

Title: The Environment Act – Terrestrial Biodiversity Targets IA No: N/A RPC Reference No: N/A Lead department or agency: The Department for the Environment, Food and Rural Affairs (Defra) Other departments or agencies:	Impact Assessment (IA)
	Date: 19/12/2022
	Stage: Final
	Source of intervention: Domestic
	Type of measure: Secondary legislation
Contact for enquiries: biodiversity.targets@defra.gov.uk	
Summary: Intervention and Options	RPC Opinion: Not applicable

Cost of Preferred (or more likely) Option (in 2020 prices)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status
£20,862m	N/A	N/A	N/A

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

Biodiversity is declining at an unprecedented rate. Since 1970 there has been a 68 percent decrease in population sizes of mammals, birds, amphibians, reptiles, and fish worldwide¹. We have seen declines replicating these trends in England. For example, our farmland bird indicator today stands at less than half its value in 1970². We value species and ecosystems in their own right, but they also contribute to our wellbeing and economic prosperity. In order to halt this decline, transformative change is needed in England and globally, at an urgency and scale that only governments can effectively implement. Rapid declines in biodiversity will not be addressed by the market, which does not fully account for the value of biodiversity to society and will, as a result, fail to adequately protect biodiversity without government intervention.

What are the policy objectives of the action or intervention and the intended effects?

Setting legally binding targets will create a legal obligation to deliver policy outcomes to halt the decline of biodiversity. Their legal force will also help to drive policy action and behaviour in a way that principles and objectives have not to date. The long timeframes for the targets will support consistent, long-term policy commitments to deliver lasting environmental outcomes. Legally binding targets for biodiversity will also provide a strong public signal that tackling biodiversity loss is a government priority. Legally binding targets demonstrate government commitment to ambitious domestic action that leads the way internationally and aims to encourage international partners to make similarly ambitious commitments. The government proposes a suite of biodiversity targets, which will work together to create lasting change for both habitats and species. These, together with other Environment Act targets, will collectively improve the natural environment by tackling the drivers of biodiversity loss such as poor air and water quality.

¹ Almond REA, Grooten M, Petersen T. (Eds). Living Planet Report 2020 - Bending the curve of biodiversity loss. WWF, 2020. Available from: <https://livingplanet.panda.org/en-gb>

² <https://www.bto.org/our-science/publications/developing-bird-indicators>

What policy options have been considered, including any alternatives to regulation? Please justify Preferred Option (further details in Evidence Base)

Option 0 - Do Nothing - This would put the Secretary of State in breach of their legal obligations under the Act and would not drive the action necessary to address the loss of biodiversity.

Option 1 - One long-term legally binding target, and the 2030 species abundance target – This would meet obligations under the Act. However, there is no single measure for biodiversity and without sufficient mitigations, a single legally binding target could lead to the creation of perverse incentives.

Option 2 (Preferred Option) - A suite of long-term legally binding targets, and the 2030 species abundance target – A suite of long-term targets will support consistent and long-term policy commitments required to tackle biodiversity decline.

The Preferred Option is Option 2. Setting a suite of biodiversity targets aligns with the 25 Year Environment Plan and will maximise benefits for biodiversity. A substantial evidence review has been undertaken, considering several possible targets. This Impact Assessment does not consider the impacts of all the possible combinations of targets and ambition levels that have been considered, but instead is focussed on a comparison between Option 2 (the recommended suite of targets) and Option 0 (Do Nothing). More detail on the possible indicators and ambition levels is provided in the biodiversity Evidence report.

An alternative to setting targets is not considered as there is a legally binding commitment for government to set targets.

Is this measure likely to impact on international trade and investment?		No		
Are any of these organisations in scope?	Micro	Small	Medium	Large
	Yes	Yes	Yes	Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)		Traded:		Non-traded: reduction of 143 mtCO ₂

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** Targets and policies will be reviewed periodically in line with Environment Act (2021) requirements

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** Trudy Harrison Date: **15 December 2022**

Summary: Analysis & Evidence

Policy Option 2

Description: Legally binding Environment Act targets for species abundance, species extinction risk, and wider habitats outside of protected sites (Preferred Option).

FULL ECONOMIC ASSESSMENT

Price Base Year	PV Base Year	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
			Low:	High:	Best Estimate:
2020	2020	2022-2100	£16,373m	£35,062m	£20,862m

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price) (2023-2042)	Total Cost (Present Value) (2022-2100)
Low	-	£209m	£4,577m
High	-	£690m	£11,928m
Best Estimate	-	£424m	£7,714m

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

The costs of introducing the targets will depend on how the targets are implemented. This Impact Assessment does not put forward all the possible government policies that could potentially help to meet the targets over a 20-year period. Further detail on the costs and impacts of individual future policies that contribute towards the targets will be assessed within their individual future Impact Assessments. However, this Impact Assessment does present an illustrative assessment of the potential costs associated with setting these targets, based on an assessment of the main actions that would need to be implemented to enable the targets to be achieved.

The primary monetised costs incurred are direct conservation actions deemed necessary to meet the targets. For the species targets (£327m average annual cost), the most substantial costs are the cost of adopting land management approaches that support widespread species, the cost of remedial actions to improve the condition of protected sites, and targeted actions to support threatened species. For the wider habitats target (£97m average annual cost), the costs incurred are related to the creation, restoration, and maintenance of wildlife-rich habitats.

The targets put a duty on government, not business, and it is expected that the contribution of the private sector will primarily be captured in other regulatory Impact Assessments (e.g., Biodiversity Net Gain (BNG)) or voluntary.

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

The cost assessment focuses on the direct costs of the actions identified as being required to meet the targets. The targets have been designed to be based on existing data and so there are not substantial additional monitoring costs required to report against the targets as currently framed, assuming that data continues to be collected by volunteer-run monitoring schemes and that protected sites monitoring continues to be funded. As set out in Evaluation section, the monitoring and evaluation programme for biodiversity targets is currently being scoped; this will consider the need for any additional data collection. There will be additional indirect costs in addressing the wider drivers impacting on habitats and species which have not been quantified. A proportion of these wider costs will be covered in the Impact Assessments for other legally binding Environment Act targets,

such as water quality and air quality, which are key pressures on biodiversity outcomes. The costs of meeting the biodiversity targets could increase considerably if the water quality and woodland cover targets are not met.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price) (2023-2042)	Total Benefit (Present Value) (2022-2100)
Low	-		£776m	£24,088m
High	-		£1,410m	£42,776m
Best Estimate	-		£940	£28,576m

Description and scale of key monetised benefits by ‘main affected groups’

Total discounted benefits are split between carbon sequestration (£8,414m), air quality regulation (£1,474m) and the value of species recovery outcomes based on a willingness to pay study (18,689m).

Other key non-monetised benefits by ‘main affected groups’

The physical health and recreation benefits have also been calculated at £3,405m and £10,795m respectively, but in case of overlap with the species recovery benefits, as a conservative approach, these are omitted in the best estimate and low estimate; they are included in the high benefits estimate.

A number of benefits are not monetised in this Impact Assessment due to data limitations and evidence gaps; this includes water supply, flood regulation, noise reduction, sustainable food production, pollination and the role of biodiversity in providing resilience to future pressures.

Key assumptions/sensitivities/risks

Discount rate (%)

First 30 years: 3.5%
 After 30 years: 3%
 After 75 years: 2.5%

The scale of costs and who bears them will depend on future policy decisions made over the twenty-year period covered by the targets. This Impact Assessment illustrates the potential resources required to meet the targets, based on a package of key actions, but does not provide a detailed analysis of all policy levers that could be introduced in future years.

More generally, there is a high degree of uncertainty around how biodiversity outcomes can be realised through specific actions. The analysis in this Impact Assessment should be seen as an assessment of the cost of programmes of action that can be reasonably judged to be capable of delivering the targets, rather than the costs of meeting the targets with a high degree of certainty. If the monitoring and evaluation of progress reveals that additional actions or policy changes are required in future, the costs of meeting the targets may be higher. The detailed impacts of any future policies which affect biodiversity outcomes will be analysed in more detail as and when they are introduced.

To account for a demonstrated, systematic, tendency for project appraisers to be overly optimistic as outlined in the Green Book guidance, an optimism bias adjustment of 10% has been applied.

A key assumption underpinning the cost analysis of the targets concerns the future unit costs of delivering, at sufficient scale, the conservation actions necessary to achieve them. For the wider habitats target, the assumptions for cost per hectare created or restored are based on evidence from recent conservation projects as well as agri-environment scheme payment rates. For the species abundance targets, the estimated unit costs for the actions required have been informed by what is currently known about the payments for species-friendly

actions under the Sustainable Farming Incentive (which are based on the cost of the action plus income forgone). The implications of unit costs for these conservation actions being higher are explored in the sensitivity analysis.

In the analysis, an adjustment is made to factor in the likely need for additional actions to adapt to the impacts of climate change on species and habitats. Given the long-term nature of the targets and the inherent uncertainty around the precise impacts of climate change, this is also explored further in the sensitivity analysis section.

As well as the sensitivity analysis, referenced above, around the unit costs for conservation actions and around the impacts of climate change, sensitivity analysis has been undertaken to explore the impact of modifying the following assumptions:

- Varying the assumptions around the package of actions required to achieve the set of target outcomes.
- Varying the percentage of wildlife-rich habitat that is created rather than restored under wider habitats target (creation is generally more expensive than restoration).
- Varying the assumption on the coverage of species friendly land management options on farmed land that is required.
- Varying the assumptions concerning the scale of benefits

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m: 0			Score for Business Impact Target (qualifying provisions only) £m: N/A
Costs: 0	Benefits: 0	Net: 0	

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Executive Summary

The Environment Act 2021 commits the government to setting at least one long-term, legally binding target for biodiversity, as well as a 2030 species abundance target. Long-term, legally binding targets will drive action and create certainty. The suite of proposed biodiversity targets considered in this Impact Assessment (Preferred Option) are to:

- halt the decline in species abundance by 2030.
- ensure that species abundance in 2042 is greater than in 2022, and at least 10% greater than 2030.
- Improve the Red List Index for England for species extinction risk by 2042, compared to 2022 levels.
- restore or create in excess of 500,000 hectares of a range of wildlife-rich habitats outside protected sites by 2042, compared to 2022 levels.

Setting a suite of biodiversity targets aligns with the 25 Year Environment Plan and will maximise benefits for biodiversity. A substantial evidence review has been undertaken, considering several possible targets. This Impact Assessment does not consider the impacts of all the possible combinations of targets and ambition levels that have been considered, but instead is focussed on a comparison between Option 2 (Preferred Option) and Option 0 (Do Nothing). More detail on the possible indicators and ambition levels is provided in the Biodiversity Evidence report¹.

This Impact Assessment does not put forward all the government policies that could help to meet the targets over the entire 20-year period. It presents an illustrative assessment of the potential costs and benefits associated with setting these targets to give a sense of the resources that may be required and the scale of benefits that could be delivered. This is based on quantifying the costs of the main conservation actions that can be reasonably judged to be capable of delivering the targets rather than specific policy levers that could potentially deliver them. The impacts of any specific future policies that would support the delivery of the targets will be assessed in more detail on a case-by-case basis as and when they are introduced and depend on future decisions on government policy. Further detail on the costs and impacts of these policies will be assessed within their individual Impact Assessments.

The direct costs to businesses of legally binding biodiversity targets will be dependent on how the targets are implemented. The targets themselves put a duty on government, not business, and it is expected that the contribution of the private sector will primarily be captured in other regulatory Impact Assessments (e.g., Biodiversity Net Gain) or voluntary. While regulatory levers could create additional costs to businesses, any future regulatory change will be subject to an Impact Assessment in which the costs to businesses will be explored.

¹ Defra (2022) Biodiversity Evidence Report, available at https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Biodiversity%20terrestrial%20and%20freshwater%20targets%20%20Detailed%20evidence%20report.pdf

The *Overarching Impact Assessment for proposed Environment Act (2021) targets* provides a high-level, descriptive, and largely qualitative analysis of all the targets under the Environment Act.

1. Problem under consideration and rationale for intervention

Biodiversity is the variety of all life on Earth. It includes all species of animals and plants, and the natural systems that support them. Biodiversity enables ecosystems to flourish and supplies the wide variety of services that we rely on including our food system, carbon capture and storage to regulate the climate, flood alleviation, improved water, air and soil quality and recreational access to nature. Without these services, life as we know it would not be possible.

According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) global biodiversity is declining faster than at any other time in human history². Since 1970 there has been a 68 percent decrease in population sizes of mammals, birds, amphibians, reptiles, and fish worldwide³. In Great Britain alone, 15% of species are threatened with extinction⁴. Biodiversity loss poses risks and uncertainty to our economies, health and wellbeing, with impacts including, but not limited to, risks to sustainable food production, increasing risk of transmission of diseases from animals to humans, and exacerbating the vulnerability of coastal areas to floods and storm surges.

The decline in biodiversity requires significant action in England and globally to halt the loss of species and habitats, with an urgency and at a scale that requires an active role for the government, private sector, civil society, and individuals. There are increasing calls from the public, businesses, politicians, civil society and the media for action⁵. The UK will support a range of ambitious goals and targets to be adopted as part of the post-2020 Global Biodiversity Framework at the Convention on Biological Diversity COP15 (CBD COP15). UK domestic biodiversity policy is devolved and each of the four countries produces their own plans or strategies to support international commitments.

