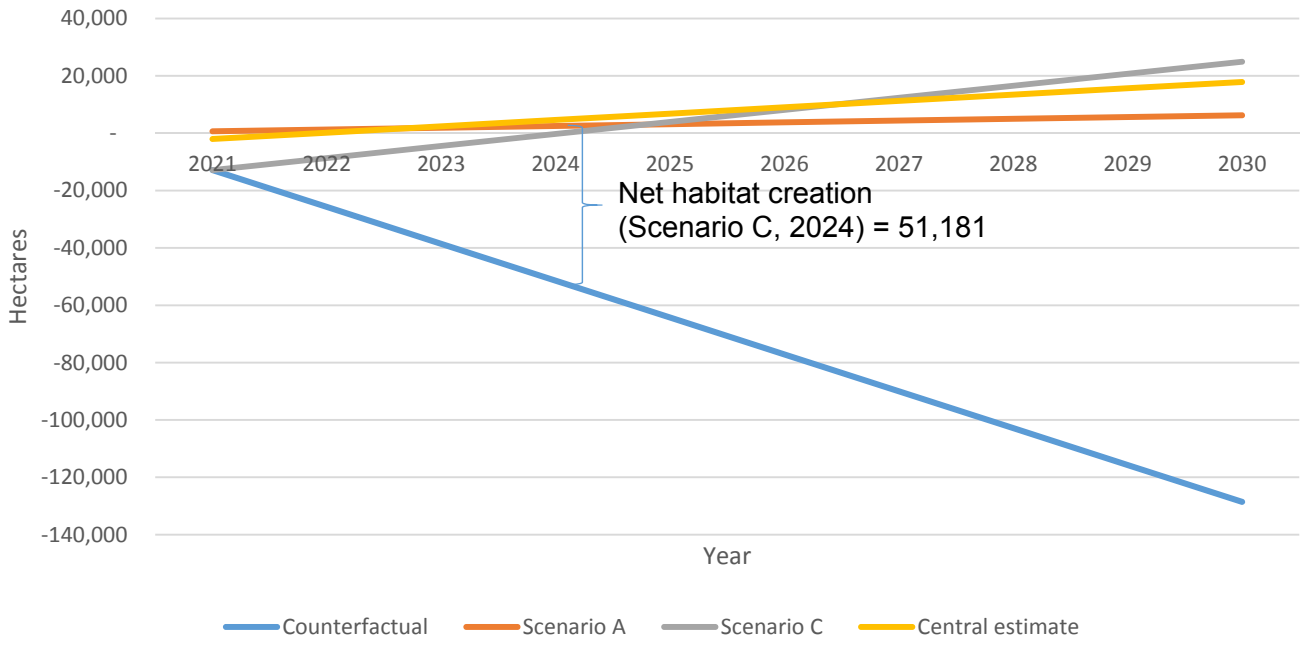
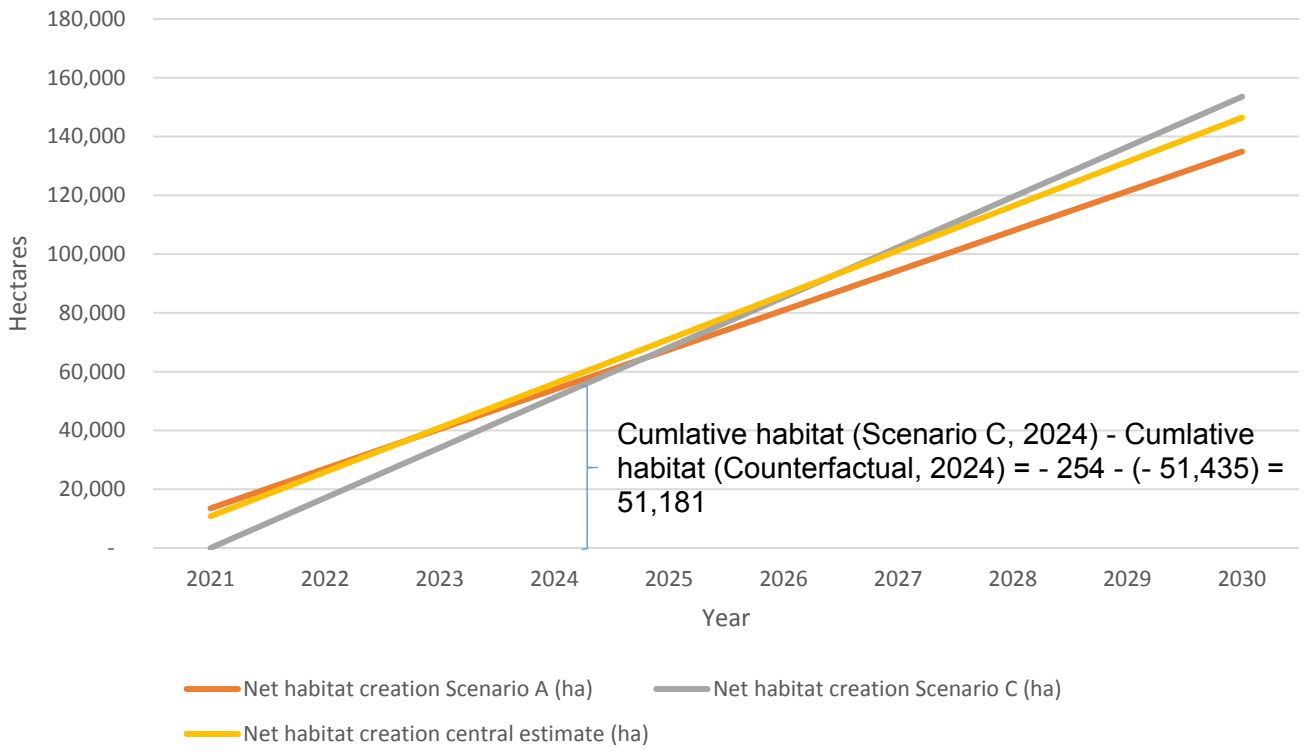


Figure 7: Net cumulative habitat creation
(ha, accounting for avoided loss and habitat creation)



6.9.1 Wider public benefits in context

The benefits of many natural capital investments often demonstrate good value for money and the benefit cost-ratios (BCRs) sometimes exceed other capital investments such as road and rail. Evidence from the National Capital Committee[118] demonstrates high return investment opportunities in woodland planting, peatland restoration, wetland restoration and addressing air quality and greenspaces in urban areas. BCRs typically vary between 3 to 1 and 8 to 1, and are based on partial valuations of benefits. For example, restoration of 140,000 ha of peatland would deliver net benefits of over £500 million over 40 years in carbon values alone.

There is a growing literature of valuation evidence for different natural capital assets and spatial scales. For example:

- ONS[119] has developed various ecosystem services accounts, mostly at the UK level. Recently, it estimated that UK urban green space has a stock value of between £100-200 billion depending on the methodology used,[120] and for woodland £87 billion (2015 prices).[121] It has also developed a tool that assesses the value of air pollution removal by

[118] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/516725/ncc-state-natural-capital-third-report.pdf. See executive summary, sections 4.1 (Box 4.1 gives an example of prioritising woodland creation) and 5.1 (Box 5.6 provides benefit cost ratios for various categories of capital investment alongside natural capital investment.)