In England, new legally binding targets on biodiversity will help deliver the government's commitment to leave the environment in a better state than we found it. This is part of the wider

² Brondizio ES, Settele J, Díaz S, Ngo HT. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES, 2019. Available from www.ipbes.net/global-assessment

³ Almond REA, Grooten M, Petersen T. (Eds). Living Planet Report 2020 - Bending the curve of biodiversity loss. WWF, 2020. Available from: <https://livingplanet.panda.org/en-gb/>

⁴ Hayhow DB, Eaton MA, Stanbury AJ, Burns F, Kirby WB, Bailey N, Beckmann B, Bedford J, Boersch-Supan PH, Coomber F, Dennis EB, Dolman SJ, Dunn E, Hall J, Harrower C, Hatfield JH, Hawley J, Haysom K, Hughes J, Johns DG, Mathews F, McQuatters-Gollop A, Noble DG, Outhwaite CL, Pearce-Higgins JW, Pescott OL, Powney GD and Symes N (2019) The State of Nature 2019. The State of Nature partnership. Available from: <https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-UK-full-report.pdf>

⁵ Hayhow DB, Eaton MA, Stanbury AJ, Burns F, Kirby WB, Bailey N, Beckmann B, Bedford J, Boersch-Supan PH, Coomber F, Dennis EB, Dolman SJ, Dunn E, Hall J, Harrower C, Hatfield JH, Hawley J, Haysom K, Hughes J, Johns DG, Mathews F, McQuatters-Gollop A, Noble DG, Outhwaite CL, Pearce-Higgins JW, Pescott OL, Powney GD and Symes N. The State of Nature 2019. The State of Nature partnership. 2019 Available from www.rspb.org.uk/our-work/state-of-nature-report/

government response to the clear and scientific evidence, and growing public demand, for a step-change in environmental protection and recovery. The Act, alongside our Agriculture and Fisheries Acts, sets a new legal foundation for government action to improve the environment.

When the targets are set in statute, they will become a key vehicle for delivering the vision set out in the 25 Year Environment Plan, setting a new domestic framework for environmental governance. The targets aim to help create a more sustainable and resilient economy and enhance well-being and quality of life.

Market failures

We value our species and ecosystems in their own right, but they also contribute to our wellbeing and economic prosperity. Rapid declines in biodiversity are negative externalities that will not be addressed by the market, which does not fully account for the value of biodiversity to society. The Dasgupta Review⁶ told us that nature's worth to society – the true value of the various goods and services it provides – is not reflected in market prices because much of it is open to all at no monetary charge. The Review confirms that economic prosperity and environmental protection are two sides of the same coin. Securing the economic and physical wellbeing of future generations means halting the decline of biodiversity by the end of this decade⁷.

Private activities which negatively impact biodiversity, such as pollution, can have social costs which are not taken into account (negative externalities).

In the absence of government intervention this can lead to the over-exploitation of biodiversity, which ultimately costs society more than it benefits it. Legally binding targets for the environment seek to address these negative externalities.

Biodiversity may also be considered a national public good. People cannot usually be prevented from enjoying biodiversity (non-excludability), and a person's enjoyment of biodiversity does not deplete its availability to others (non-rivalry). This means there is not enough incentive for individual investment in biodiversity.

The benefits of biodiversity take many forms and are widespread, which makes it difficult to quantify value and ensure that the people who benefit pay proportionately. This means that, despite the important economic and social benefits of biodiversity, in the absence of

⁶ Dasgupta, P. The Economics of Biodiversity: The Dasgupta Review. Abridged Version. (London: HM Treasury). 2019. Available from: www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review

⁷ HM Treasury. The Economics of Biodiversity: The Dasgupta Review Government Response, 2021. Available from: www.gov.uk/government/publications/the-economics-of-biodiversity-the-dasgupta-review-government-response

government intervention, the market will underprovide biodiversity and undervalue the important benefits it provides to our economy, health and wellbeing.

Investment in biodiversity pays off

The Dasgupta review found that human demands for goods and services “far exceed” nature’s capability to support its production.⁸ This trajectory is unsustainable and demonstrates the need for long term targets to halt and reverse this trend. The government has set ambitious targets in the past, such as the Climate Change Act⁹, which provided successful signals to industry about the direction of travel and where to invest. The Environment Act targets will act as similar market signals.

In 2020, the stock of the aspects of UK natural capital we can currently value was estimated to be worth £1.8 trillion¹⁰. This stock of natural capital provides us with ecosystem services including food, water, energy, materials, noise reduction, temperature regulation, cleaner air, carbon sequestration, tourism, recreation, and aesthetic experience. Investing in nature helps to protect and enhance social benefits; for example, benefit-cost ratios of around 4:1 have been estimated for investment in wetland creation, upland peatland restoration and intertidal habitat creation¹¹. Grassland and heathland management and restoration also offers substantial value, particularly through public access and pollination services. Pollinators contribute more than £500 million a year to UK agriculture, through improving crop quality and quantity¹².

Action is required now, as the cost of biodiversity recovery will likely increase substantially if the government waits. According to the Dasgupta review: “by acting now, the cumulative social cost of stabilising [global] biodiversity intactness by 2050 is estimated to be US\$7 trillion (equivalent to around 8% of global GDP in 2019). Delaying action by 10 years would more than double the social cost, at approximately US\$15 trillion (equivalent to around 17% of global GDP in 2019). The difference in costs between acting now and later is equivalent to 9% of global GDP (in 2019)¹³.”

⁸ Dasgupta, P. The Economics of Biodiversity: The Dasgupta Review. Abridged Version. (London: HM Treasury). 2021. Available from: www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review

⁹ The UK Government. Climate Change Act (2008).

¹⁰ [UK natural capital accounts - Office for National Statistics \(ons.gov.uk\)](http://ons.gov.uk)

¹¹ Natural Capital Committee. The state of natural capital: protecting and improving natural capital for prosperity and wellbeing. 2015. Available from: www.gov.uk/government/publications/natural-capital-committees-third-state-of-natural-capital-report

¹² Update to Pollinator Strategy Summary of Evidence (2019). Available from Defra, UK - Science Search

¹³ Dasgupta P. The Economics of Biodiversity: The Dasgupta Review. Abridged Version. (London: HM Treasury). 2019. Available from: www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review

Existing regulation and legislation

Section 40 of the Natural Environment and Rural Communities Act 2006, as amended by the Environment Act 2021, places a duty on all public authorities to consider the actions they can take, consistent with the exercise of their functions, to conserve and enhance biodiversity, and then take that action.

Within England the principal pieces of legislation which afford protection to species are the Conservation of Habitats and Species Regulations (2017) and the Wildlife and Countryside Act (1981). Broadly this legislation protects certain species through the prohibition of activities which could impact on their conservation status. Legal protection for species is used where this addresses a potential impact on a species e.g., through development, persecution etc. However, there are species (particularly plants, invertebrates, and widespread generalists) for which legal protection is not required to underpin their recovery but nevertheless require action to support their conservation.

There are also legal protections for habitats, such as Sites of Special Scientific Interest (SSSIs) designated under powers derived from the Wildlife and Countryside Act 1981 (as subsequently amended); and Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated under the Conservation of Habitats and Species Regulations 2017 (as amended).

There are several existing policy commitments to address the decline in biodiversity. In the 25 Year Environment Plan, the government committed to:

- restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term.
- creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected site network, focusing on priority habitats as part of a wider set of land management changes providing extensive benefits.
- taking action to recover threatened, iconic or economically important species of animals, plants and fungi, and where possible to prevent human-induced extinction or loss of known threatened species in England and the Overseas Territories.

The Environment Act provides an opportunity to build upon existing commitments by setting long-term statutory targets for biodiversity. This is further supported by the Agriculture Act, which sets out a new system of payments to reward farmers for their role as environmental stewards, and the Fisheries Act which helps to support a thriving and sustainable fishing industry whilst safeguarding the health of our oceans.

2. Rationale and evidence to justify the level of analysis used in the Impact Assessment (proportionality approach)

There is no single measure of 'biodiversity'; different ecosystems, habitats and species are changing in diverse ways which cannot all be captured in a single index. However, several biodiversity indicators have been produced at a UK and England level as part of the 25 Year Environment Plan Outcome Indicator Framework, which provides a robust starting point and includes a set of indicators to track environmental change. Additionally, the government consulted stakeholders in 2018 during the process of defining headline indicators for the Outcome Indicator Framework and identified several new biodiversity indicators. The government used these indicators, as well as exploring other sources of evidence, to help develop the range of proposed targets proposed. Throughout target development and this Impact Assessment, the best available evidence has been used, but a high degree of uncertainty remains.

Whilst the UK has some of the best biodiversity data in the world, there are gaps in both data and our knowledge¹⁴. There is a good broad understanding of the type of actions that are required to meet the proposed biodiversity targets, and previous evaluation evidence that can inform future policy (for example the evaluation of Biodiversity 2020¹⁵), but biodiversity is highly complex and dynamic, with a high degree of inherent uncertainty. This limits the government's ability to comprehensively measure changes and to make accurate quantitative predictions of the future of all habitats and species. The government wants to improve this over time, including as part of the regular framework of reporting against the progress towards these targets under the Environmental Improvement Plan.

2.1. Approach to assessing the costs and benefits of introducing targets against the counterfactual

This Impact Assessment sets out some of the options considered¹⁶. The Impact Assessment is focussed on a more detailed appraisal of the Preferred Option (Option 2 – introducing legally binding targets), compared to the counterfactual (Option 0 – do nothing).

The impacts of Option 2 will heavily depend on *how* the targets are implemented. For example, the cost of meeting a habitat creation or restoration target would depend on a wide range of

¹⁴ Further detail on these gaps and further information on the indicators for each proposed target can be found in the biodiversity Evidence report.

¹⁵ UKCEH (2019) Evaluation of Biodiversity 2020, available at <http://scienceresearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=20409&FromSearch=Y&Publisher=1&SearchText=Biodiversity%202020&SortString=ProjectCode&SortOrder=Asc&Paging=10>

¹⁶ See the biodiversity Evidence report for the full range of options considered.

factors including the types of habitats created or restored, the location and alternative uses for that land and the approach used to create or restore the habitat. It will also depend on the balance of policy levers used, for example, the mix of regulation, incentives, or market-based approaches.

This Impact Assessment does not put forward all the government policies that could help to meet the targets over the entire 20-year period. It presents an illustrative assessment of the potential costs and benefits associated with setting these targets – based on the main actions required rather than specific policy levers that could potentially deliver them - to give a sense of the resources that may be required and the scale of benefits that could be delivered. This is based on quantifying the costs of the main conservation actions that can be reasonably judged to be capable of delivering the targets.

As of yet no decisions have been made regarding policy pathways. Therefore, the impacts of any specific future policies that would support the delivery of the targets will be assessed in more detail on a case-by-case basis as and when they are introduced. Further detail on the costs and impacts of these policies will be assessed within their individual Impact Assessments.

The costs and benefits included in this Impact Assessment are primarily based on external research produced by ICF Consulting Services Limited (ICF) and Economics for the Environment Consultancy (eftec), who were commissioned by Defra to assess the costs and benefits of meeting notional long-term biodiversity targets, with various levels of ambition explored for each potential target. This project¹⁷ has undergone both an internal review and external peer review. The ICF and eftec research was commissioned in 2020, when thinking about the wording of the targets and the feasible levels of ambition was at an early stage. Therefore, the potential targets explored in the ICF and eftec report were similar in scope to the proposed targets in Option 2, but do not align exactly in terms of timelines and ambition.

To assess costs and benefits of the notional targets, it was necessary to define and quantify the actions needed to meet a target at a particular level of ambition. For the outcome-based targets, the authors, advised by Natural England, formed a judgement as to the type, pace and extent of action required to achieve a certain outcome, defining a low, medium and high ambition package of actions. For example, ICF and eftec's medium and high ambition scenarios assume certain key actions would need to be undertaken over the initial three to five years rather than a longer timeframe as modelled in a low ambition approach (with investment staggered over 10 years). However, there was a high level of uncertainty because models quantifying the effect of conservation action on the outcomes were lacking. Therefore, the link between the low, medium and high packages of actions, and the notional levels of ambition/outcome (as they were defined for the purposes of the study) was imprecise and indicative only.

Since the ICF research was produced, further evidence and analysis was undertaken to explore the feasibility of meeting different levels of ambition. A series of expert workshops were held to

¹⁷ ICF and eftec, 2021. Costs and Benefits of England's Biodiversity Ambition - publication forthcoming, <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20607>

assess the feasibility of meeting different levels of ambition and the policies and actions that would be required. Natural England and the UK Centre for Ecology and Hydrology (UKCEH) also carried out trajectory modelling for the targets. The modelling, as set out in the biodiversity Evidence report, shows that the 2030 species abundance target in particular will be highly challenging to meet, and requires a step change in the level of conservation action¹⁸.

Given the scale of the challenge identified for the proposed suite of targets in Option 2, and the inherent uncertainty about the responsiveness of biodiversity outcomes to specific policy actions, the Impact Assessment adopts the highest cost package of actions modelled in the ICF and etec report. This assumes that an ambitious and fast-paced package of actions would be required to meet the targets. This has been judged to be the most appropriate assumption, particularly given the adoption of the highly ambitious target to halt the decline of species abundance by 2030. It is assumed that the 2030 species abundance target is on the trajectory of the long-term species abundance target, to then bend the curve and begin to recover nature.

The impact of climate change on species and habitats was not in scope of the initial ICF and etec cost benefit analysis. Therefore, additional analysis was subsequently commissioned to explore the potential impacts of climate change on the costs and achievability of meeting the targets. The climate change research, undertaken by consultants for Defra in 2021, looked at each of the proposed biodiversity target areas examined in ICF and etec (2021) and assessed the extent of the risk due to climate change; the costs of meeting the target were then adjusted to account for additional actions required to meet the proposed biodiversity targets under a changing climate.

The estimated benefits of the biodiversity targets are based on the research by ICF and etec (2021) and a primary research project completed for Defra by etec (2022¹⁹) which was commissioned to fill a key evidence gap on the value of policy interventions targeting species abundance and extinction risk in England. The study used stated preference methodology to estimate willingness to pay values for improved species recovery outcomes for households in England²⁰.

Approach to uncertainty

In line with Green Book guidance, optimism bias has been applied to account for a systematic tendency for appraisers to be over-optimistic about project parameters, including capital and operating costs. In this assessment total estimated costs have been increased by 10%. According to the Green Book, different optimism bias adjustments are appropriate for different

¹⁸ Defra (2022) Biodiversity Evidence Report, available at https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Biodiversity%20terrestrial%20and%20freshwater%20targets%20%20Detailed%20evidence%20report.pdf

¹⁹ Etec (2022) Valuing the Benefits of Species Recovery in England, publication forthcoming, <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20860>

²⁰ In etec (2022) 'recovery' is understood to represent a positive movement along a spectrum of habitat integrity - from a habitat intensively used for human purposes to a habitat in an intact state - to achieve ecological stability in the habitat and for the species residing within it. In general, a more intact habitat implies greater species diversity and abundance, and as well as contributing to reducing the extinction risk for vulnerable or threatened species.

types of projects and programmes. In this IA, the analysis is not specific to a set of policies and programmes that could deliver the targets over the 20-year time period which the targets cover; this makes it difficult to apply a highly tailored optimism bias adjustment for different measures. Therefore a 10% optimism bias has just been applied to all costs. However, more detailed appraisal would be undertaken for policies or measures that may be introduced in future which help deliver the targets.