[119] https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/naturalcapital

[120] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemaccountsforurbanareas

[121] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/landandhabitatecosystemaccounts

vegetation,[122] which estimates this pollution removal saved the UK around £1 billion (2012 prices) in avoided health damage costs in 2015

- Eftec[123] has developed a partial valuation of natural capital for the Greater Manchester Combined Authority (GMCA). It estimates total annual benefits of over £900 million (2017 prices), with health benefits (air quality and noise regulation, physical and mental health) contributing to more than half of the benefits. This translates to an estimated natural capital stock value of £25.4 billion (2017 prices). Given the extent of GMCA is 127,613 ha, the benefits are equivalent to £7,300 per ha annually (**Table A1.2** in **Annex 1** shows that we assume the annual environmental benefits per ha of new habitat creation or avoided habitat loss in the 'North West' region is £8,192), or nearly £200,000 per ha in stock value
- the Forestry Commission[124] has reviewed natural capital valuation for urban trees, demonstrating estimated annual benefits in various areas such as Wrexham (£2 million per year), Glasgow (£6.7 million per year) and Greater London (£130 million per year). These are partial valuations that account for benefits such as carbon sequestration, and air pollution removal
- University of Exeter have constructed online tools to provide estimates for the of existing and changing land uses for a range of asset types: Outdoor Recreation Valuation (ORVal)[125] and Natural Environment Valuation Online (NEVO)[126]. Under the former tool, the average per hectare value for a selection of parks is £30,000. This only considers recreational benefits and not wider natural capital benefits of accessible greenspace, and therefore is considered likely to be an underestimate.

As outlined in **Section 6.2** and **Section 6.9**, the benefits assessment is uncertain, reflecting a national based approach to the analysis for a policy that will have spatially specific impacts. To demonstrate the validity of this approach, we combine land use change data (**Table 24**) with valuations from ONS ecosystem services accounts to demonstrate alternative estimates for the value of avoided habitat loss. **Table 25** presents a summary of the natural capital data, while **Table 26** demonstrates the value of avoiding the recent annual losses of selected asset types shown in **Table 4**.

The analysis demonstrates that there are significant benefits that could be realised by avoiding future losses of distinctive and valuable habitat, assuming recent trends continue. For example, the estimated net present value of avoiding the loss of 100 ha per year of urban green space (proxy for outdoor recreation) is around £350 million (2016 prices) based on annual benefits, or £2.2 billion (2016 prices) based on natural capital stock value. While avoiding woodland and farmland losses also delivers benefits (albeit less significant than urban green space), it should be noted that all estimates made here are based on partial valuations of the ecosystem services provided. In other words, the true benefits are likely to be much greater than those estimated here and in the headline analysis, particularly as some key ecosystem services (e.g. biodiversity) are not quantified.

122 https://www.ons.gov.uk/economy/environmentalaccounts/articles/ukairpollutionremovalhowmuchpollutiondoesvegetationremoveinyourarea/2018-07-30

123 https://naturegreatermanchester.co.uk/wp-content/uploads/2018/06/NCA-for-GM-Final-Report-270618.pdf

124 https://www.forestry.gov.uk/pdf/FINAL_REPORT_FCRP027.pdf/$FILE/FINAL_REPORT_FCRP027.pdf. See section 10 on Urban Trees. The exact price years for quoted figures is not obvious from the report, but most likely between 2010 and 2015.

125 https://www.leep.exeter.ac.uk/orval/

126 https://www.exeter.ac.uk/leep/research/nevo/ - tool not formally released at time of writing.

Table 24: Annual land use change to developed uses within policy scope in England (hectares)

Year	Agriculture (ha)	Forest, open land and water (ha)	Outdoor recreation (ha)
2013-14	1,400	250	100
2014-15	2,500	375	100
2015-16	1,950	375	100
2016-17	1,900	350	75
Annual average	1,950	325	100
Annual average (all developed uses in land use change data)	9,675	875	350

All figures are rounded, so sub-totals may not equate to stated totals and averages. Data from Table P361 - see **Table 1** for sources and definitions. Developed uses only includes the categories **within scope of the policy** – residential, industry and commerce, and transport and utilities.

Table 25: ONS ecosystem services accounts - summary data

		Natural capital benefits (total)		**Natural capital benefits** (per ha)	
Asset	**Extent** (ha)	**Annual flow** (£ billions)	**Stock value** (£ billions)	**Annual flow** (£)	**Stock value** (£)
Urban greenspace[1] (2016 prices)	73,600 *(England)*	5.8	187.9	78,804	2,553,564
Woodland[2] (2015 prices)	3,160,000 (UK wide)	2.7	87.6	855	27,717
Farmland[2] (2015 prices)	17,600,000 (UK wide)	1.6	50.6	89	2,876

Notes: *Stock values estimate the lifetime benefits over 100 year appraisal period, using variable discount rates as outlined in the HMT Green Book: 3.5% for 0 - 30 years, 3.0% for 31-75, and 2.5% for 76 - 100 years. Some of the estimated values are derived from the published data – for example, the annual flow of benefits for woodland was derived from the total stock value.*

[1]urban green spaced used as a proxy for "outdoor recreation". Valuation data taken from ONS ecosystem accounts for urban areas, based on visits to publically accessible greenspace in England only.
https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemaccountsforurbanareas

[2]valaution data from the latest ONS ecosystem accounts for freshwater, farmland and woodland based on UK wide data on extent and ecosystem services benefits.
https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/landandhabitatecosystemaccounts

Table 26: Natural capital benefits of avoid habitat loss - an alternative analysis

		Value of natural capital benefits based on:		**Net present value (10 year appraisal period) of natural capital benefits based on:**	
Asset	**Average annual avoided loss** (ha)	**Annual flow** (£m)	**Stock value** (£m)	**Annual flow** (£m)	**Stock value** (£m)
Urban greenspace	100	7.9	255.4	354.3	2,198.0
Woodland	325[1]	0.3	9.0	13.5	77.5
Farmland	1,950	0.2	5.6	8.4	48.3

Notes: *Stock values estimate the lifetime benefits over 100 year appraisal period, using variable discount rates as outlined in the HMT Green Book: 3.5% for 0 - 30 years, 3.0% for 31-75, and 2.5% for 76 - 100 years. The net present value estimate assumes that previous average annual losses are avoided over a 10 year appraisal period.*

*[1]the land cover map analysis (see **Section 2.2.2**) suggests that average annual loss of woodland to urban development is around 500 ha per year between 2007 to 2015. For the purposes of this illustrative analysis, we use the annual loss figure from the land use change data, although we acknowledge that this includes open land and water in addition to forest.*

6.10 Net present value and equivalent annual net cost to business

Based on direct impacts to developers, the central net present value estimate over a 10 year appraisal period is **£9,566.8m** (2017 prices), (range between £-5,878.4m and £14,715.3m), based on a discount rate of 3.5%.[127] The estimated equivalent annual net cost to business (EANDCB, 2016 prices) is **£170.7m**, based on the central scenario. As discussed in **Sections 6.4**, the pass through effect to land prices (representing a cost to landowners) means that the impact on developers is likely to be significantly lower (£17.1m per year). However, the headline figures report the direct impacts (which contains the indirect effects) – otherwise this would be misrepresentative of the costs to businesses and landowners (e.g. if only costs after pass-through was considered) or be double counting (e.g. the indirect impacts are already contained within the headline figures).

6.11 Sensitivity analysis

The impact of changes to assumptions and risks, outlined in **Sections 6.2** and **6.3**, on key outputs are assessed though sensitivity analysis. This section outlines how this analysis was conducted (**Section 6.11.1**) and reports the findings (**Section 6.11.2**).

6.11.1 Description of sensitivity analysis

All analysis in this section is compared against both the headline 10 year appraisal period analysis (**Table 27**) and extended 40 year appraisal (**Table 28**). The impact on 'net indirect costs to developers' are not displayed in the tables since the percentage change will always match the direct costs to developers. That is, the absolute value of indirect costs are 10% of the direct costs.

Our headline analysis assumes that the housebuilding rate is constant and in-line with assessed housing need data, which is estimated at roughly 267,000 per annum.[128] An increase of this scale is likely given that the government's ambition is to increase housebuilding to 300,000 per year (see **Section 2**). We consider the results if we changed our analysis so that the housebuilding increased to 300,000 per year for every year in the appraisal period.