As well as this adjustment for optimism bias, sensitivity analysis has been undertaken which includes consideration of a number of ways that the costs of delivering the targets may be significantly higher than expected. For example, for the species abundance target, analysis has been undertaken on the implications of the central assumptions about the scale of action required, or the average costs of species friendly land management, being too optimistic.

The implications of the benefits being lower than expected in the central scenario are also explored in the sensitivity analysis. However, it should be noted that the estimated benefits of the biodiversity targets are only partial. Many important benefits of biodiversity such as insect pollination – conservatively estimated to be worth over £0.5 billion a year to UK crops²¹ - and the role of biodiversity in preserving the resilience of our natural capital to future pressures and shocks, have not been quantified in this Impact Assessment.

The following sensitivity analysis has been undertaken to explore uncertainties and assumptions in the analysis:

- One sensitivity test varies the percentage of wildlife-rich habitat that is created rather than restored under wider habitats target (as opposed to an equal mix of creation and restoration).
- Another sensitivity test explores the impact of varying the scale of species friendly actions that is assumed to be required to meet the target, on the costs of meeting the species targets.
- There are also sensitivity tests that assume higher unit costs are required to deliver actions judged as necessary to meet the wider habitats target and species abundance targets.
- There is also sensitivity analysis concerning the scale of the impact of climate change on the achievability and costs of the targets.
- Sensitivity analysis is also undertaken around the scale of benefits that would occur from delivery of the biodiversity targets.

Further detail on the approach and results is provided in the sensitivity analysis section of this Impact Assessment.

²¹ Update to Pollinator Strategy Summary of Evidence (2019). Link: [Defra, UK - Science Search](#)

3. Description of options considered

Option 0 – Do Nothing

Setting non-statutory targets or relying on the 25 Year Environment Plan commitments will not be sufficient to incentivise the step change in policy needed to halt nature’s decline, without which nature would continue on a downwards trajectory. Crucially, legislative targets will hold successive governments to account on specific, measurable changes and delivery action in a way that non-legally binding goals will not. In this way, the 2030 species abundance target embodies the government’s commitment to leave the environment in a better state. Non-statutory targets are also unlikely to provide sufficient certainty and market signals to spur private investment or innovation on the same scale as legal targets. Doing nothing and not setting statutory biodiversity targets would put the Secretary of State in breach of their legal obligations under the Act. This is therefore not a viable option.

Therefore Option 0 is **not the preferred option**. As explained below, legally binding targets are needed to ensure policy objectives are met.

Legally binding targets drive action and create long-term certainty

Setting legally binding targets will create a legal obligation for government to deliver policy outcomes to halt the decline of biodiversity, and an independent review process (by the Office for Environmental Protection (OEP)) will monitor progress. Their legal force will also help to drive policy action and behaviour in a way that principles and objectives have not to date.

The long-term nature of the targets will support consistent policy commitments to deliver on environmental objectives. If a long-term target is missed, then government must, within 12 months of confirming that it missed it, publish and lay before Parliament, a “remedial plan.” This plan must explain why the target was missed and set out the steps the government intends to take to achieve the target as soon as reasonably practicable. This requirement, as with other aspects of the Environment Act’s targets framework, will form part of environmental law, and will therefore fall within the OEP’s remit.

Legally binding targets for biodiversity will also provide a strong external public signal that tackling biodiversity loss is a government priority. Long-term targets can help provide businesses with confidence in the market to develop long-term investment frameworks²². These legally binding targets, together with the policies and incentives to implement them, will create certainty and direction required to help drive industry investment in environmental improvement, cleaner practices and technologies and innovation to tackle habitat creation and restoration, and species loss.

²² Green Finance Strategy. Transforming finance for a greener future. HM Government. 2019. Available from: www.gov.uk/government/publications/green-finance-strategy

Legally binding targets also demonstrate our commitment to ambitious domestic action that leads the way internationally, aiming to encourage international partners to make similarly ambitious commitments. Demonstrating credible and urgent efforts is important to the UK's international leadership role, including as host of COP26 and in helping to drive the agreement of a new global framework for biodiversity at the CBD's 15th Conference of the Parties (COP15) in December 2022²³. The UK wants COP15 to be a turning point for countries around the world to collectively commit to ambitious targets and actions which will bend the curve of biodiversity loss globally by 2030.

Option 1 – One long-term legally binding target, and the 2030 species abundance target

The Environment Act commits the government to setting at least one long-term biodiversity target, and a target to halt the decline of species abundance by 2030. There is no single measure for biodiversity. Further detail on indicator choice and development is included in the biodiversity Evidence report. In setting a single long-term target, this IA has assumed that it would be a long-term target for species abundance, as the continuation of the 2030 species abundance target and the apex target for biodiversity. As an outcome-based target, it would be expected to drive wide-ranging improvements to the state of nature.

Species abundance is a good proxy for wider ecosystem health and the species abundance indicator is the preferred indicator for the long-term and 2030 species abundance targets. Further information on the indicators considered can be found in the biodiversity evidence report. The species abundance indicator covers approximately 1,000 species.

There is a risk that setting a single target could be narrow in focus and allow the creation of perverse incentives. The abundance indicator can only include species for which we have sufficiently robust data (approximately 1,000 species). While the abundance target is intended to drive an overall increase in population sizes, it may not, for example, help certain rare and threatened species. Setting a suite of biodiversity targets aims to capture a wider, more holistic picture of the state of nature, and maximise the benefits for wider environmental recovery. For this reason, Option 1 – to set only one long-term legally binding target and the 2030 species target is **not the preferred option**.

²³ Convention on Biological Diversity. www.cbd.int/cop/

Option 2 – A suite of long-term legally binding targets, and the 2030 species abundance target – Preferred Option

The government proposes a suite of legally binding biodiversity targets

The Environment Act commits the government to setting at least one long-term, legally binding target for biodiversity, as well as a 2030 species abundance target. Long-term, legally binding targets will drive action and create long-term certainty. As set out previously, this will also lead to benefits across the economy, public health and wellbeing, and in basic ecosystem services.

The government proposes a suite of biodiversity targets to drive the required change. As explained in section 4 below, these targets are complementary, with each supporting the achievement of the other targets. The proposed suite of targets will drive wide-ranging improvements and work together to create lasting change for both habitats and species. They will be supported by other Environment Act targets, and together will collectively improve the natural environment by tackling the drivers of biodiversity loss, including poor air and water quality.

The government proposes to set targets to:

- halt the decline in species abundance by 2030.
- ensure that species abundance in 2042 is greater than in 2022, and at least 10% greater than 2030.
- Improve the Red List Index for England for species extinction risk by 2042, compared to 2022 levels.
- restore or create in excess of 500,000 hectares of a range of wildlife-rich habitats outside protected sites by 2042, compared to 2022 levels.

This is the preferred option.

4. Policy objective

A suite of legally binding biodiversity targets will drive wide-ranging improvements to the state of nature. They will deliver a range of ecosystem services including not only habitats for species, but flood alleviation, carbon sequestration, pollination and improvements in wellbeing. Climate change and biodiversity loss are interlinked problems, and nature-based solutions to tackle climate change will also be important for reducing pressures on biodiversity and increasing investment in habitats.

The suite of targets will work together to ensure biodiversity is recovered. Recovering wildlife will require more habitat; in better condition; in bigger patches that are more closely connected, in line with Lawton principles and our objectives for the Nature Recovery Network²⁴. Species abundance gives us information about wider ecosystem health, with good quality, connected habitats supporting a greater abundance of species.

A complementary habitat restoration and creation target will support the recovery of a wide range of species beyond those included in the species abundance target. As the habitat needs of some species conflict with the needs of others, despite being part of the same ecosystem, a suite of approaches to habitat creation is necessary to avoid improving the status of some species at the cost of others. For example, lowland heath in Southern England, where management focussing on improving butterfly populations led to a decline in ant populations²⁵. The wider habitats target will deliver an ecosystem more resilient to both natural and human-made pressures, including climate change, that supports the species targets in a sustainable way and contributes to nature recovery.

All proposed targets are SMART

- **Specific:** All targets have a specific and clearly defined level to be achieved.
- **Measurable:** The method for objective measurement is clear and repeatable in each case, allowing results to be reproduceable within reason.
- **Achievable:** To be sure that each target is ambitious, yet achievable, the historic pace of change of our indicators and potential future trends was analysed. Also, an independent expert advice group (Biodiversity Targets Advisory Group) who provided scrutiny of the evidence-based approach for targets was created. The Secretary of State is satisfied that the target can be met.
- **Relevant:** All targets will track something of real-world importance to biodiversity.

²⁴ Lawton JH, Brotherton PNM, Brown VK, Elphick C, Fitter AH, Forshaw J, Haddow RW, Hilborn, S, Leafe RN, Mac, GM, Southgate MP, Sutherland WJ, Tew TE, Varley J, Wynne GR. Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra. 2010. Available from: <https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf>

²⁵ Webb and Thomas (1994) Conserving insect habitats in heathland biotopes: a question of scale. In: P.J. EDWARDS, R.M. MAY & N.R. WEBB, eds. Large scale ecology and conservation biology. Oxford: Blackwell Scientific Publications.

- **Time-bound:** All targets are time-bound with a specific date by which it must be achieved, creating a clear deadline to focus policy action.

The Environment Act creates a new statutory cycle of monitoring, planning and reporting. Long-term targets will be supported by interim targets, which will set a five-year trajectory towards meeting the long-term targets. The Act requires Government to set interim targets in the Environmental Improvement Plan. This will ensure that there is always a shorter-term goal Government is working towards, as well as the long-term target and will allow for an ongoing assessment of whether the government is on track to meet its long-term target ambitions.

4.1. Species abundance and extinction targets

In the 25 Year Environment Plan, the government committed to taking action to recover threatened, iconic, or economically important species of animals, plants and fungi and, where possible, to prevent human induced extinction or loss of known threatened species. Trends show that, overall, species populations have declined over the last 40 years²⁶.

Once the post-2020 Global Biodiversity Framework is agreed, Parties to the CBD will be expected to set their own national level targets and to report what contributions they have made. In England, we are leading the way internationally by setting key targets in law. Our 2030 species target demonstrates our commitment to ambitious domestic action, and we hope it will encourage international partners to make similarly ambitious commitments.

Setting targets to support species recovery will help us to engage people and galvanise public support for the recovery of biodiversity. Addressing species declines will see multiple benefits, with species targets not only helping us to prioritise species or groups of species for recovery but also to support and prioritise actions for the improvement of habitats and the ecosystem services they provide. A species target is therefore not just about the outcome for said species but about promoting broader investment and action in the environment from NGOs, landowners and others, including the wider public, to deliver a range of benefits to society and the economy.

A species abundance target and species extinction risk target will work together. The species extinction risk target will capture changes in populations of very rare species as well as more widespread species, to complement the species abundance targets.

The proposed species targets are:

- **2030 species abundance target:** To halt the decline in species abundance by 2030.
- **Long-term species abundance target:** To ensure that species abundance in 2042 is greater than in 2022, and at least 10% greater than 2030.

²⁶ England biodiversity indicators. 4a. Status of priority species: relative abundance. Available from www.gov.uk/government/statistics/england-biodiversity-indicators

- **Long-term species extinction risk target:** Improve the Red List Index for England for species extinction risk by 2042, compared to 2022 levels

4.2 Wider habitats target

The wider habitats target will be the most sensitive target to change as it directly measures action to create and restore habitat outside of the protected site network. Successful habitat restoration and creation would be a clear indicator that positive change has been made and would help to guide future progress and action. Our evidence base shows that where we facilitate habitat creation or restoration, and where we address pressures, we see the signs of nature recovery.

The government wants to increase the number of wildlife-rich habitats in England. Many of our wetlands, woodlands, grasslands and coastal habitats have been lost. While losses have slowed, many natural and semi-natural habitats are in poor condition and not recovering as we would like. Patches of habitat are also often very fragmented, isolated, and too small to sustain thriving communities of species into the future. Historical data on species abundance and distribution consistently link species loss with habitat loss or degradation. Recovering biodiversity will require more habitat, in better condition, in bigger patches that are more closely connected²⁷.

In the 25 Year Environment Plan, the government committed to create or restore 500,000 hectares of wildlife-rich habitats outside of protected sites as part of a Nature Recovery Network, to complement and connect our best wildlife sites. A statutory target of in excess of 500,000 hectares is expected to drive a net increase in restoration and creation of 'wildlife-rich' habitats across a range of habitat types. Maximising the habitat created and restored will support delivery of the 2030 and longer term species abundance targets. Our ambition is to exceed 500,000 hectares, in order to drive wider nature recovery. Setting a legally binding target to support the 25 Year Environment Plan commitment will help us to act on habitat loss, to create and restore habitats outside of protected sites and bring habitats into appropriate management to recover biodiversity.

The proposed target is:

- **Wider habitats target:** to restore or create in excess of 500,000 hectares of a range of wildlife-rich habitats outside protected sites by 2042, compared to 2022 levels.

²⁷ In line with Lawton principles. The Natural Choice: Securing the value of Nature. Defra. 2011. Available from: www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

5. Summary and Preferred Option with description of implementation plan

The Environment Act creates a new statutory cycle of monitoring, planning and reporting. Long-term targets will be supported by interim targets, which will set a five-year trajectory towards meeting the long-term targets. The Act requires Government to set interim targets in the Environmental Improvement Plan. This will ensure that there is always a shorter-term goal Government is working towards, as well as the long-term target and will allow for an ongoing assessment of whether the government is on track to meet its long-term target ambitions.

The Office for Environmental Protection (OEP) will hold the government to account on progress towards achieving the targets and every year can recommend how the government can make better progress. The government must respond to these recommendations, which will be published and laid before Parliament. The OEP will have the power to bring legal proceedings if the government breached its environmental law duties, including its duty to achieve the biodiversity targets.

There are a number of existing and future initiatives and policy levers that will contribute to progress towards meeting the Environment Act biodiversity targets. Many of these will also support delivery of wider Environment Act targets and other government environmental objectives, while in some cases balances and trade-offs will need to be sought. Research and analysis will be required to improve the existing evidence base and help ensure action is directed appropriately. An effective monitoring and evaluation programme will be essential for tracking our progress towards the targets, understanding the contribution of individual policy levers and adopting a dynamic, adaptive management approach that supports the system towards delivering the target outcomes.

6. Monetised and non-monetised costs and benefits of each option (including administrative burden)

This section provides a cost benefit analysis of the preferred option (Option 2 – introducing a suite of legally binding targets), compared to the counterfactual (Option 0 – Do Nothing).

All the costs and benefits are estimated in 2020 prices and discounted to 2020 present values. This policy will come into effect in 2022, so we have therefore appraised the costs and benefits over a 78-year appraisal period from 2022 to 2100. This is to ensure consistency with other Environment Act targets where possible, allowing the impacts of all targets to be comparable.

Option 0: Do Nothing – the counterfactual

This option represents the continuation of the status quo with no legally binding Environment Act targets. To understand the baseline, the government commissioned research which examined biodiversity funding²⁸.

Protecting and improving biodiversity is a complex challenge, requiring efforts from a wide range of organisations within and outside of government. Defra's strategy for conserving biodiversity in England has long depended on partnerships involving statutory, voluntary, academic and business sectors, and there are a vast range of initiatives that contribute to progressing biodiversity outcomes. This means the policy landscape is complex and it is difficult to get a comprehensive picture of the expenditure and other resources that contribute towards our biodiversity goals. The researchers used a number of methods to gather data on expenditure from a wide range of organisations including public sector funding (such as Agri-environment schemes), private sector funding and funding from environmental NGOs.

It is likely that the level and the composition of funding streams will change over the twenty-year target period. Due to the uncertainties involved, the estimated funding for the 2021/22 financial year is used in the baseline option analysis, as this is the best evidence available²⁹.

²⁸ ICF and ettec (2021) – The costs and benefits of England's biodiversity ambitions, publication forthcoming <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20607>.

²⁹ Public sector funding: Legacy Agri-environment funding (i.e., Countryside Stewardship schemes and Higher-Level Environment Schemes), Farming in Protected Landscapes Programme, Nature for Climate funding, the Green Recovery Challenge Fund, Flood and Coastal Resilience Innovation Programme, Flood Defence Grant-in-Aid, Water Environment Improvement Fund, Natural Environment Investment Readiness Fund; High Speed 2 Biodiversity Woodland Fund

Private sector funding: Water related funding (PR19), and other private sector funding, E.g., Airport Community Trust Funds.

Wider habitats

The baseline level of funding for the wider habitats target can be explored using the funding analysis. Funding has been categorised as either public sector, private sector, or NGO funding. The funding analysis estimated that in the 2021/22 financial year £268m will be spent on wider habitats outside of protected sites actions, with £176m attributable to the public sector, £47m to the private sector and £45m to NGOs.³⁰

As the wider habitats target is action-based rather than outcome-based, the current rate of annual habitat creation is used to estimate the area of habitat created/restored in the absence of a legally binding wider habitats target. It is assumed that there will be a continuation of average delivery rates for Outcome 1B of Biodiversity 2020³¹. The current rate of delivery is approximately 16,595 hectares of habitat per annum³². This means that over the 20-year target period it is estimated that, in the absence of a legally binding wider habitats target, approximately 331,900 hectares of habitat will be created or restored³³.

Species abundance and species extinction risk

In the 2021/22 funding analysis, it was not possible to distinguish between funding that was aimed at increasing mean species abundance and funding to reduce the risk of species extinction. This is because funding aimed at either will likely support the other. As such the funding analysis is presented as a total for species. This means that it is not possible to present separate baseline options for the species abundance and species extinction risk targets.

Additionally, 2021/22 funding for protected sites is included in the species baseline. This is because, for species abundance and species extinction risk ambitions to be realised, action on improving the condition of protected sites in line with the 25 Year Environment Plan goal of restoring 75% of our terrestrial and freshwater protected sites to favourable condition is vital. In a workshop held with stakeholders and experts to assess the desirability and feasibility of

NGO funding: funding from a wide range of NGOs captured via primary data collection through a targeted questionnaire and secondary data collection from NGO annual returns to the Charity Commission website.

³⁰ These figures are in 2020 price years.

³¹ Outcome 1B (For habitat and ecosystems on land, including freshwater environments): more, bigger and less fragmented areas for wildlife, with no net loss of priority habitat and an increase in the overall extent of priority habitats by at least 200,000 ha. Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Defra. 2011. Available from: www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services

³² This assumption is in line with the wider habitats outside of protected sites target trajectory. See biodiversity Evidence report for further details.

³³ Delivered through the following mechanisms: Highways England Biodiversity Plan, National Trust Estate management. Environment Agency habitat creation programme, Forestry Commission – habitat creation, Forestry Commission – restoration of Ancient Woodland Sites, Forestry - Open Habitats Programme, Local Planning Authorities – Green Infrastructure delivery recorded by Natural England, Mineral Companies Sire Restoration, External Partners and Natural England – Restoration/Creation of priority habitats and arable field margins.

potential species targets, improving the condition of protected sites was consistently seen as essential for delivery of the species targets.

The funding analysis estimated that in the 2021/22 financial year £616m will be spent on species and protected sites actions, with £449m attributable to the public sector, £20m to the private sector and £147m to NGOs³⁴. This is used as the estimate of baseline annual spending that supports species under the status quo.

Option 2: A suite of long-term legally binding targets, and the 2030 species abundance target (Preferred Option)

The impacts of introducing legally binding biodiversity targets relative to 'Option 0 - Do nothing' will depend on the specific policies introduced to meet the targets. This Impact Assessment does not put forward all the government policies that could potentially be introduced over the next 20 years to meet the targets. Instead, it presents an illustrative assessment of the potential costs and benefits associated with setting these targets, based on the key conservation actions that would be required. The exact costs and benefits will depend on how the targets are implemented.

Meeting these targets will be complex. It will need government, land managers, the public, the private sector, and NGOs to all work together and contribute. It is expected that environmental land management schemes will play a crucial role by providing incentive payments to reward farmers and land managers for actions that support biodiversity across the farmed landscape. We are also looking at how to increase private sector investment in nature and analysing responses to our Nature Recovery Green Paper consultation published in March, which explores the possibility of regulatory changes to support biodiversity.

The distribution of impacts on different groups and sectors will also depend on how the targets are implemented.

Scale of costs

To inform the development of potential Environment Act biodiversity targets, independent research was commissioned from ICF and ettec which examined 'The Costs and Benefits of England's biodiversity ambitions'³⁵. This research forms the basis of the costs and benefits explored below.

This research provides estimates of the costs of direct conservation actions for three long-term target areas:

- Creating and/or restoring priority habitats outside of protected sites.

³⁴ Figures are in 2020 price years

³⁵ ICF and ettec, 2021. The costs and benefits of England's biodiversity ambitions, Publication forthcoming, - <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20607>

- Increasing species abundance.
- Preventing species extinctions.

The researchers worked with the relevant experts in Natural England to develop a methodology for assessing the costs of each of the potential legally binding biodiversity target areas set out above. For each target area, a judgement was made on the necessary actions that would be required to achieve the targets. The costs of these actions were then estimated; further detail is provided in the respective target areas below. The actions deemed necessary to achieve the targets are based on reasoned judgement by experts rather than on scientific evidence. However, these policy pathways are illustrative, and no decisions have yet been made on appropriate delivery policies.

The three targets are interlinked, and it is expected that action under one target will contribute towards the achievement of another target. To ensure that actions are not costed multiple times under different biodiversity targets, actions that are required to achieve the wider habitats target were defined and quantified first. The actions defined and costs quantified under the species targets are therefore additional to those captured under the wider habitats target. Thus, the achievement of the species abundance target is contingent on successfully carrying out the actions identified as necessary to meet the wider habitats target. Similarly, the actions and costs of the species extinction risk target are additional to the other target areas.

It is likely that climate change will negatively affect the ability of some species and habitats to recover; the 2021 UK Climate Change Risk Assessment³⁶ highlighted the urgent need for adaptation measures for terrestrial, marine and freshwater species and habitats. Some of the actions costed for targeted species interventions and for protected sites improvement in ICF and eftec (2021) were related to climate change - for example where further research has been identified as needed to explore the impacts of climate change on a particular species, or where climate adaptation actions have been identified as necessary for a specific site. However, the overall impacts of climate change were not explicitly taken into account in the project. To fill in this evidence gap, further external analysis was subsequently undertaken to explore the likely impacts of climate change of the proposed biodiversity targets and adaptation costs and benefits³⁷. This aimed to assess the risk of species and habitats to climate change and the impact of climate change on the achievability and cost of the proposed targets. The indicative results of this research were explored in the sensitivity analysis in the Consultation IA. In this Final Stage Impact Assessment, we have incorporated the findings of this now-completed project into the central assumptions within the IA, to better take account of the costs of climate proofing the targets. More information on how the analysis for each target has been adjusted to account for climate change is provided in the respective target areas below.

³⁶ <https://www.ukclimaterisk.org/independent-assessment-ccra3/technical-report/>

³⁷ Watkiss, P., Berry, P., Hunt, A., (2021) Impacts of climate change on the proposed biodiversity targets and adaptation costs and benefits. Report to Defra as part of the Economic Case for Climate Change Adaptation project. January 2021.

The three targets are interlinked, and it is expected that action under one target will contribute towards the achievement of another target. To ensure that actions are not costed multiple times under different biodiversity targets, actions that are required to achieve the wider habitats target were defined and quantified first. The actions defined and costs quantified under the species targets are therefore additional to those captured under the wider habitats target. Thus, the achievement of the species abundance target is contingent on successfully carrying out the actions identified as necessary to meet the wider habitats target. Similarly, the actions and costs of the species extinction risk target are additional to the other target areas.

All costs and benefits are assessed over the period 2022 to 2100 due to the long timeframes for the benefits to accrue for biodiversity conservation action. The costs and benefits are presented in 2020 prices and discounted to 2020 present values where monetised. This is to ensure consistency with other Environment Act targets where possible, allowing the impacts of all targets to be comparable.

Wider habitats

The costs of a legally binding wider habitats target (to restore or create in excess of 500,000 hectares of a range of wildlife-rich habitats outside of protected sites by 2042, compared to 2022 levels) are examined below. The analysis has been informed by ICF and eftec (2021) and supplementary analysis undertaken by Frontier Economics and Paul Watkiss Associates (2021)³⁸, the methodology of both have been set out in detail in the section below.

To calculate the costs of implementing a wider habitats target, the baseline level of habitat creation of 331,900 hectares (over 2023-2042 period) that was set out in the wider habitats 'Option 0 - Do nothing' was subtracted from the legally binding target of creating/restoring 500,000 hectares of wildlife-rich habitats. Thus, the target would require an additional 168,100 hectares of wildlife-rich habitats to be created or restored by 2042, compared to the projected amount that would be created under Option 0.

Woodland creation under the woodland cover target is also expected to make a contribution towards the wider habitats target. For the purposes of this IA, we assume a contribution of around 100,000 hectares of woodland creation that is wildlife-rich and supports the wider habitat target (of which around 40,000 hectares of woodland is part of baseline delivery under Option 0 and 60,000 is additional). To minimise the risk of double counting, the monetised costs and benefits of woodland creation are only included in the woodland cover target and not in this Impact Assessment. If the woodland cover target is not met, the costs of meeting the wider habitats target is likely to increase.

Taking account the expected contribution of wildlife-rich woodland creation captured in the woodland cover Impact Assessment, this analysis assumes that, in addition to baseline delivery,

³⁸ Watkiss, P., Berry, P., Hunt, A., (2021) Impacts of climate change on the proposed biodiversity targets and adaptation costs and benefits. Report to Defra as part of the Economic Case for Climate Change Adaptation project. January 2021.

108,441 hectares of additional restoration and creation of other types of wildlife-rich habitat is required to meet the target.

The wider habitats target is action-based. Therefore, the main direct conservation actions identified as necessary to achieving the target are creation, restoration and maintenance of the wildlife-rich habitats. The wider habitats target does not specify the required balance between habitat creation and restoration activities. The wider habitats target could potentially be met by any balance of creation and restoration activities. Additionally, whilst the types of habitats that may contribute towards the target are known³⁹, the specific hectareage of each habitat type created and restored is not specified as part of the wider habitats target. No decisions have yet been made regarding the pathway to meet the target however for the purposes of the IA, Defra modelling has assumed certain potential mixes.

It has been assumed that the targets will include a range of habitat types that are most amenable to area-based creation and restoration targets⁴⁰. For the purposes of this cost benefit analysis, an equal 50:50 split of habitat creation and restoration by area has been assumed. This assumption is explored in the sensitivity analysis set out at a later point in this IA (see Sensitivity 1). The creation mix follows a similar percentage breakdown of relevant habitats for England Biodiversity targets to Rayment (2017)⁴¹. The restoration mix is proportionate to current habitat area not in Countryside Stewardship, Higher Level Stewardship or Forestry Commission agreements.

In the analysis, it is assumed that any restoration and/or creation activity will be carried out between 2023 and 2042, with an equal amount of priority habitat created and restored each year⁴². This is an assumption made solely for analytical purposes and in practice may not be possible at the beginning of the target period. The wider habitat target is not prescriptive about the hectareage of habitat that needs to be created or restored each year and in reality, the area of habitat restored/created may be higher in later years. This could potentially have a small impact on the costs of meeting the target.

The specific hectareage of each priority habitat type either restored or created is estimated by multiplying the restoration and creation percentage of each priority habitat type by the total

³⁹ Draft Regulation 10 in the Statutory Instrument sets out that wildlife rich habitats include a habitat type of principle importance for the conservation of biodiversity under section 41 of the Natural Environment and Rural Communities Act 2006 or a habitat type listed in Schedule 1 of the Statutory Instrument. .