We expect that developers will continue to build over the same level of habitat as before (averaging 4.46 units per ha) and shall choose to create the most distinctive habitat available (estimated at 19.84 units per ha before time, risk and baseline deductions). The tables demonstrate changes to results if developers were to create the least distinctive habitat possible within the bounds of the policy (estimated at 11.05 units per ha before time, risk and baseline deductions). The tables show the change in results if developers were to develop on habitat that is 20% less distinctive than current trends.

Our analysis assumes that the amount of habitat delivered, as of result of net gain, on-site is 75%. It was indicated, by consultation responses, that the 'majority' of habitat would be delivered in this way. To that end, we test that 50% is delivered on site. This is considered to be the lowest bound for what could be expected to be meant by 'majority'.

The benefits are derived using the ONS ecosystem services accounts for urban areas, which estimates greenspace within 100m of a property to be worth £4,800 per residence. This is a

[127] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[128] https://www.gov.uk/government/consultations/planning-for-the-right-homes-in-the-right-places-consultation-proposals

conservative estimate relative to those offered by Natural Environment Valuation Online (NEVO) and Outdoor Recreation Valuation (ORVal), and the wider literature (see **Section 6.9.1** for further discussion). We test this further by applying a 20% reduction to the value used. Similarly, we apply a 20% increase to all costs to test against optimism bias.[129]

This analysis examines the cost and benefits of implementing net gain at the 10% level. There are advantages of a significant margin of gain (e.g. it increases the likelihood that net gain will be achieved), but the increased costs this would lead to should be considered alongside potential development viability issues. We consider how these values are affected if this percentage was doubled (20%) or halved (5%) respectively. Finally, we consider the impact if all sensitivities that decreased benefits, increased costs and expanded scale of the policy were considered collectively.[130]

As per guidance from HM Treasury Green Book, the appraisal period in our analysis runs for 10 years. Given the 20 year time lag between habitats being created and reaching maturity, this means that benefits of the policy are not adequately reflected in the headline analysis. **Table 28** shows the results for the same aforementioned scenarios but over a 40 year appraisal period to capture the full lifetime impacts.

[129] Costs included are: survey costs, habitat creation, price of biodiversity unit, staff .costs (including familiarisation)

[130] Sensitivities included are: housing targets, developers creating suboptimal habitat, developers building on less distinctive habitat, onsite delivery, environmental benefits and optimism bias.

Table 27: Outputs and cost benefit analysis change by scenario (10 year appraisal, 2017 prices)										
										(Change from headline analysis beneath. If blank, it indicates no change was estimated)
	Headline analysis	**Government housing target met**	**Developers create less distinctive habitat**	**Developers build on less distinctive habitat**	**Net gain on-site delivery percentage is 50%**	**20% reduction in estimate for environmental benefits**	**Optimism bias (increase all costs 20%)**	**Double level of net gain (20%)**	**Halve level of net gain (5%)**	**All**
Estimated residential development per year	6,701	7,529 (+12%)								7,529 (+12%)
Avoided habitat loss *(Annual, ha)*	9,644	10,085 (+5%)			6,429 (-33%)					6,723 (-30%)
Habitat creation *(Annual, ha)*	5,428	5,699 (+5%)	21,178 (+290%)	4,343 (-20%)	9,306 (+71%)			6,979 (+29%)	4,653 (-14%)	30,492 (+462%)
										(£ millions, unless stated otherwise, change from headline analysis beneath)
Net direct cost to developers (*annual*)	199.0	209.2 (+5%)	265.4 (+33%)	194.4 (-2%)	355.8 (+79%)		238.8 (+20%)	236.8 (+19%)	180.0 (-10%)	489.9 (+146%)
Present value of costs *(10 year appraisal, total costs to developers and government)*	1,828.2	1,916.3 (+5%)	2,400.4 (+31%)	1,788.8 (-2%)	3,178.3 (+74%)		2,188.4 (+20%)	2,154.2 (+18%)	1,665.3 (-9%)	4,350.1 (+138%)
Present value of benefits *(10 year appraisal, social benefits derived from local avoided habitat lost and local habitat creation)*	11,395.1	11,916.0 (+5%)			7,596.7 (-33%)	9,116.1 (-20%)				6,355.2 (-44%)
Net present value (*total, 10 year appraisal period, 3.5% discount rate*)	9,566.8	9,999.7 (+5%)	8,994.6 (-6%)	9,606.3 (+0%)	4,418.4 (-54%)	7,287.8 (-24%)	9,206.6 (-4%)	9,240.9 (-3%)	9,729.8 (+2%)	2,005.1 (-79%)

Table 28: Outputs and cost benefit analysis change by scenario (40 year appraisal, 2017 prices)										
(Change from headline analysis beneath. If blank, it indicates no change was estimated)										
	40 year appraisal	**Government housing target met**	**Developers create less distinctive habitat**	**Developers build on less distinctive habitat**	**Net gain on-site delivery percentage is 50%**	**20% reduction in estimate for environmental benefits**	**Optimism bias (increase all costs 20%)**	**Double level of net gain (20%)**	**Halve level of net gain (5%)**	**All**
Estimated residential development per year	6,701	7,529 (+12%)								7,529 (+12%)
Avoided habitat loss *(Annual, ha)*	9,644	10,085 (+5%)			6,429 (-33%)					6,723 (-30%)
Habitat creation *(Annual, ha)*	5,428	5,699 (+5%)	21,178 (+290%)	4,343 (-20%)	9,306 (+71%)			6,979 (+29%)	4,653 (-14%)	30,492 (+462%)
(£ millions, unless stated otherwise, change from headline analysis beneath)										
Net direct cost to developers (*annual*)	199.0	209.2 (+5%)	265.4 (+33%)	194.4 (-2%)	355.8 (+79%)		238.8 (+20%)	236.8 (+19%)	180.0 (-10%)	489.9 (+146%)
Present value of costs *(40 year appraisal, total costs to developers and government)*	4,700.4	4,927.4 (+5%)	6,174.9 (+31%)	4,598.7 (-2%)	8,179.4 (+74%)		5,626.6 (+20%)	5,540.3 (+18%)	4,280.4 (-9%)	11,197.1 (+138%)
Present value of benefits *(40 year appraisal, social benefits derived from local avoided habitat lost and local habitat creation)*	100,127.6	104,751.5 (+5%)	127,241.0 (+27%)	98,258.6 (-2%)	76,299.4 (-24%)	80,102.1 (-20%)		102,962.8 (+3%)	98,710.0 (-1%)	92,022.5 (-8%)
Net present value (*total, 40 year appraisal period, 3.5% discount rate*)	95,427.3	99,824.0 (+5%)	121,066.0 (+27%)	93,659.9 (-2%)	68,120.1 (-29%)	75,401.7 (-21%)	94,501.0 (-1%)	97,422.6 (+2%)	94,429.6 (-1%)	80,825.4 (-15%)

6.11.2 Results of sensitivity analysis

The tables demonstrate that biodiversity net gain, as outlined in our preferred approach (**Section 5.2.2**), is expected to deliver measurable benefits under all scenarios. This is still true even if all sensitivities, which have a negative impact upon our estimates, were realised. According to our analysis, the policy's greatest dependency is the proportion of developments which avoid habitat loss and deliver on site (Scenario A) and those which damage existing habitats and pay compensation (Scenario C). The sensitivity analysis shows that decreasing this percentage to 50% significantly increases costs and reduces benefits by nearly a third. This amounts to a 54% decrease in the net present value of the policy under a 10 year appraisal period. This is misleading however, given that a lot of the benefits are transferred from avoided habitat damage to created habitats. Due to the 20 year delay in the realisation of benefits from created habitat, the transferred benefits are not accounted for. In the 40 year appraisal, the same effect leads to a 29% decrease in the estimated net present value of net gain. While this is still a substantial decrease, it is clear that the created habitat benefits not being realised has a noticeable effect on the results.