⁴⁰ The following habitats have been included within the scope of this analysis: Coastal Saltmarsh, Coastal Sand Dunes, Coastal Vegetated Shingle, Maritime Cliff and Slope, Mudflats, Saline Lagoons, Lowland Calcareous Grassland, Lowland Dry Acid Grassland, Lowland Meadows, Purple Moor-Grass and Rush Pastures, Upland Calcareous Grassland, Upland Hay Meadow, Lowland Heathland, Mountain Heaths and Willow Scrub, Upland Heathland, Limestone Pavement, Traditional Orchard, Blanket Bog, Coastal and Floodplain Grazing Marsh, Lowland Fens, Lowland Raised Bog, Reedbeds, Upland Fens Flushes and Swamps.

⁴¹ To avoid double counting deciduous woodland has been excluded as the costs and benefits of creating such habitat has been captured in the woodland cover target. Assessing the costs of Environmental Land Management in the UK. Final Report. A report for the RSPB, the National Trust and The Wildlife Trust. Rayment. 2017. Available from: <https://nt.global.ssl.fastly.net/documents/assessing-the-costs-of-environmental-land-management-in-the-uk-final-report-dec-2017.pdf>

hectare that would be created and restored each year. The cost of maintaining existing priority habitat outside of protected sites has been included as well as the cost of maintaining additional habitat that has been created or restored.

Unit creation, restoration and maintenance costs for each priority habitat type were collected by ICF and eftec (2021) from a range of sources including a literature review, data from habitat creation and restoration projects funded by LIFE, National Lottery Heritage Fund (NLHF) and the Environment Agency and interviews of staff in Natural England, the Environment Agency, the Forestry Commission and environmental NGOs. The cost of maintaining existing priority habitat outside of protected sites has been included as well as the cost of maintaining additional habitat that has been created or restored.

The average annual creation, restoration, and maintenance costs of meeting the target have been calculated by multiplying the estimated area of habitat created, restored, and maintained each year by the unit cost per hectare of creation and restoration according to habitat type (see Table 1).

Familiarisation costs to business of the wider habitats target have not been estimated as this Impact Assessment does not put forward all of the possible government policies that could potentially help to meet this target. Further detail on the familiarisation costs of individual future policies that contribute towards this target will be assessed within their individual future Impact Assessments.

The estimated costs of the habitat target are then adjusted for climate change. To explore the potential impact of climate change on the cost of the proposed wider habitats target, Frontier and Paul Watkiss Associates carried out a rapid analysis for Defra, making assumptions about the type and potential scale of the impacts. For the wider habitats target, they assessed the vulnerability of each priority habitat type set out in the ICF and eftec analysis (2021) to climate change using Natural England habitat typology and assessment of risk for each⁴³. It was assumed that for habitats that are categorised as either medium or high risk, additional costs would be incurred. These are factored in as costs of additional restoration required due to climate impacts. There is inherent uncertainty around the precise impacts of climate change over the long time period of the targets. As a reasonable assumption, the climate analysis used evidence from Duffield et al. (2021)⁴⁴ which considered an A1B scenario (a broadly middle of the road business as usual scenario, which might lead to 3°C of warming globally, relative to pre-industrial); this identified between 80% and 90% of the biodiversity features in freshwater, wetland, uplands and coastal habitats would be at medium or high risk over the next 30 years. This would translate into an *annual* loss in condition (quality) of up to 3%. Using this, the unit cost per hectare of restoration of priority habitat, taken from ICF and eftec (2021) is multiplied by an assumed 3% annual loss, to account for additional costs to compensate for impacts of

⁴³ Natural England (2020). Climate Change Adaptation Manual (NE751), available from: <http://publications.naturalengland.org.uk/publication/5679197848862720>

⁴⁴ Simon J. Duffield, Ben Le Bas, Michael D. Morecroft, (2021). Climate change vulnerability and the state of adaptation on England's National Nature Reserves. *Biological Conservation*, Volume 254, 2021, <https://doi.org/10.1016/j.biocon.2020.108938>.

climate change. It is assumed that no additional management costs will be incurred as a result of climate change, and no additional costs will be incurred for those habitats classified as low risk. However, given the inherent uncertainty around the long-term impacts of climate change, sensitivity analysis has been undertaken to test these assumptions further – see Sensitivity Analysis section for more information.

Finally, following on from the approach taken in GHK (2006⁴⁵ and 2011⁴⁶), a 15% mark up on the costs of meeting this target has been added. This is to take into account central planning, administration, and co-ordinating costs.

Table 1 shows the estimated average annual cost between 2023-2042 of meeting the wider habitats Environment Act target. It is estimated that the average annual creation cost of meeting the wider habitats target is £24m. The estimated average annual restoration cost of meeting this target is £5m. Generally, creation costs tend to be considerably higher than restoration costs and if more of the target is met through creation activities, the estimated average annual cost will be much higher (see Sensitivity Analysis for more information). The average annual maintenance cost of meeting the wider habitats target is estimated to be £36m. The maintenance costs include the cost of maintaining existing priority habitats and additional priority habitats created or restored.

The additional costs that are estimated to be incurred as a result of adaptation to climate change is £12m. The estimated central planning, administration and co-ordinating costs of meeting the proposed wider habitats target is £11m. Finally, the optimism bias adjustment factor is £9m.

Table 1 : The estimated average annual cost between 2023-2042 of meeting the proposed legally binding wider habitats target, £m.

Action	Cost, £m
Restoration	5
Creation	24
Maintenance	36
Climate adaptation	12

⁴⁵ UK Biodiversity Action Plan: Preparing Costings for Species and Habitat Action Plans. Costings Summary Report. Revised Report to Defra and Partner. GHK Consulting LTD and RPS. 2006. Available from: www.cbd.int/financial/finplanning/uk-speciescost.pdf

⁴⁶ Benefits of SSSIs in England and Wales - Summary. GHK. 2011. Available from: <http://randd.defra.gov.uk/Document.aspx?Document=sssis-benefits-non-technical-summary.pdf>

Central planning, administration and co-ordinating	11
Optimism Bias (10% mark-up)	9
Total	97

Proportion of costs borne by businesses

The target places a duty on government and does not itself lead to any direct costs to business.

Any future costs to businesses of meeting a legally binding wider habitats target will be dependent on how the target is implemented. However, it is expected that some of the costs of meeting the habitat target will be borne by the private sector, for example, this may be voluntary contributions or to comply with other regulatory measures. Any future regulatory change will be subject to an Impact Assessment in which the costs to businesses will be explored. Similarly, any contributions made under the framework of existing legislation –for example Biodiversity Net Gain - would already be captured in other Impact Assessments and are not an impact of the introduction of this target. In this way, this target alone does not create additional costs to businesses.

While the target itself does not lead to a cost to business, to understand the proportion of the costs of meeting the habitat target that are likely to be met by businesses rather than government, existing expenditure on habitat creation and restoration has been examined. The ICF (2021) funding analysis estimated that in the 2021/22 financial year, 66% of funding for wider habitats activities was from the public sector and 17% originated from the private sector (with the remaining 17% funding coming from NGOs).

If the 2021/22 breakdown of wider habitats funding between the public and private sector is used to estimate the relative proportion paid by government and businesses, the estimated average annual cost to government of meeting the wider habitats target is £64m and the estimated contribution by businesses is £17m.

However, it is likely that in the future an increasing amount of wider habitats activities will be financed by the private sector. HMG has set an ambitious target to raise at least £500m in private finance for nature’s recovery every year by 2027, rising to more than £1bn a year by

2030⁴⁷. This could mean that businesses' contribution towards meeting this target could be greater in future.

To create and restore habitats requires targeted action from landowners and managers, particularly in the agricultural sector given 70% of UK land is farmed. This will be supported in part by agri-environment schemes, which will offer land managers the opportunity to be financially rewarded for taking actions that contribute to the delivery of the targets. The new environmental land management schemes will offer choice of support for more regenerative approaches to farming and the creation or restoration of habitats in appropriate areas. The Government intends to ensure that all environmental land management schemes are fully compatible with the blending of public and private finance, and that public money does not "crowd out" private investment. Enabling private revenue streams and investment will give farmers and land managers more opportunity to derive an attractive return from delivering ecosystem services.

The housing and development sector will contribute to delivering the targets, primarily through Biodiversity Net Gain which will require developers to offset the impact of their development on biodiversity by enhancing or creating habitat. The Biodiversity Net Gain Impact Assessment estimates that 15,900 ha of non-developed land is to be developed annually. Biodiversity Net Gain aims to deliver a minimum of 10% of habitat gain. The impact assessment further estimates an annual creation or enhancement of between 1,551 and 17,060 ha. The expected impacts of Biodiversity Net Gain are set out in more detail in the published BNG Impact Assessment.

Water companies also manage substantial areas of land and will be able to contribute to meeting all the proposed targets. The Environment Act water targets will be key to addressing off-site pressures through reducing water, and other related, pollution. Further details on the impacts of the water targets are included in the water targets Impact Assessment.

Species targets

- Ensure that species abundance in 2042 is greater than in 2022, and at least 10% greater than 2030.
- Improve the Red List Index for England for species extinction risk by 2042, compared to 2022 levels.

The costs and benefits of the proposed legally binding species Environment Act targets have primarily been informed by the ICF and eftec research and supplementary analysis undertaken by Frontier Economics and Paul Watkiss Associates whose methodologies are set out in detail below.

The proposed species targets are outcome-based, and so in order to assess the costs and benefits of meeting them, it was first necessary to define a package of actions required to

⁴⁷ Autumn Budget and Spending Review. Policy paper. HM Treasury. 2021. Available from: www.gov.uk/government/publications/autumn-budget-and-spending-review-2021-documents/autumn-budget-and-spending-review-2021-html

achieve a certain outcome. ICF and eftec's assessment of the package of actions required was informed by advice from experts in Natural England and is supported by the findings of the expert elicitation workshops (for more information see the Biodiversity Evidence report). The main actions required to achieve the species targets, which have been costed for this IA, are:

1. widespread adoption of land management which supports the recovery of species (to increase the abundance of wider countryside species that are more likely to be reliant on farmed habitats).
2. an increase in targeted investment for threatened species.
3. increased investment in protected sites.
4. a step change in habitat creation and restoration.

The costs of a step change in habitat creation and restoration are already captured under the wider habitats target, set out in the previous section. To reduce the risk of double counting costs, for the species targets, we have only included the costs of the other three sets of actions required to deliver the species targets; habitat creation and restoration is excluded here.

Familiarisation costs to business of species targets have not been estimated as this Impact Assessment does not put forward all of the possible government policies that could potentially help to meet these targets. Further detail on the familiarisation costs of individual future policies that contribute towards these targets will be assessed within their individual future Impact Assessments.

Species friendly land management

In this IA, it is assumed that widespread adoption of species-friendly land management is required to increase the abundance of wider countryside species that are more likely to be reliant on farmed habitats. This would include land management actions such as creating hedgerows and providing food and cover for farmland birds.

While the costs of delivering species friendly land management necessary to achieve the targets will depend on the specific policy levers used, for the purposes of the analysis, the unit costs have been estimated based on the available information regarding the Sustainable Farming Incentive⁴⁸ - which are based on the cost of the actions plus income forgone - to illustrate the scale of resources that may be required to deliver the species targets. Each payment rate is associated with differing extent of Agri-environment action at farm level, with higher payment rates relating to additional actions being carried out. ICF and eftec's initial payment rate assumptions were based on the information available at the time the research was carried out. Where available, for this IA, payment rates for introductory and intermediate levels of the arable and improved grassland standards have been updated to take account of more recently published Sustainable Farming Incentive information⁴⁹.

⁴⁸ www.gov.uk/government/publications/sustainable-farming-incentive-scheme-pilot-launch-overview/sustainable-farming-incentive-defras-plans-for-piloting-and-launching-the-scheme

⁴⁹ www.gov.uk/government/publications/sustainable-farming-incentive-how-the-scheme-will-work-in-2022/sustainable-farming-incentive-how-the-scheme-will-work-in-2022

The Sustainable Farming Incentive proposals outline standards which will deliver actions to benefit species. Sustainable Farming Incentive proposals are still in development and could be subject to change. The proposed Sustainable Farming Incentive standards outlined in ICF and ettec (2021) that were available at the time the research was undertaken and would be important for supporting species were as follows:

- **Hedgerow standard** – Includes prescriptions for management and cutting, buffer strips and hedgerow trees.
- **Arable standard** – Requires management of a proportion of arable area to provide resources for farmland birds, pollinators and other beneficial insects. This includes nesting and cover areas; insect and flower rich habitat; winter seed food and/or unharvested low input cereal, overwintered stubbles. Also includes requirements for nutrient management and, for higher payments, enhanced wildlife habitat.
- **Improved grassland standard** – Includes sward management, uncut margins, buffers around trees, nutrient management plan, taking areas out of management, and for higher payments specific rules on silage cutting, clover, ditches, nutrients, slurry, and manures.
- **Semi-improved/ unimproved grassland standard** – Includes rules on management of nutrients and weeds, buffering field trees, uncut margins, avoiding poaching and overgrazing, ditch management, sward management, and for higher payments management of rushes, scrub, hay meadow, wildflowers, and water levels.

In ICF and ettec (2021), it was assumed that 80% of hedgerow, arable land, improved grassland and unimproved/semi-improved grassland would need to be covered by similar standards and associated prescriptions (with a small proportion of each farm used for nature friendly options) to deliver improvements to species abundance. This assumption was informed by expert judgement from Natural England about the scale of action required in order to meet the species abundance targets.

Modelling subsequently undertaken by UKCEH, and RSPB (see the Biodiversity Evidence Report) based upon empirical data on the response of farmland birds to higher level Agri-environment schemes in England found that around 40% of farms would need to adopt nature friendly farming to halt the decline of farmland birds by either 2030 or 2040 and that this would need to increase to around 65% to halt and reverse the decline of farmland birds by 2030 and put it on an upward trajectory. In order to return the FBI to its 2022 value by 2040 it would require a steady increase to 68% in 2040. The modelling assumed that these farms would adopt options similar to the old Higher Level Stewardship scheme in which a small proportion of the land area was covered by nature-friendly options (e.g., as sown field margins). The modelling was based only on farmland birds in the FBI, rather than all species in the abundance indicator. The authors note that these estimates should be treated with caution given the high uncertainty in the data and assumptions made but that they provide a sense of the step-change in action required.

Therefore, for the purposes of this IA, based on the analysis by UKCEH, it is assumed that species-friendly land management options would need to be adopted on 68% farmed land (with a small proportion of land for each farm used for nature friendly options) to enable the species targets to be met.

As a simplifying assumption, it is assumed that the same coverage will be required from 2024 to 2042. In the UKCEH modelling a gradual increase in coverage of nature friendly farming was assumed, rather than high coverage immediately; their modelling reported that around 40% of farms would need to adopt nature friendly farming to halt the decline of farmland birds by 2030, increasing to 68% by 2040. A gradual increase is also likely to be more realistic. However, for analytical simplicity we have assumed constant coverage of 68%; this will lead to a slight over-estimate of the costs in the early years rather than if a gradual increase was assumed.

Given the high level of uncertainty, sensitivity analysis has also been undertaken, assessing the costs of meeting the target if a lower coverage (50%), or higher coverage (80%) of species friendly land management options on farmed land is sufficient to meet the species abundance targets; this is explained in more detail in Sensitivity 4.

There is also uncertainty around the assumed unit costs to deliver these species friendly management options. While the assessment assumes fixed unit costs per hectare based on Sustainable Farming Incentive payments (which are based on estimated costs of delivering the action and income forgone), it is possible that the future average unit costs of delivering the activities at the required scale may be higher than assumed. To address this uncertainty, the impact of higher unit costs for species friendly land management actions is explored further in Sensitivity 3.

To estimate the annual cost of implementing widespread uptake of species friendly land management measures, the area/length of land in each standard has been multiplied by the land area required and the relevant unit cost.

To estimate any additional costs of species friendly land management as a result of climate change, additional analysis was undertaken by Frontier and Paul Watkiss Associates, to factor in the impacts of climate change to the modelling undertaken by ICF and effec (2021) as this was out of scope for the first project. In the climate analysis, the researchers made use of previous modelling by Pearce-Higgins et al (2015⁵⁰ and 2017⁵¹) looking at the impact of climate change on a large number of species in England. This modelling included a large sample (over 3,000), including birds, invertebrates, vascular plants and bryophytes. Amphibians, reptiles and mammals were not included.

⁵⁰ Pearce-Higgins, J.W., Ausden, M.A., Beale, C.M., Oliver, T.H. & Crick, H.Q.P. (eds). 2015. Research on the assessment of risks & opportunities for species in England as a result of climate change. Natural England Commissioned Reports, Number 175.

⁵¹ Pearce-Higgins, J.W.; Beale, C.M.; Oliver, T. H.; August, T. A.; Carroll, M.; Massimino, D. et al. (2017). A national-scale assessment of climate change impacts on species: assessing the balance of risks and opportunities for multiple taxa. *Biological Conservation*, 213, 124-134. doi:<http://dx.doi.org/10.1016/j.biocon.2017.06.035>

Between the species modelled and those in the abundance indicator, there is most overlap among bird and invertebrates. Therefore, the analysis by Frontier included separate results for birds and invertebrates; for these 21% were expected to be at risk from climate change, while when all species are included, the figure was 28%. Given the uncertainty, including the fact that some species on the abundance indicator are not captured in the climate modelling, we have taken a cautious approach and used the higher of these estimates, 28%. The modelling also considered both positive and negative impacts of climate change; it was noted that a large number of the modelled species may positively benefit from climate change and the proportion of species expected to benefit was actually higher than the proportion of species that were at high risk. Again, given the inherent uncertainty around the precise impacts of climate change over the long timeframes, as a conservative assumption, for this impact assessment, only the negative impacts of climate change on species abundance have been taken into account.

The exact scale of the impacts of climate change on those species that are expected to be at risk is uncertain, given the long timeframes. In this analysis, the simplified assumption is made that the percentage of species at risk translates to an equivalent decline in species abundance, in line with the approach adopted by Massimino et al (2017⁵²) who use projected changes in climate suitability to derive changes in abundance. It is assumed that the percentage reduction in abundance is matched by an equivalent increase in costs to offset the impacts of climate change. Where the modelling indicates a positive change in species abundance, it is assumed that no extra expenditure on species-accommodating habitats is needed. Given the high uncertainty around these assumptions, sensitivity analysis is undertaken around the impacts of climate change on species abundance (see Sensitivity 5).

Targeted investment for threatened species

The types of targeted species actions that are included in the targeted species investment cost estimates include:

- Field survey work and species status assessment work.
- Research into species ecology/pressures/means of recovery.
- Field trial of management options.
- Habitat/site management actions.
- Policy and legislative actions.
- Advisory actions.
- Species protection work.

There is a lack of evidence linking actions to outcomes for species and for this IA it has not been possible to model the effect of specific targeted actions on the outcomes of specific species. For a subset of threatened species though, Natural England do have an existing database assessing the actions required for each species and the associated cost. For the purposes of this analysis, it has been assumed that the average costs for other species

⁵² Massimino, D., Johnston, A., Gillings, S. et al. (2017) Projected reductions in climatic suitability for vulnerable British birds. *Climatic Change* 145, 117–130

requiring targeted action will be similar to the average costs for the subset of species that Natural England have existing cost estimates for.

To calculate the direct conservation cost of meeting this target, the average cost per species has been multiplied by the number of species requiring targeted action. There is uncertainty around how many species will require targeted action over the target period. For the purposes of this IA, it is assumed that over the 20-year target period the number of species that will require targeted action will be 2,500, based on Natural England advice to inform the ICF and eftec project (2021). This is likely to be an overestimate; Natural England's most recent estimates suggest that less than 2,000 species on the indicator are likely to be threatened or near threatened, and thus require targeted support. However, given uncertainty about which species may need targeted support over the 20-year period, we have cautiously used the higher figure to allow for the possibility that the bespoke actions are required for a higher number of species than currently envisaged.

Additionally, in ICF and eftec (2021) it was estimated that the future cost of the number of species that require targeted species action will be £150,000 annually over a 10-year period (between 2023 and 2032).⁵³

Climate change is likely to increase the probability of species extinctions and the number of threatened species, and make the species extinction target more difficult to achieve. For example, additional active management may be needed for certain affected species. The greatest risks are associated with certain species and habitats (e.g., montane species), where there are limited opportunities for migration.

To factor in the potential impacts of climate change on the species extinction target, analysis was undertaken to assess the proportion of species likely to be adversely affected by climate change. As above, the results of Pearce-Higgins et al. were again used to derive indicative climate risk levels for various species, and again it was assumed that species identified as being at high risk from climate change will also have a higher risk of extinction and require additional actions to support their climate adaptation.

To reduce the risk of under-estimating the impacts of climate change, as well as those species already on the red list that are at high risk, the analysis also factors in the species that might fall into the red list because of the impacts of climate change. This is based on the number identified as being at high climate risk in Pearce-Higgins et al. This assumes that additional costs would be required for actions to be taken proactively in the short-term to protect additional species from moving towards possible extinction in the longer-term as a result of climate change.

While the project found that climate change might also reduce the costs for some threatened species, as a conservative approach, only the negative impacts of climate change on the target are considered in this analysis.

⁵³ Based on unpublished Natural England cost estimates.

It is then assumed that climate change requires additional species action costs to be incurred equal to the per species action costs (used in ICF and ettec, 2021) multiplied by the number of species identified as threatened by climate change. Given the high uncertainty, sensitivity analysis has also been carried out around these assumptions (see Sensitivity 5).

Increased investment in protected sites

While Option 2 (the preferred option) does not include a legally binding protected sites target, improving site condition will be a core part of achieving our species abundance and extinction risk targets. For example, protected sites have been shown to have positive impacts on the abundance of rare and habitat specialist bird species included in the Breeding Bird survey.⁵⁴ The Breeding Bird survey data is included in the species abundance indicator. Natural England, advised on actions necessary to achieve the 25 Year Environment Plan goal of restoring 75% of terrestrial and freshwater protected sites to favourable condition. This IA therefore assumes that it will be necessary to carry out protected sites actions in order to achieve the species targets.

The protected sites actions monetised in this cost benefit analysis include:

- Ongoing habitat management.
- Direct management or capital works.
 - Water related site management/restoration.
 - Diffuse pollution action.
 - Flood and coastal erosion risk management.
 - Habitat creation or restoration.
 - Additional direct management works.
- Management advice/plan.
 - Invasives/biosecurity plan.
 - Other plan/agreement.
 - Site Nitrogen Action Plan.
 - Advice.
- Investigation/research/monitoring.
- Other.

The remediation costs included in the analysis are based upon the cost estimates included in the Improvement Programme for England's Natura 2000 Sites (IPENS) study⁵⁵. IPENS provided cost estimates for the improvement of European protected sites. This study provides the only available cost estimates for SSSIs (Sites of Special Scientific Interest), which underpin the majority of European sites. The IPENS estimates informed the costings set out in the Prioritised

⁵⁴ A Barnes et al., Do Conservation Designations Provide Positive Benefits For Bird Species And Communities? British Trust For Ornithology. 2022. This is a draft paper.

⁵⁵ Improvement Programme for England's Natura 2000 Sites (IPENS) Planning for the future Programme Report – a summary of the programme findings. Natural England. 2015. Available from: <http://publications.naturalengland.org.uk/publication/5757712073752576>

Action Framework (PAF) for England's Natura 2000 sites⁵⁶, which estimated costs of £1.3 billion to £1.4 billion over six years between 2015 and 2021.

The remediation costs to improve condition of protected sites is calculated by upscaling the PAF remediation costs for a subset of SSSIs to all SSSIs, by area. The protected sites maintenance costs are estimated by multiplying the area of terrestrial SSSI (Sites of Special Scientific Interest) habitats⁵⁷ by the unit cost per hectare for each habitat.⁵⁸

The impact of climate change on the protected site-related costs of meeting the species targets are estimated using a similar methodology as for the wider habitats target. Climate change will have impacts on the condition of SSSI habitats, arising from changes in bioclimatic zones, as well as changes in extreme events (Berry and Brown, 2021). Whilst there is the potential for some positive effects for some SSSIs, the analysis takes a conservative approach and focusses on potential negative impacts. To factor in the potential impact of climate change on vulnerable protected sites, the analysis uses the Natural England habitat typology and assessment of risk for each⁵⁹ to estimate the proportion of sites that are sensitive to climate change. As with the habitats target, an annual deterioration of 3% as a result of climate change is assumed for sites that are sensitive to climate change, based on Duffield et al. (2021). The unit costs of restoration used in ICF and eftec (2021) are then applied to these areas to identify total additional restoration costs per year. In practice there will be considerable variation between sites, but this simplified assumption allows analysis of a plausible range of impacts. Sensitivity analysis has been carried out around these assumptions (see Sensitivity 5).

As with the wider habitats target areas, the costs of the actions judged to be required to achieve the species targets are increased by 15% to account for central planning, administration, and co-ordination costs.

Table 2: Estimated absolute average annual cost of meeting species targets between 2023-2042

Actions required to meet species targets	Average annual cost, £m
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⁵⁶ Natura 2000. Format for a prioritised action framework (PAF) for Natura 2000. For the EU Multiannual Financing Period 2014-2020. England including marine to 12 nautical miles (2nd edition). (Version 30 March 2016). Available from: <https://hub.jncc.gov.uk/assets/1b21d5b4-e87a-42db-a3af-894f10d40e4e>

⁵⁷ As measured by the England Biodiversity indicators. www.gov.uk/government/statistics/england-biodiversity-indicators

⁵⁸ Unit cost estimates are taken from Rayment (2019). Rayment M. Paying for public goods from land management: How much will it cost and how might we pay? Final report. A report for the RSPB, the National Trust and The Wildlife Trusts. 2019. Available from: www.wildlifetrusts.org/sites/default/files/2019-09/Paying%20for%20public%20goods%20final%20report.pdf

⁵⁹ Natural England (2020). Climate Change Adaptation Manual (NE751), available from: <http://publications.naturalengland.org.uk/publication/5679197848862720>

Species friendly land management	Hedgerow	58
	Arable land	178
	Improved grassland	92
	Semi-improved/unimproved grassland	71
Targeted investment for threatened species	Assessment of species requiring targeted investment ⁶⁰	0
	Targeted species actions	49
Increased investment in protected sites	Maintenance of protected sites	76
	Remedial actions on protected sites	63
Climate change adaptation		158
Central planning, administration and co-ordinating (15% mark-up)		112
Optimism Bias (10% mark-up)		86
Total		944

The estimated average annual costs presented in Table 2 do not take into account the baseline level scenario, and action that will already likely occur in the absence of a legally binding species target. The estimated costs presented above are representative of all action judged to be necessary to achieve the species targets.

To understand the estimated *additional* costs of implementing a legally binding species targets, the baseline level of funding estimated for the 2021/22 financial year needs to be deducted from the estimated costs presented in Table 2.

As explained in Option 0, the funding analysis estimated that in the 2021/22 financial year £616m will be spent on species and protected sites actions (that contribute to the achievement of the species targets). By deducting this baseline scenario level funding for the 2021/22 financial year from the total estimated annual cost of the species abundance and species

⁶⁰ This does not reflect 0 annual costs for assessment of species requiring targeted investment but is the rounded value of the estimated annual cost. The estimated value to 2 decimal places is 0.08.

extinction risk targets, it is estimated that the cost of the additional actions needed to achieve the species targets is **£327m**.

Proportion of costs borne by businesses

The ICF funding analysis estimated that in the 21/22 financial year 73% of funding for species-focused activities came from the public sector and 3% originated from the private sector (with the remaining 24% of funding coming from NGOs).

It is possible that in the future an increasing number of wider species-focused activities will be financed by the private sector. The government has set an ambitious target to raise at least £500m in private finance for nature’s recovery every year by 2027, rising to more than £1bn a year by 2030. This could mean that the contribution of business towards meeting this target could be greater in future. However, there is a high degree of uncertainty regarding future private sector funding for terrestrial biodiversity activities.

If the 21/22 breakdown of species funding and the protected sites funding which contributes towards the species targets between the public and private sector is used to estimate the relative proportion paid by government and businesses, the estimated cost to the public sector of meeting the species abundance and species extinction risk targets is £238m and the estimated contribution by businesses is £11m.