When analysing the impact of changing the level of net gain required, we show that doubling (to 20%) and halving (to 5%) the net gain percentage increases costs to developers by 19% and decreases costs by 10% respectively in both a 10 year and 40 year appraisal period. As a result, doubling the percentage reduces the overall net present value by 3% and halving the percentage improves this by 2% under a 10 year appraisal period. In the 40 year appraisal, however the benefits increase by 3% and costs decrease by 1%. Consequently, the net present value increases by 2% or decreases by 1% in response to doubling or halving the level of net gain.

While this suggests that varying the level of net gain between 5% and 20% has very limited impact on the outcome, there is a trade-off between cost implications for developers and the likelihood of net gain being delivered at a national level (e.g. less costly/likely at 5% net gain compared to 10%, and vice versa for 20%). Our chosen policy approach, which sets out that 10% is the right level to demonstrate net gain, considers this trade-off among other issues. These are discussed further in **Annex 3**.

Also of note, if developers were to create the least distinctive habitat allowed (see **Section 2.3.1** on "trading down") we estimate the amount of habitat created would increase by 290%, improving net present value by 27% in the 40 year appraisal. This increase is true for the extent of habitat, however the quality per hectare of this habitat would be less than that assumed in the headline analysis. This is reflected in that there would be no change to the amount of biodiversity units delivered. For this reason, we anticipate that this would not lead to a corresponding increase in environmental benefits, although a small change in the overall benefits may be possible in this case.

7 Small and micro business assessment

7.1 Background

A small business is defined as one employing fewer than 50 full-time equivalent employees, and a micro-business as one employing up to 10 employees. There are 34,580 developers in England, with 45% located in London and the South East. In addition, 97% (33,535) and 3% (990) of developers are classed as micro and small business respectively. Only 50 developers

can be classed as medium or large businesses.[131] The sector also employs 81,000 people.[132] Micro and small developers reflect approximately 60% of gross value added (GVA) and 50% of turnover.[133]

In a planning context, the impact of mandating biodiversity net gain will vary depending on the size of the:

- **Developer:** in the absence of mitigation steps, new regulations are typically more costly for small businesses to implement compared to medium or large ones; and
- **Development:** minor developments (i.e. small sites) have far less (and sometimes negligible) impact on habitats compared to major developments. However, small developments happen frequently enough such that their cumulative impact is not insignificant over time (see land cover map analysis conclusions in **Section 2.2.2**).

Table 29 presents the definitions of minor and major developments by development type.

Table 29: Definitions of minor and major developments, by development type

	Residential development	Non-residential development
Minor development (i.e. small sites)	Where the number of dwellings to be provided is between one and nine inclusive on a site having an area of less than one hectare; **OR** where the number of dwellings to be provided is not known, a site area of less than 0.5 hectares.	Where the floor space to be created is less than 1,000 square metres **OR** where the site area is less than one hectare.
Major development	Where the number of dwellings to be provided is ten or more; **OR** where the number of dwellings to be provided is not known, a site area of more than 0.5 hectares.	The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more **OR** development carried out on a site having an area of one hectare or more.

Source: MHCLG, Planning applications in England. https://www.gov.uk/government/collections/planning-applications-statistics

There is limited evidence overall on the interaction between size of developer and sites. For example, the data shows that for residential development, 96% of small sites are built by developers that are responsible for 10 projects or fewer.[134] However, the data does not indicate how many of those developers with fewer than 10 projects are genuinely small, and how many are actually large developers operating under a different name. A House of Commons briefing paper on self-build and custom build housing estimates that these account for between 7-10% of new housing in the UK.[135]

When analysing planning applications and land use change, a 2014 study by Glenigan[136] found that the vast majority of residential planning applications are for small sites. Similarly, analysis of recent planning application data suggests that small sites cover 80% of permissioned residential

[131] https://www.nomisweb.co.uk/. ONS data on number of enterprises by employment size band. Developers defined by the Standard Industrial Classification (Revised 2007) Section F 41.10: 'Development of building projects'. 2018 data.

[132] https://www.nomisweb.co.uk/ . ONS data from Business Register and Employment Survey. Developers defined by the Standard Industrial Classification (Revised 2007) Section F 41.10: 'Development of building projects'. 2017 data.

[133] https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/uknonfinancialbusinesseconomyannualbusinesssurveyemploymentsizeband. ONS data Non-financial business economy in the UK by employment sizeband. UK level data for construction industry (Standard Industrial Classification Section F, which includes developers 41.10) used as a proxy.

[134] MHCLG analysis of Glenigan planning pipeline data.

[135] https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN06784

[136] https://www.glenigan.com/sites/default/files/Residential-Planning-Outcomes-and-the-NPPF-Apr-14FINAL.pdf?sid=37864

sites, but only 12% of permissioned residential units.[137] For non-residential developments, small sites make up 90% of applications,[138] but there is no comprehensive data on the number of completions given the range of development types this includes, and the fact that some developers operate across different sectors.

The land cover map analysis (see **Section 2.2.2**) indicates that minor developments (e.g. less than 1 ha) make up majority of land use changes in terms of frequency, but only a small proportion of the land use change overall. In other words, the majority of habitat lost to urban development is small in scale but many in number. This means that the significant habitat loss of recent years is an accumulation of many small losses, each of which may not seem individually problematic. This is in addition to the losses from major developments, which make up the majority of land use change in terms of area.

Assuming that the relationship between planning applications and completions is similar for residential and non-residential development, our best estimate is that micro and small developers represents between 10-20% of residential and non-residential development. This is equivalent to between 1,600 ha and 3,200 ha per year based on the total development in scope (16,232 ha) given in **Table 12** in **Section 6.1**.

7.2 Exemptions and mitigations

At consultation, we tested the assumption that including broad exemptions for micro/small developers or small developments carries a risk of making the policy ineffective by undermining the net gain delivered elsewhere. We also highlighted that it would represent a weakening of existing NPPF policy, which was recently revised to strengthen policy wording on biodiversity net gain.

The consultation IA set out how broad exemptions could have unintended consequences. For example, exemptions for:

- **small developers** may exempt lots of small sites but not those by large developers
- **small developments** would capture both small and large developers. It may introduce an incentive to subdivide plots when trading land to avoid biodiversity obligations and achieve higher prices
- **some developers or developments** would leave the maximum value of the land unaffected for some market participants. This would make cost pass-through to land values less likely and also prevent a competitive level playing field.

However, we proposed that permitted development and developments that would result in negligible loss or degradation of habitat, for instance material change of use of or alterations to buildings and house extensions, would fall out of scope. Beyond this, we also consulted on whether appropriate exemptions could be made to developments by size, sector or site location, in cases where there would be little environmental impact or be proportionate where development would otherwise be compromised.

[137] Internal MHCLG analysis, based on planning application data provided by Glenigan for the year to 2018 Quarter 1.

[138] https://www.gov.uk/government/collections/planning-applications-statistics. Analysis of planning applications for the year ending December 2017. There were 75,126 planning applications for non-residential developments, where 67,884 (90%) are classed as minor developments (small sites). 'Non-residential development' includes the following categories defined within the dataset: Office/research and development/light industry; General industry/storage/warehouse; Retail and services; Traveller pitches; and all other major developments.