Legally binding species abundance and species extinction risk targets alone do not create additional costs to businesses. While regulatory levers could create additional costs to businesses, any future regulatory change will be subject to an Impact Assessment in which the costs to businesses will be explored. In the above the potential relative contribution of businesses has been estimated based upon existing funding levels from the private sector for wider species-based activities. However, this is not a direct cost to businesses.

Total costs of meeting all targets

Table 3 summarises the total costs incurred to achieve all of the biodiversity targets which have been described in detail above.

Table 3: Average annual cost and present value cost of achieving the biodiversity targets (PV calculated over a 78 -year period, 2022-2100)

Target	Average Annual Cost, £m	Present Value, £m
Species friendly land management	£400	£5,202

Increased investment in protected sites	£139	£3,119
Targeted investment for threatened species	£49	£701
Wider habitats	£64	£1,514
Climate change adaptation	£170	£2,480
Central planning, administration and co-ordinating (15% mark-up)	£123	£1,952
Optimism Bias (10% mark-up)	£95	£1,497
Total	£1,040	£16,465

As explained in Option 0, the funding analysis estimated that in the 2021/22 financial year £616m will be spent on species and protected sites actions (that contribute to the achievement of the species targets). By deducting this baseline scenario level funding for the 2021/22 financial year from the total estimated annual cost of the species abundance and species extinction risk targets, it is estimated that the cost of the additional actions needed to achieve the species targets and the wider habitats target is **£7,714m**.

Benefits

Overview of approach to estimating benefits

The benefits of biodiversity targets have been assessed using a natural capital approach.⁶¹

ICF and eftec (2021) provided a partial assessment of the benefits of the biodiversity targets based on pragmatism and on what it was possible to include given data limitations, the available evidence and due to the policy ambitions not being spatially defined. The benefit assessment focussed on the benefits from habitat creation and restoration inside and outside of protected sites. It provided a preliminary estimate of the potential scale of the benefits of the wider habitats and species targets, which informed the Consultation Stage Impact Assessment.

This initial benefits assessment quantified the following:

⁶¹ As set out in Enabling a Natural Capital Approach (ENCA) guidance. Available from: www.gov.uk/guidance/enabling-a-natural-capital-approach-enca

Regulating services: Carbon sequestration and air quality regulation

Cultural services: Recreation and physical health.

Since the completion of the ICF and ettec research and the publication of the Consultation IA, additional independent research commissioned by Defra has been undertaken. The purpose of this research, carried out by ettec, was to fill in an evidence gap highlighted in ICF and ettec (2021) and the Environment Act Biodiversity Consultation IA concerning the economic value of species recovery actions. The research questions explored in ettec (2022) were as follows: what is the value of meeting our biodiversity goals for species in England and what is the value of policy interventions targeting species abundance and extinction risk in England. The study used a stated preference methodology to estimate willingness to pay values for improved species recovery outcomes for households in England. This project by ettec (2022) provides additional evidence around the benefits of the biodiversity targets to inform this IA.

However, it is possible that there will be some overlap in the benefits captured through this stated preference study and the cultural services that were previously estimated in ICF and ettec (2021). For the stated preference values, feedback from the majority of respondents indicated that non-use value considerations such as bequest and existence values were underlying motivations for the choices they made regarding species recovery outcomes, whereas the separate cultural services values for recreation and physical health in ICF and ettec (2021) are confined to use values. Ettec report that this means there is likely a lower risk of overlap and double counting, but this risk cannot be fully discounted as use value motivations do partly underlie the household WTP estimates. This risk of double counting does not apply to the regulating benefits; outcomes relating to regulating services were not featured in the valuation scenario that formed the basis of the choice task and a review of the wider attitudinal question responses and insight from qualitative research does not indicate that preferences for enhanced outcomes related to carbon and air quality regulation were drivers of household WTP.

We have therefore taken a cautious approach; to avoid double counting the benefits, in this Impact Assessment, the stated preference values elicited in ettec (2022), are combined with the regulating benefits (carbon sequestration and improved air quality) that were quantified in ICF and ettec (2021) to produce a central estimate of the total benefits of the biodiversity targets. The cultural values estimated in ICF and ettec (2021) are not included in the central estimate. However, as this is a cautious approach – and since a number of benefits are not monetised in this IA - in the sensitivity analysis the high benefit scenario provides an upper estimate which includes all of these estimated benefits (see Sensitivity 6).

The following sections describe the assumptions used to estimate the benefits of the biodiversity targets in more detail.

For analytical purposes it is assumed that habitat creation will occur mostly on agricultural land, and a benefit unit value by hectare for conversion from agricultural use to the specific habitat is estimated for the assessed benefits. These benefit unit values are applied to the total hectare of habitat created over the assessment period to estimate the impact on benefits provision.

For restoration and maintenance action for habitats the impact on the benefit is modelled as a change in the profile of the benefits provided over the assessment period. A restored habitat is improved from a degraded state to good condition. Evidence on how ecosystem services change in response to a change in condition is limited. As a result, for the purposes of this analysis the degraded state is assumed to provide 50% of the benefit provided by a habitat in good condition (i.e., the full benefit unit value for the benefit from that habitat), and improve to good condition (i.e., providing 100% of the benefit unit value) over the course of 20 years from the beginning of the target period. The added value from the restoration activity is the additional benefit provision over the assessment period.

For approaches which maintain habitat in good condition, it is assumed that without maintenance, the habitat would degrade leading to a decline in the benefits provided. This avoided decline is assumed within the model as a gradual reduction in benefits to 0% of the benefit provided by a habitat in good condition over 60 years. The added value from the maintenance activity is the avoided loss in benefit over the assessment period.

While the modelling for habitat creation applies specific benefit unit values to the area of habitat created and provides a reasonable approximation of benefit provision, the approach to modelling restoration and maintenance has an added layer of assumption around the level of benefit provided by a degraded habitat. It is widely understood that the condition of a habitat is directly related to its ability to provide benefits. However, the function by which this occurs is not well understood for specific habitats and the range of benefits provided, which likely do not react in linear or even highly correlated ways.

Therefore, the assumptions applied for restoration and maintenance activities are not considered as robust and the resulting estimates should be interpreted as demonstrating an indicative range of potential impact.

Carbon sequestration

The carbon sequestration benefit has been estimated by multiplying the estimated tonnes of carbon dioxide equivalent (CO_{2e}) sequestered (through wetland and grassland habitats⁶²) by the non-traded central price per tonne of CO_{2e} in 2020 prices⁶³. For habitat creation, the agriculture to habitat conversion sequestration rate is used for the first 10 years, the average carbon sequestration rate is used thereafter. The total amount of CO₂ equivalent sequestered is estimated by multiplying these per hectare rates with the total change in hectares of the respective habitat type due to the policy intervention.

⁶² Carbon sequestration from woodland habitats have not been considered in this as they are included in the woodland cover target.

⁶³ The amount of CO_{2e} sequestered is valued following BEIS guidance. Valuation of greenhouse gas emissions: for policy appraisal and evaluation. BEIS. 2021. Available from: www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation

Air regulation

This benefit relates to the human health benefits of the removal of particulate matter (PM_{2.5}) from the air by woodland⁶⁴. The value of this is estimated through the reduced exposure of people to the relevant pollutants, and the resulting avoided healthcare cost.

To avoid double counting, the air regulation benefits associated with creating and restoring woodland outside of protected sites are not quantified in this IA but are considered within the woodland cover target. The air regulation benefits associated with improving the condition of woodland in protected sites (as an action included under the species targets) have been included in this IA.

The net change in annual air quality improvements is estimated for woodland in SSSIs. The PM_{2.5} removal and value per hectare is multiplied by the area of woodland in SSSIs that is restored and maintained. The benefit of removal is estimated as the avoided health costs (treatment and productivity) plus welfare value (CEH and ettec, 2019)⁶⁵. This factors in changes in the pollution and population levels from 2015 to 2030; values decline between 2015 and 2030 and are assumed constant post 2030.

Recreation

The following section describes the approach used to estimate recreation benefits in ICF and ettec (2021). However, the recreation benefits are only used in the upper estimate of benefits; they are not included in the central estimate to avoid the risk of double counting with the species benefits estimated in ettec (2022) (see 'Improved species recovery outcome benefits' section).

Recreation benefits are measured by the number of visits to accessible greenspaces, and the average welfare value and physical health benefits associated with these visits. The online Outdoor Recreation Valuation tool (ORVal)⁶⁶ is used to help quantify the recreation benefits of creating and restoring habitats under the biodiversity targets. The possible future policy interventions to achieve the targets are not defined spatially, thus a broad estimate of the recreational benefits of the targets can be based on a generic location, the actual realised benefits will be highly dependent on where the specific actions occur. As a result, the value heatmap function in ORVal is applied. This feature returns the number of visits and welfare value for a grid of 25 possible site locations around the point specified by the user. This allows for average values to be taken if the general location of the areas is known. Six representative locations were chosen to show how the value of recreational benefits would be expected to change in different locations. The resulting number of sampled locations is 150 (25 possible site

⁶⁴ As noted in ICF and ettec (2021), estimates are available for other habitats such as enclosed farmland and coastal margins, but the value of these is negligible compared to the value of woodland so only the air regulation of woodland habitats is included in this analysis.

⁶⁵ CEH and ettec. Pollution Removal by Vegetation tool. Available from: <https://shiny-apps.ceh.ac.uk/pollutionremoval/>

⁶⁶ Outdoor Recreation Valuation Tool (ORVal: Version 2.0). Developed by the Land, Environment, Economics and Policy Institute (LEEP) at The University of Exeter. Available from: www.leep.exeter.ac.uk/orval/

locations for each of the six representative locations). A representative value for the whole of England is derived as the average value of the six locations.

There is a non-linear relationship between the size of an open greenspace and the number of visits/value – adding additional hectares of open greenspace results in smaller increases in the number of visits. As the size of site created increases, the marginal value of the new visits declines. Therefore, the size of the new habitat created, restored or maintained needs to be accounted for to consider this diminishing marginal utility effect. Since the size of each site is not known, for the purposes of the benefits assessment, the average area of a SSSI (total SSSI in England divided by the total number of SSSI sites) was used as a proxy for the size of the habitats in the model. Rounded to the nearest 50 gives an assumed size of 250 hectares for each site.

ORVal estimates both the number of total visits and new visits that would not be made if the site was not there. The number of new visits is multiplied by the average value per visit (i.e., total welfare value divided by the total number of visits). The annual values reported are the welfare values for the new visits. It is assumed that 50% of habitats are accessible to the public to account for the possibility that some habitats which are situated away from population centres or are not readily accessible to the public.

To estimate the recreational value from the changes in habitat areas, the number of new visits and the associated welfare value for sites of 250 hectares have been estimated. The per hectare value is derived by dividing the ORVal estimates by 250. For habitat creation, the new visits are assumed to reach full value 5 years after the habitat is created, whereafter the visits/value are assumed to remain constant.

Physical health

The following section describes the approach used to estimate physical health benefits in ICF and eftec (2021). However, these are only used in the upper estimate of benefits; they are not included in the central estimate to avoid the risk of double counting with the species benefits estimated in eftec (2022) (see 'Improved species recovery outcome benefits' section).

If people are active during their visits to created or restored habitats, recreational activities can provide physical health benefits. To estimate these physical health benefits, the proportion of the visits that are active, the health benefits of active recreation (in terms of improvements in Quality Adjusted Life years – QALYs⁶⁷) and the economic value of health improvement (in terms of the avoided health cost due to improvements in QALYs) are taken into account.

It is assumed that 51.5% of recreation visits are 'active,' where an 'active visit' is defined as one undertaken by a person who meets recommended physical activity guidelines either fully, or

⁶⁷ QALY is a health measurement used widely in health and health economics research. QALY of zero denotes death, and 1 denotes full health.

partially, during weekly visits⁶⁸. This assumption is applied to the increase in annual visits to greenspaces identified by ORVal, to estimate the number of annual active visits. For habitat creation, active visits linearly increase for the first 5 years, whereafter the visits remain constant.

The physical health benefit is measured as the improvement in QALYs. It is assumed the relationship between physical activity and QALYs is cumulative and linear⁶⁹. The cost-effectiveness threshold of a QALY⁷⁰ which represents the additional cost that must be imposed on the health system to forgo one QALY of health through displacement is used as a proxy for health costs, reflecting the avoided health costs when QALY is improved by one unit. The avoided health cost is applied to the number of active visits. The monetary unit value is assumed to remain constant over time⁷¹.

Combined cultural and regulating benefits

The present value estimate of benefits of the wider habitats target is £9,607m (where present values are calculated over a 78-year time period). As with the estimation of the costs of meeting the wider habitats target, only the benefits attributable to the **additional** habitat created or restored has been considered; the benefits of the baseline habitat delivery are not included. The hectareage of woodland created has also been excluded given that the benefits of woodland creation are covered in the woodland cover target.

Table 4: Present value estimates of benefits of the wider habitats target, in the mix of creation and restoration scenario (present values estimates are calculated over a 78-year time period, 2022-2100)

Benefit	PV, £m
Carbon sequestration	3,628
Recreation	4,564
Physical health	1,415

⁶⁸ White MP, Elliott LR, Taylor T, Wheeler BW, Spencer A, Bone A, Depledge MH, Fleming LE. Recreational physical activity in natural environments and implications for health: A population based cross-sectional study in England. Preventive Medicine. 2016.

⁶⁹ Beale S, Bending M, Trueman P. An economic analysis of environmental interventions that promote physical activity. University of York: York Health Economics Consortium. 2007.

⁷⁰ Claxton K, Martin S, Soares M, Rice N, Spackman E, Hinde S, Devlin N, Smith PC, Sculpher M. Methods for the estimation of the National Institute for Health and Care Excellence cost-effectiveness threshold. Health Technol Assess. 2015. Available from: <https://pubmed.ncbi.nlm.nih.gov/25692211/>

⁷¹ This methodology follows the guidance set out in ENCA. Available from: www.gov.uk/guidance/enabling-a-natural-capital-approach-enca

Total	9,607
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The present value estimate of the benefits of the protected sites actions to deliver the species targets is £37,593m (where present values are calculated over a 78-year time period). Some of the actions defined under the species targets will be carried out even in the absence of a legally binding target, and as such the benefits of a portion of the actions will be attributable to the baseline scenario and should not be included in the estimates in this section. It is estimated that 39% of the present value of the total costs of the actions necessary to achieve the species targets are over and above the baseline. It is therefore assumed that 39% of the present value total benefits are also attributable to introduction of legally binding species targets. As a result, the estimated present value benefit of the legally binding species targets is £14,480m (see Table 5).