Feedback from consultees and industry experts suggests that both minor and major developments should be in scope of the policy. However, we recognise the potential disproportionate regulatory burden on small developers or developments. A survey has raised concerns about the disproportionate cost and delay SME house builders report in bringing small scale developments through the planning system.[139]

Therefore, our preferred option proposes that, as an alternative to broad exemption, that aspects of the process are simplified for small developments. This supports our core policy objective for environmental obligations in the planning system to be streamlined, a benefit to all developers, whilst having a policy that is scalable, simple and administratively light as possible. Mitigation steps for small developments include:

- **aiming to create no increase in survey burden for small developers and ensure that processes are proportionate to the impact on biodiversity.** A simple walkover survey and habitat plan for the proposed development prepared by an appropriately qualified person, who could be an in-house member of staff without very specialist experience, should suffice for assessments of biodiversity net gain if a survey is not required for other biodiversity reasons. In contrast, a large developer or a development affecting biodiverse habitat would typically be expected to engage an experienced ecologist to carry out or review the assessment
- **use of an abridged version of the biodiversity metric with condition values pre-populated, resulting in marginally lower or higher levels of net gain on individual sites but close to the target overall.** This is compared to a large development where the assessor would need to establish the habitat condition as part of the survey
- **the ability to purchase, through local markets or from government, any necessary biodiversity units upon receipt of planning permission.** Whilst this mechanism applies to both small and large developers, it is expected that this will particularly benefit smaller developers who may not have access to wider land portfolios for compensation, or room within developments for full impact mitigation
- **guidance on implementing on site measures through generic good design and 'off the shelf' habitat banking.** This is compared to a large development where design considerations may be more site specific and bespoke habitat improvement may be necessary

We will also be exploring options throughout implementation for avoiding new process burdens to developments that are slightly larger than our stated definition of 'small sites' in **Table 29**. It is intended that significant additional survey requirements will not be created through biodiversity net gain policy (as was found to be the case by the evaluation of the biodiversity offsetting pilots), particularly with regard to developments smaller than 40 residential units or 1 hectare which might be more likely to be undertaken by smaller development businesses.

8 Justice Impact Test

The impact of mandating net gain for biodiversity on the justice system is estimated to be minimal. We might expect an initial increase in biodiversity-related cases on commencement due to unfamiliarity with the policy and/or e.g. developers testing the legislation. However, the baseline of proxy cases is low and any increase on this is likely to be modest. Long-term,

[139] https://www.fmb.org.uk/media/35090/fmb-house-builders-survey-2017.pdf

biodiversity net gain policy will make it clearer upfront to developers what is required of them and the approved metric and supporting guidance will reduce scope for disagreement.

Payments, or increased costs, which are based on an assessment of the biodiversity value of land determined via the biodiversity metric are, to an extent, novel. While the Defra metric is established and in use by a number of local authorities and developers, familiarity is not consistent at a national level. We might reasonably expect initial challenges around, for example, the application of professional judgement in assessing habitat 'condition' under the metric (see **Section 5.2.2.3**). To note, however, that the biodiversity offsetting pilots in Warwick and Coventry, which have been in operation since 2012, have seen no appeals or legal challenges under their offsetting-related requirements.

In the long term, we would expect initial challenges to be worked out through case law and the consistency provided by the proposed mandatory approach and single metric to build common understanding and enable constructive scrutiny by communities and stakeholders. This will reduce significantly the scope for disagreements to reach the courts.

We submitted a Justice Impact Test to the Ministry of Justice (MoJ). The outcome is that MoJ consider that the impact our preferred policy approach on the justice system is likely to be minimal, but that Defra would be expected to meet any downstream costs to the justice system should these arise.

Annex 1: Key cost benefit analysis assumptions

Table A1.1: Estimated biodiversity unit value of land use types

Previous land use type	**Biodiversity units (1 ha)**	Distinctiveness	Condition	Connectivity	Strategic significance
Previously developed use					
Community Service	0	0	2	1	1
Defence	0	0	2	1	1
Industry and Commerce	2	1	2	1	1
Minerals and Landfill	0	0	2	1	1
Residential	2	1	2	1	1
Transport and utilities	2	1	2	1	1
Other developed use	4	2	2	1	1
Vacant - previously developed	4	2	2	1	1
Previously non-developed use					
Agriculture	4	2	2	1	1
Forest, open land and water	16	6	2	1.15	1.15
Outdoor recreation	4	2	2	1	1.1
Residential garden	4	2	2	1	1
Undeveloped land	10	4	2	1.1	1.1
Vacant – not previously developed	10	4	2	1.1	1.1

Distinctiveness values for sub-categories of habitat types were estimated for the previous biodiversity metric by Warwickshire's impact calculator.[140] The values were averaged according to land use types to provide a distinctiveness score, that could be applied to MHCLG's land use data and then scaled up to match the new biodiversity metric.[141,142] Each land use type was then given a score for the remaining categories (connectivity, condition, strategic significance, time to create and difficulty of creation). Multiplying these values as per the biodiversity metric gives estimated biodiversity unit value of land use types (**Table A1.1**). **Please note that these estimated values are indicative for the purpose of a national level appraisal analysis**. In practice, actual scores will vary by site and spatial characteristics, and shall be judged by ecological expertise.

Land uses with unit value of zero are included in the table to demonstrate that they were considered. For example, we estimate 'defence' would have a distinctiveness score of zero, but in reality the score might be greater than zero. However, our estimate reflects the classification

[140] https://www.warwickshire.gov.uk/biodiversityoffsetting

[141] https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics

[142] http://publications.naturalengland.org.uk/publication/6020204538888192

methodology[143] which indicates that the majority of this land type would have no distinctiveness value (those being barracks and buildings). There are sub-groups within the defence classification that may have a distinctiveness value (airfields and firing ranges). We expect that if they did then they would be classified under a different land type – as with residential and residential gardens which are separated.

Table A1.2: Estimated regional natural capital value of habitat

Region	Value of habitat *(£ per ha, 2017 prices)*	Persons per hectare	Residences per hectare
North East	4,912	3.07	1.02
North West	8,192	5.12	1.71
Yorkshire and The Humber	5,632	3.52	1.17
East Midlands	4,832	3.02	1.01
West Midlands	7,152	4.47	1.49
East	5,136	3.21	1.07
London	89,248	55.78	18.59
South East	7,568	4.73	1.58
South West	3,696	2.31	0.77

The regional natural capital value of 1ha of matured habitat is derived from the ONS ecosystem accounts for urban areas, which values green space within 100m of a residence as £4,800 per residence on average[144]. This is divided by the number of people in a residence (assumed to be 3) to get value of habitat per person in a residence (£1,600). This number is then multiplied by persons per hectare for each region to give estimated regional value of habitat (**Table A1.2**).[145] This assumes that each person in every region value habitat equally, and the regional difference is driven by the density of people in that area.

143 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/432348/DCLG_LUCS_New_Methodology_Guidance.pdf

144 https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/ecosystemaccountsforurbanareas

145 https://lginform.local.gov.uk/reports/lgastandard?mod-metric=176&mod-period=1&mod-area=E92000001&mod-group=AllSingleTierInCountry_England&mod-type=namedComparisonGroup

Annex 2: Cost benefit analysis calculations

Table A2 outlines each calculation step in the cost-benefit analysis. Values given are indicative to provide a reference – either displaying total values or an average local authority value. Some calculations in the table will not add up perfectly due to rounding and averaging.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	**Indicative values** *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated. p.a. = per annum*
Unit values		
(A1) Habitat scalar to factor time and difficulty components of the metrics	Calculate metric unit for habitat lost and habitat created for an example development. Divide through to get scalar.	1.14
(A2) Costs to developer of surveys	*Estimate provided by Natural England that assumes conducting a Phase 1 habitat survey on a 1 ha site would take 1 -1.5 days of an ecologists time, plus half a day for report writing.*	£900
(A3) Net present value (NPV) of habitat creation and maintenance costs per hectare	*NPV of habitat creation and maintenance costs (£1,070 per year) over 30 years, assuming a discount rate of 3.5%. The annual cost is derived from this study,[146] which estimates a need to restore 250,646ha of priority habitat per year (see Table 4.1) at a cost of £250,376,000 per year (see Table 5.1) – giving a priority habitat restoration costs per hectare of c£1,000 per annum. The report also identifies a need to create 27,153ha of priority habitat per year (see Table 4.1) at a cost of £31,036,000 (see Table 5.1) giving a priority habitat creation cost per hectare of c£1,150 per annum. The average of the two costs is £1,070 per year.*	£19,698

[146] https://www.nationaltrust.org.uk/documents/assessing-the-costs-of-environmental-land-management-in-the-uk-final-report-dec-2017.pdf

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	**Indicative values** *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(A4) Cost of a biodiversity unit	*Value assumed for typical off-site habitat creation, based on evidence of existing compensation schemes (usually charge between £6,000 and £25,000 per unit) plus a small uplift for administration.*	£11,000
(A5) Value of habitat per residence.	*Average social value of habitat per residence, based on ONS ecosystem accounts for urban areas.*	£4,800
Residential development		
(B1) Biodiversity units lost **from a land use type** in a representative hectare of brownfield or greenfield **residential** development at local authority level	*Multiply assumed biodiversity value of 1ha of a land use type by the proportion of brownfield/greenfield development that is that land use type in each local authority*	**Range of units lost from a representative 1ha residential development in an average LA by land use type:** 0.0 – 2.65
(B2) Biodiversity units lost from a representative ha of brownfield or greenfield **residential** development at local authority level	*Sum line (B1) for relevant land use types for each local authority.*	**Brownfield units lost from 1ha development in average LA:** 2.07 **Greenfield units lost from 1ha development in average LA:** 7.53
(B3) Weighted average biodiversity units lost from a representative ha of (all) **residential** development	*Sum brownfield and greenfield values in line (B2).*	**Units lost from 1ha development in average LA:** 4.46
(B4) Expected **residential** development at local authority level	*MHCLG assessed local housing need data*[147]	**Total assessed housing need:** 269,714 p.a.

[147] https://www.gov.uk/government/consultations/planning-for-the-right-homes-in-the-right-places-consultation-proposals

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(B5) Expected **residential** development at local authority level ***(for sensitivity analysis only)***	*Scale up line (B4) so that it sums to 300,000 p.a. in line with Government target*	**Multiplier to scale up assessed housing need:** 1.11
(B6) Expected **residential** development that do not implement net gain (without intervention)	*Multiply line (B4) – that is unscaled residential development - by (1 minus 29%). Analysis of 2017 annual reports of the 9 largest housebuilders (who are responsible for 52% of completions). Of these, 6 already have full or partial net gain or a similar policy. These 6 account for 29% of all completions.*	**Total assessed housing need not delivering net gain:** 189,578 p.a.
(B7) Expected number of **residential** developments that are greenfield or brownfield	*Multiply line (B6) by proportion of residential developments which comes from previously undeveloped or developed land use type respectively*	**Greenfield residential development in average LA:** 228 p.a. **Brownfield residential development LA:** 353 p.a.
(B8) Size of individual **residential** greenfield or brownfield developments	*Multiply line (B7) by representative size for a greenfield (0.033ha) and brownfield (0.02ha) developments respectively.*	**Size of all greenfield residential development in average LA:** 8 ha p.a. **Size of all brownfield residential development in average LA:** 7 ha p.a.
(B9) Size of all **residential** developments (not implementing net gain)	*Sum values in line (B8)*	**Size of all residential development in average LA:** 15 ha p.a.
(B10) Expected biodiversity units lost p.a. from **residential development**	*Multiply lines (B2) by line (B8) for greenfield and brownfield respectively. Sum.*	**Units lost from greenfield development in average LA:** 16.64 p.a. **Units lost from brownfield development in average LA:** 52.71 p.a. **Units lost from development in average LA:** 70.30 p.a.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(B11) Expected units delivered by net gain from **residential development**	*Net gain requires 10% is delivered on top of all habitat lost - line (B10).*	**Residential net gain requirement in average LA:** 77.33 p.a.
(B12) Onsite and offsite habitat delivered in ha for **residential development**	*Subject to scenario assumptions. Multiply line (B11) by the respective proportions below and by line (A1) then divide by line (B3).* *Onsite habitat:* *Scenario A – 100%* *Central Estimate – 50%* *Scenario C – 0%* *Offsite:* *Scenario A – 0%* *Central Estimate - 50%* *Scenario C – 100%*	Onsite habitat created in average LA: **Scenario A:** 2 ha p.a. **Central Estimate:** 1 ha p.a. **Scenario C:** 0 ha p.a. Offsite habitat created in average LA: **Scenario A:** 0 ha p.a. **Central Estimate:** 5 ha p.a. **Scenario C:** 21 ha p.a.
Non-residential development		
(C1) Biodiversity units lost **from a land use type** in a representative ha of brownfield or greenfield **non-residential** development	*Multiply assumed biodiversity value of 1ha of a land use type by the proportion of brownfield/greenfield development that is that land use type*	**Range of units lost from a representative 1ha non-residential development in average LA by land use type:** 0.0 – 3.37
(C2) Biodiversity units lost from a representative ha of brownfield or greenfield **non-residential** development at local authority level	*Sum line (C1) for relevant land use types.*	Brownfield units lost from 1ha development of **Industry & Commerce:** 1.51 **Residential:** 2.25 **Transport & utilities:** 2.41 Greenfield units lost from 1ha development of **Industry & Commerce:** 6.36 **Residential:** 7.73 **Transport & utilities:** 7.49

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(C3) Weighted average biodiversity units lost from a representative ha of (all) **non-residential** development	*Sum brownfield and greenfield values in line (C2).*	Average units lost from 1ha development of **Greenfield:** 7.48 **Brownfield:** 1.80 **Average:** 3.88
(C4) Size of all **non-residential** development	*Divide line (B4) at local authority level by line (B4) at national level. Using land use change data, subtract total residential development size from total all development size. Multiply the two values.*	**Size of all non-residential development in average LA:** 29 ha p.a.
(C5) **Non-residential** development not already delivering net gain	*Multiply line (C4) by (1 minus 15%).*	**Size of all non-residential development not delivering net gain in average LA:** 25 ha p.a.
(C6) Size of **non-residential developments** not delivering net gain that are greenfield/brownfield	*Multiply line (C5) by proportion of non-residential developments which are greenfield/brownfield respectively.*	**Size of all greenfield non-residential development in average LA:** 9 ha p.a. **Size of all brownfield non-residential development in average LA:** 16 ha p.a.
(C7) Expected biodiversity units lost p.a. from **non-residential development**	*Multiply lines (C2) by line (C6) for greenfield and brownfield respectively.*	**Units lost from greenfield development in average LA:** 67.32 p.a. **Units lost from brownfield development in average LA:** 28.80 p.a. **Units lost from development in average LA:** 96.49 p.a.
(C8) Expected units delivered by net gain from **non-residential development**	*Net gain requires 10% is delivered on top of all habitat lost - line (C7)*	**Non-residential net gain requirement in average LA:** 106.14 p.a.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(C9) Onsite and offsite habitat delivered in ha for **non-residential development**	*Subject to scenario assumptions. Multiply line (C8) by the respective proportions below and by line (A1) then divide by line (C3).* *Onsite habitat:* *Scenario A – 100%* *Central Estimate – 75%* *Scenario C – 0%* *Offsite:* *Scenario A – 0%* *Central Estimate - 25%* *Scenario C – 100%*	Onsite habitat created in average LA: **Scenario A:** 3 ha p.a. **Central Estimate:** 2 ha p.a. **Scenario C:** 0 ha Offsite habitat created in average LA: **Scenario A:** 0 ha **Central Estimate:** 8 ha **Scenario C:** 31 ha
Local and central government costs		
(D1) Annual cost of additional resources required by local authorities.	*Multiply the FTE required for each grade, as identified by the new burdens assessment, by the respective staff costs.*	**Average upper-tier authority FTE resource cost:** £125,384 p.a. **Total annual ongoing costs to local authorities:** £9.5m p.a.
(D2) Annual cost of additional resource required by Natural England	*Multiply the FTE required for each grade, as identified by Natural England, by the respective staff costs. Sum with capital costs.*	**Total annual ongoing cost to Natural England:** £1.8m p.a.
(D3) Annual cost of spatial planning to Defra Group	*Multiply the FTE required for each grade, by the respective staff costs. Sum with capital costs.*	**Total annual ongoing cost of spatial planning to Defra Group:** £1.3m p.a.
(D4) Total annual cost to local and central government	*Add lines (D1) to (D3). Note that not all values in lines (D2) and (D3) are ongoing.*	**Annual ongoing costs to local and central government:** £12.6m p.a.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
Costs to developers		
(E1) Onsite and offsite habitat for **all development**	*Sum figures from line (B12) and (C9) for onsite and offsite respectively.*	Onsite habitat created in average LA: **Scenario A:** 5 ha p.a. **Central Estimate:** 4 ha p.a. **Scenario C:** 0 ha p.a. Offsite habitat created in average LA: **Scenario A:** 0 ha p.a. **Central Estimate:** 13 ha p.a. **Scenario C:** 52 ha p.a.
(E2) Total cost of habitat created onsite	*Multiply respective amount in line (E1) by line (A3)*	Onsite habitat creation cost in average LA: **Scenario A:** £93,713 p.a. **Central Estimate:** £70,285 p.a. **Scenario C:** £0 p.a.
(E3) Total cost of habitat created offsite	*Sum lines (B11) and (C8) multiplied by respective scenario percentages, then multiply by line (A4)*	Offsite units owed in average LA **Scenario A:** 0 p.a. **Central Estimate:** 45.87 p.a. **Scenario C:** 183.47 p.a. Cost of offsite units owed in average LA **Scenario A:** £0 p.a. **Central Estimate:** £504,543 p.a. **Scenario C:** £2,018,173 p.a.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	Indicative values *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
(E4) Total cost of surveys	*Sum line (B9) and line (C5). Multiply by line (A2).*	**Development not currently implementing net gain in average LA:** 39 ha p.a. **Survey costs in average LA:** £35,499 p.a.
(E5) Annual ongoing cost to developers of net gain delivery (direct)	*Sum lines (E2) to (E4) for costs in an average LA. Multiply this by 326 (number of local authorities) to get total developer costs.*	Total developer costs in average LA: **Scenario A:** £129,212 p.a. **Central Estimate:** £610,327 p.a. **Scenario C:** £2,053,672 p.a. Total developer costs: **Scenario A:** £42.1m p.a. **Central Estimate:** £199.0m p.a. **Scenario C:** £669.5m p.a.
(E6) Annual additional cost to developers of net gain delivery after 90% pass-through to land prices (indirect)	*Line (E5) multiplied by 0.1, to account for 90% pass through.*	**Total developer costs in average LA:** **Scenario A:** £1,292 p.a. **Central Estimate:** £6,103 p.a. **Scenario C:** £20,536 p.a. Total developer costs: **Scenario A:** £4.2m p.a. **Central Estimate:** £19.9m p.a. **Scenario C:** £66.9m p.a.

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	**Indicative values** *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
Assessment of the benefits from habitat creation and avoided loss		
(F1) Cumulative habitat lost (counterfactual)	*Sum lines (B8) and (C4) for annual lost (a). Assumed to be linear, for nth year:* $L_n = a \times n$	**Annual habitat loss:** 12,859 ha p.a.
(F2) Cumulative habitat created onsite	*Annual onsite habitat created (b) is the respective amount from line (E1). Habitat assumed to be completed after z years. Also linear, for nth year:* $N_n = b \times (n-z)$*. Where n-z is bounded to zero. That is before or on year z:* $N_n = a \times 0 = 0$	Annual increase total onsite habitat: **Scenario A:** 1,551 ha p.a. **Central Estimate:** 1,163 ha p.a. **Scenario C:** 0 ha p.a.
(F3) Cumulative habitat created offsite	*Assumed y delay between development start and habitat creation from offsetting due to agreeing and settling payment. Annual offsite habitat created (c) is the respective amount from line (E3). For nth year:* $F_n = b \times (n-y-z)$*.*	Annual increase in total offsite habitat **Scenario A:** 0 ha p.a. **Central Estimate:** 4,265 ha p.a. **Scenario C:** 17,060 ha p.a.
(F4) Avoided habitat damage	*Scenario A (and relevant proportion of the central estimate) assume developers avoid damage on habitat. Avoided percentage (d) is equal to proportion of habitat created onsite.* *For nth year:* $A_n = a \times L_n$	Annual avoided habitat loss **Scenario A:** 12,859 ha p.a. **Central Estimate:** 9,644 ha p.a. **Scenario C:** 0 ha p.a**.**
(F5) Cumulative habitat created in a given year	*Sum lines (F2) to (F4) minus line (F1) for each respective year. For nth year:* $Y_n = N_n + F_n + A_n - L_n$*.*	Annual increase in total habitat **Scenario A:** 1,551 ha p.a. **Central Estimate:** 2,214 ha p.a. **Scenario C:** 4,202 ha p.a.
(F6) Net habitat created in a given year	*Sum lines (F2) to (F4). For nth year:* $Y_n = N_n + F_n + A_n$*.*	Annual increase in net total habitat **Scenario A:** 13,484 ha p.a. **Central Estimate:** 10,807 ha p.a. (4,265 ha p.a. – not matured habitat)

Table A2: *cost benefit analysis step-by-step calculations*

Calculation line	Description	**Indicative values** *All figures are unrounded. Costs are stated in 2017 prices. Values are the same across scenarios unless stated.* *p.a. = per annum*
		Scenario C: 0 p.a. (17,060 ha p.a. – not matured habitat)
(F7) Value of habitat by region (1 ha)	*Divide (A5) by assumed people per residence (3). Multiply by persons per hectare by region.*	**Range of regional values for 1ha of habitat:** £4,832 - £89,248 per ha
(F8) Value of net habitat created in a given year	*Multiply values for respective years in line (F6) by line (F7). Call this v.*	Value of annual benefits from annual increase in net total habitat (for given year only) **Scenario A:** £338.4m p.a. **Central Estimate:** £253.8m p.a. (£398.2m p.a. after habitat maturity) **Scenario C:** £0m p.a. (£454.0m p.a. after habitat maturity)
(F9) Annual social (i.e. natural capital) benefits (10 year average)	*Multiply line (F8), v, by Gauss' arithmetic formula for first 10 years. This gives sum of benefits for first 10 years. For n years:* $V_n = v \times n(n+1)/2$ *Divide this by 10 for 10 year average annual benefits.*	10 year annual average benefits **Scenario A:** £1,860.9m p.a. **Central Estimate:** £1,395.7m p.a. **Scenario C:** £0m p.a.

Annex 3: Further evidence on level of net gain and permanence

Two key policy components we tested at consultation concerned the level of net gain and permanence of habitat offsets. While key policy parameters are outlined in **Section 5**, this annex sets out additional evidence and considerations for both policy components.

Level of net gain required

Two primary factors were considered in selecting a suitable level of net gain:

- the capability of the policy to deliver genuine gains for nature (and thereby give confidence of enhancement to communities in receipt of development) and any consequent social and economic benefits
- the capability of the development sector (and others) to meet the requirement without significantly affecting development rates or inhibiting sustainable economic growth

Sources of uncertainty in the delivery of compensation-based conservation policy include scientific sources, such as measurement error and narrow scope of measurements, and communicative sources such as under-specificity (because the metrics are highly simplified relative to the depth of ecological information that would be necessary for net gain in the strictest sense). Further process uncertainties include the risk of habitat degradation before application submission (i.e. baseline alteration), allowances for imperfect enforcement, the risk of insolvency of offset providers and/or developers, the risk of systematic undervaluation of habitats and wider (indirect) pressures of development on general biodiversity from light, sound, predation by pets and recreational use.

The time lags in between development and compensatory habitat reaching equivalent biodiversity are also significant. It can take centuries for some types of compensation habitats to acquire ecological communities that are equivalent to lost habitats across different measures of biodiversity.[1] This is not applicable to all compensation projects (it would likely be accelerated where part of the existing ecology is retained nearby to the compensation site) and is not practical in the design of compensation habitat within desirable development timeframes. Therefore, a more achievable multiplier is included in the biodiversity metric that relates to the creation timeframe of the habitat itself. The permanence of offsets (i.e. the expectation that not all compensation habitat will exist as long as the development it is compensating for, further discussed in the next section) represents another factor by which overall gains might be undermined in the medium to long term.

Compensation habitat creation undertaken through schemes around the world have been delivered with reported success rates that range from 0% (where success is defined as fully ecologically functioning habitats) to 74% in long-term established offsetting schemes.[2] Other studies have found lower success rates of between 6 and 20%.[3] It is therefore considered desirable, despite expectations that this policy will achieve higher success rates than those commonly reported in the literature (due to improving habitat creation understanding, risk multipliers in the metric and lessons from past experiences), to set a more ambitious requirement for net gain to increase the likelihood that development schemes will deliver net enhancement in aggregate, or at least prevent loss of biodiversity.

---

[1] Curran, Hellweg and Beck, Is there any empirical support for biodiversity offset policy? *Ecological Applications*, Volume 24, 2014

[2] Bull et al., Biodiversity offsets in theory and practice. *Oryx,* Volume 47, 2013

[3] Maron et al., Faustian bargains? Restoration realities in the context of biodiversity offset policies. *Biological Conservation,* Volume 155, 2012

Setting a higher level also means that gains could be achieved with an imperfect level of scrutiny and monitoring of individual sites (and the costs that such extensive monitoring and enforcement would incur). The evidence on past habitat compensation success rates in the literature, and practical limitations on the intensity of monitoring and enforcement, suggest that a target rate above a nominal 1% gain would likely be appropriate to avoid net loss in biodiversity in practice.

In summary, there are a number of factors that make halting biodiversity loss through development an unlikely prospect with any level of gain which is close to 0% (e.g. 1%). The department therefore favours a high level of net gain in principle, though the available evidence does not identify any particular level of gain as uniquely suitable.

The analysis undertaken in this IA indicates that the level of requirement makes relatively modest difference to the costs of mitigating and compensating for impacts (see **Section 6.11**) when assessed against the more significant costs of achieving no net loss and wider development policy objectives. The majority of the costs associated with net gain are incurred to correct for the initial loss of biodiversity through development (i.e. achieving only 'no net loss'). When compensation for development's impacts is incorporated, a 10% net gain could be seen as a requirement to deliver approximately 110% of the total lost biodiversity (approximately because the 10% is applied to the full biodiversity value of the development site, rather than only those lost or in the structures' footprint). A 10% gain therefore represents a relatively small proportion of overall habitat creation/enhancement requirements.

Industry evidence from developers and LPAs implementing biodiversity net gain approaches suggest that the average gains achieved on developments vary widely, between a few percent and over 300%. Whilst very high gains are possible for some developments and the aforementioned evidence demonstrates the desirability of a very high rate, the level of gain selected for a mandatory requirement must be applicable (and therefore achievable) for all appropriate development in scope: a wide range of development types and sizes.

The planning authority for Lichfield District requires a net gain of 20% on new development (this is measured against gross units lost, rather than the full within-boundary baseline, but this will be similar for many schemes), and experience there to date suggests that developers are able to meet this requirement and often achieve much greater levels of biodiversity net gain. Evidence was received during consultation of several commercial sites aiming for net gains of 25% (though it is unclear what metric these schemes were using). Some other authorities in England are currently considering 5% net gain policies and some accept a marginal 1% gain.

Advice to the department from some Natural Capital Committee members[4] suggests, in line with evidence from academic literature, that a level of net gain at, or ideally above, 10% is necessary to give reasonable confidence in halting development's role in biodiversity loss. Consultation responses more generally highlighted the fact that many existing industry commitments are based on rates of around 1%-5%; this does not prove that higher levels are unachievable, but gives the strongest sense of what is achievable even under the pre-existing policy-driven approach and without improved guidance, design and compensation markets.

[4] Pers. comm. 2018

In light of the advantages of a significant margin of gain, but also the need for a rate that can be mandated with confidence that it will not significantly affect the delivery of appropriate development, 10% was selected as a reasonable level of gain to consult on.

A 10% gain provides a small margin of gain to account for the outlined process, epistemic and linguistic uncertainties whilst operating within the parameters of established and successful net gain planning policies which are not thought to significantly affect development rates or viability. In simple terms, it is the most achievable level of net gain that the department could confidently expect to deliver genuine net gain, or at least no net loss, for biodiversity and thereby meet its policy objectives.

Consultation responses were mixed with regard to this rate: development stakeholders typically (but not unanimously) asked for a lower rate, whilst several environmental NGOs requested that a higher level of gain should be set to be confident of real net benefits for wildlife. Some respondents acknowledged that the rate would need to be set somewhere initially, and that monitoring and evaluation would be necessary to identify an optimal rate in the future. This IA examines the costs and benefits of implementing net gain at a 10% level as part of our chosen policy approach detailed in **Section 5.2.2**.

Permanence

Developments typically remove some habitats permanently. If offset habitats are established temporarily, with no guarantee that they will be retained beyond a fixed period, the result will be a net loss of habitat. This could also be true if a habitat is protected for a second fixed term by offsetting from a second development elsewhere (though protection in itself would not be considered eligible as compensation). This is because over time, a single hectare of offset habitat would have been used to offset multiple hectares of lost habitat elsewhere. A discussion of the issue in the evaluation of the biodiversity offsetting pilots illustrates that there is a current lack of guidance. The pilots prepared management plans of 25-30 years in the absence of guidance on the meaning of 'in perpetuity' for offset sites.[5] We will provide clarity on this issue, and will also develop guidance or policy that address the risk of compensation sites being 'recycled' after 25-30 years to offer compensation to more than one development.

We have so far assumed that developer responsibility for management is time-bounded to 30 years (though in practice this responsibility is often passed on earlier to the agency contracted by the developer to create and manage compensation habitat). But permanence of land use change, with another entity responsible for long-term management, is being considered. International evidence shows that an existing policy in France requires offsetting for as long as the impacts occur. Options to achieve this include giving land to a Public Land Trust or designating land as a protected area.[6] The U.S.A and Australia[7] also mandate offsets which last either as long as the development itself, or for perpetuity. It should be clarified that whilst management obligations are unlikely to extend beyond 30 years in most cases, it is not expected or intended that compensation habitat will subsequently be removed or be stripped of any acquired protections after this timeframe expires.

Concerns over perpetuity have centred on deliverability and the willingness of landowners to enter into long term stewardship agreements. The solutions most commonly seen are to

[5] http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18229

[6] http://bbop.forest-trends.org/documents/files/frances_new_biodiversity_law_and_implications_for_no_net_loss_of_biodiveristy.pdf

[7] https://www.ncbi.nlm.nih.gov/pubmed/19924472

purchase land, with a conservation non-governmental organisations (NGO) or local authority assuming responsibility for long-term management, or habitat banking using unproductive or marginal land offered by landowners who are happy to keep newly created habitat indefinitely.

Conservation covenants might also facilitate longer term delivery and reduce the cost of setting management agreements. We are exploring the impact that a requirement or incentive for longer term delivery through conservation covenants would have on deliverability.