Table 5: Estimated present value of the protected sites actions judged to be needed to meet the species targets (PV calculated over a 78 -year period, 2022-2100)

Benefit	PV, £m
Carbon sequestration	4,786
Air quality regulation	1,474
Recreation	6,231
Physical health	1,990
Total	14,480

Improved species recovery outcome benefits

In ettec (2022) the researchers focused on a representative view of species associated with habitats in England. The researchers defined recovery as ‘a positive movement along a spectrum of habitat integrity - from a habitat intensively used for human purposes to a habitat in an intact state - to achieve ecological stability in the habitat and for the species residing within it. In general, a more intact habitat implies greater species diversity and abundance, and as well as contributing to reducing the extinction risk for vulnerable or threatened species.’ As such, in this IA the estimation of species recovery benefits has been based on the quantity and quality of habitat created and/or restored.

Estimated household willingness to pay values for improved species recovery outcomes in England have been used from ettec (2022) and multiplied by the estimated number of households in England. An ‘ecological lag’ factor has been applied to account for the time it takes species recovery to occur. It is assumed that species recovery occurs over the estimated twenty-year target period.

It is estimated that the present value estimate of the benefits improved species recovery outcomes is £48,518m (where present values are calculated over a 78-year time period). Some of the actions defined as required for improved species recovery outcomes may be carried out even in the absence of a legally binding target, and as such the benefits of a portion of the actions will be attributable to the baseline scenario and should not be included in the estimates in this section. It is estimated that 39% of the present value of the total costs of the actions necessary to achieve the species targets are over and above the baseline. It is therefore assumed that 39% of the present value total benefits are also attributable to introduction of legally binding species targets. As a result, the estimated present value benefit of improved species recovery outcomes is £18,689m.

Total monetised benefits

As previously outlined, there could be some overlap between the species recovery benefits and the other benefits quantified in this IA. To avoid the risk of overlap, a cautious approach which excludes ICF and ettec (2021) cultural benefits is adopted for the central benefit estimates.

Total benefits therefore include the central results of the improved species recovery outcomes, £18,689m, and regulating services benefits, £9,888m (see Table 6). From the ICF and ettec (2021) benefits, carbon sequestration and air quality regulation are included as regulating services, whilst the cultural services of recreation and physical health are excluded. The assumption around the inclusion of cultural benefits is explored further in the sensitivity analysis set out at a later point in this IA (see Sensitivity 6).

Table 6: Present value estimates of benefits of the biodiversity targets (PV calculated over a 78 -year period, 2022-2100)

Benefit	PV, £m
Carbon sequestration	8,414
Air quality regulation	1,474
Recreation	0
Physical health	0

Species Recovery	18,689
Total	28,576

Non-monetised benefits

A partial assessment of benefits was undertaken in the ICF and ettec (2021) report. This focussed on the benefits from protected sites actions and habitat creation and restoration outside of protected sites and considered a subset of the multiple benefits of Defra’s biodiversity ambition. The selection of benefits was pragmatic, based on the available evidence and practical judgements concerning the robustness of the assumptions that support the estimation of the benefits.

One area highlighted by ICF and ettec (2021) was a lack of evidence around the value of species in a UK context. Since then, further primary research was commissioned to estimate the economic value of species recovery outcomes to households in England. Ettec (2022) used a discrete choice experiment (DCE) to explore households’ preferences and willingness to pay (WTP) for improved species recovery outcomes. These values have been incorporated into the impact assessment.

However, several benefits are not explicitly captured in the benefits assessment due to insufficient evidence and data limitations. This includes flood regulation, water supply, sustainable food production and pollination. These benefits could be considerable. For example, the conservative estimated value of insect pollination to UK crops is over £0.5 billion a year, based on increases in crop yield and quality⁷². Insect species (mostly butterflies and moths) make up over 60% of the species in our species abundance indicator; and the action that we need to take towards these targets will benefit many other pollinating insect species, including bees.

Another important evidence gap highlighted in ICF and ettec (2021) is that there are no empirical studies examining the contribution of biodiversity to sustaining future benefits, through either “insurance values” or the resilience of natural assets to pressures. Generally, this is a key gap in the understanding of how biodiversity contributes to societal wellbeing. No routinely applied practical methodologies are available to robustly assess aspects of resilience value. Multiple aspects of biodiversity help ensure the resilience of ecosystem functions. From an economic perspective, measures for wildlife-rich habitats, protected areas, and species can all be thought of as sustaining or enhancing the ‘stock’ of biodiversity that helps confer high resilience in a system. Due to these evidence limitations, the benefits estimated in this IA therefore cannot accurately and fully capture the full range of benefits of the biodiversity targets.

⁷² Update to Pollinator Strategy Summary of Evidence (2019). Available from [Defra, UK - Science Search](#)

Sensitivity analysis

As explained throughout the IA, there is a high degree of uncertainty around the costs and benefits of meeting the proposed targets. The most substantial uncertainty is the responsiveness of biodiversity outcomes to specific policy actions; to address some of the uncertainties related to this, sensitivity analysis (detailed below) has been undertaken. The impact of climate change on the achievability, costs and benefits of the targets is also highly uncertain and is explored further in this section.

Sensitivity 1: Balance of creation and restoration activities

In the wider habitats cost analysis presented earlier in this IA, it was assumed that there will be an equal balance between the hectareage of wildlife-rich habitats created and restored. In reality, the proposed wider habitats target is not prescriptive about the balance between creation and restoration activities and therefore this proportion may vary.

Unit creation costs for the habitats included in the analysis tend to exceed the unit restoration costs. Thus, if more than 50% of wildlife-rich habitat is created then the costs of meeting the wider habitats target will likely be higher than presented in the wider habitats cost analysis.

Table 7 illustrates the estimated average annual cost of meeting the wider habitats target through the creation of priority habitat only. For the estimates presented in Table 7 it is assumed that no restoration activity takes place. The updated split of 100% creation is also factored into the climate change adaptation costs and the proportion of habitats that are vulnerable to climate change and require additional restoration activity has been adjusted accordingly. Under this assumption the estimated average annual cost of meeting the wider habitats target is £116m, compared to an estimated £97m when the wider habitat target is met through 50% creation and 50% restoration activities. The estimated annual benefit of meeting the wider habitats target also differs depending on the balance of creation and restoration activities; when 100% creation is assumed, total discounted benefits are £29,119m compared to £28,576m when the wider habitat target is met through 50% creation and 50% restoration activities. Assuming 100% creation results in an estimated BCR of 4.3:1.

Table 8 presents the estimated average annual cost of meeting the wider habitats target through the restoration of priority habitat only. For the estimates shown in Table 8 it is assumed that no creation activity beyond what is assumed in the baseline scenario takes place. The updated split of 100% restoration is also factored into the climate change adaptation costs and the proportion of vulnerable habitats has been adjusted accordingly. Under this assumption the estimated average annual cost of meeting the wider habitats target is £77m, compared to an estimated £97m when the wider habitat target is met through 50% creation and 50% restoration activities. The estimated annual benefit of meeting the wider habitats target differs depending on the balance of creation and restoration activities; when 100% restoration is assumed, total discounted benefits are £28,034m compared to £28,576m when the wider habitat target is met through 50% creation and 50% restoration activities. Assuming 100% restoration results in an estimated BCR of 4.1:1

Table 7: Estimated annual average cost of meeting the proposed wider habitats target via creation of wildlife-rich habitats only (2023-2042, £m)

Action	Cost, £m
Creation	47
Maintenance	31
Climate change adaptation	13
Central planning, administration and co-ordinating	14
Optimism Bias (10% mark-up)	11
Total	116
BCR	4.3:1

Table 8: Estimated annual average cost of meeting the proposed wider habitats target via restoration of wildlife-rich habitats only (2023-2042, £m)

Action	Cost, £m
Restoration	9
Maintenance	41
Climate change adaptation	11
Central planning, administration and co-ordinating (15% mark-up)	9

Optimism Bias (10% mark-up)	7
Total	77
BCR	4.1:1

Sensitivity 2: Higher habitat creation and restoration unit costs

For the wider habitats target, the payment rates (unit cost estimates) used to inform the costs estimates are based on evidence from recent conservation projects as well as Agri-environment payment rates. It is possible that the average future unit costs to deliver those actions at sufficient scale may be higher than assumed in the IA. As such the impact of an arbitrary increase of 50% of the unit costs has been explored in Table 9. This is to explore the potential impact on the average annual cost of meeting the wider habitats target if the average unit costs are higher.

Table 9: Estimated average annual cost of meeting the proposed wider habitats target with 50% higher unit costs (2023-2042, £m)

Action	Cost, £m
Creation	36
Restoration	7
Maintenance	54
Climate change adaptation	18
Central planning, administration and co-ordinating (15% mark-up)	17
Optimism Bias (10% mark-up)	13
Total	145

BCR	3.2:1
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Table 9 illustrates that the estimated average annual cost of meeting the wider habitats target when assuming a 50% increase in the habitat creation and restoration unit costs is £145m.⁷³ This is compared to an estimated £97m when the payment rates have not been arbitrarily increased by 50%. This assumption does not have an impact on the estimated annual benefit of meeting the wider habitats target. As a result of the higher unit costs in this scenario the BCR in this sensitivity test (3.2:1) is lower than when unit costs are not inflated by 50% - but even if costs are 50% higher than currently assumed, the benefits still exceed the costs.

Sensitivity 3: Higher unit costs for species abundance measures

As previously explained, a key requirement deemed necessary to achieve the species abundance targets is species friendly land management actions such as that incentivised by grassland, arable and hedgerow standards under the proposed Sustainable Farming Incentive scheme. In the species abundance cost analysis, unit costs have been informed by potential intermediate and advanced Sustainable Farming Incentive payment rates.

It is possible that the average future unit costs to deliver sufficient coverage of species friendly land management options could be higher than has been assumed. As such an arbitrary increase of 50% of the unit costs has been considered in the sensitivity analysis. This is to explore the potential impact on the average annual cost of meeting the targets, if unit costs are higher.

Table 10: Average annual cost of meeting the species targets with 50% higher payment rates

Actions required to meet species targets		Average annual cost, £m
Species friendly land management	Hedgerow	88
	Arable land	267
	Improved grassland	138
	Semi-improved/unimproved grassland	107

⁷³ Assuming the wider habitats target is achieved by 50% creation and 50% restoration.

Targeted investment for threatened species	Assessment of species requiring targeted investment ⁷⁴	0
	Targeted species actions	49
Increased investment in protected sites	Maintenance of protected sites	76
	Remedial actions on protected sites	63
Climate change adaptation		168
Central planning, administration and co-ordinating (15% mark-up)		143
Optimism Bias (10% mark-up)		110
Total		1,209
BCR		2.4:1

Table 10 illustrates the estimated average annual cost of undertaking all the actions judged to be necessary to achieve the species Environment Act targets when assuming a 50% increase in the unit costs.

When taking into account the £616m of funding in the Do Nothing option it has been estimated that under this scenario the additional average annual cost of meeting the species abundance and species extinction risk targets is £593m, compared to baseline funding levels.

The estimated annual benefit under this scenario is the same as in the central scenario in the central scenario. The resulting estimated BCR in this scenario is 2.4:1.

There is a high degree of uncertainty around the future unit costs of species friendly land management actions, thus this sensitivity test has been undertaken.

Sensitivity 4: Lower or higher coverage of species friendly land management options on farmed land

As previously noted, there is a high degree of uncertainty around the aggregate scale of action necessary to deliver the required outcomes for species abundance. It was initially assumed in ICF and eftec (2021), based on expert judgement, that it would be necessary for 80% of hedgerow, arable land, improved grassland and unimproved/semi-improved grassland to adopt

⁷⁴ This does not reflect 0 annual costs for assessment of species requiring targeted investment but is the rounded value of the estimated annual cost. The estimated value to 2 decimal places is 0.08.

nature-friendly actions on a small proportion of their land similar to those proposed under the Sustainable Farming Incentive schemes, to deliver improvements to species abundance.

Subsequent modelling undertaken by UKCEH, and RSPB (see the biodiversity Evidence report) based upon empirical data on the response of farmland birds to higher level agri-environment schemes in England found that around 40% of farms would need to adopt nature friendly farming to halt the decline of farmland birds by either 2030 and that this would need to increase to around 68% by 2040 to return the FBI to its 2022 value by 2040.

Whilst the UKCEH and RSPB modelling and the ICF and ettec (2021) assumption (that for 80% of hedgerow, arable land, improved grassland and unimproved/semi-improved grassland, species friendly actions are adopted on a small proportion of each farm) are not directly comparable,⁷⁵ the UKCEH and RSPB modelling indicates that coverage of species friendly land management options on around two thirds of farmed land could provide a substantial step change. As a result, in this IA, we have used 68% as a central assumption on the scale of coverage required.

However, given the high level of uncertainty, this sensitivity test assesses the costs of meeting the target if a lower coverage (50%) or higher coverage (80%) of species friendly land management options on farmed land is required to meet the species abundance targets.

Table 11: Average annual cost when it is assumed that 50% coverage of species friendly land management options on farmed land will help achieve the proposed species targets

Actions required to meet species targets		Average annual cost, £m
Species friendly land management	Hedgerow	43
	Arable land	131
	Improved grassland	68
	Semi-improved/unimproved grassland	52
Targeted investment for threatened species	Assessment of species requiring targeted investment ⁷⁶	0

⁷⁵ The UKCEH and RSPB modelling refers to number of farms, whereas the ICF and ettec (2021) assumption is based on percentage of farmed land. The UKCEH and RSPB modelling is based on the farmland bird index rather than the species abundance indicator.

⁷⁶ This does not reflect 0 annual costs for assessment of species requiring targeted investment but is the rounded value of the estimated annual cost. The estimated value to 2 decimal places is 0.08.

	Targeted species actions	49
Increased investment in protected sites	Maintenance of protected sites	76
	Remedial actions on protected sites	63
Climate change adaptation		83
Central planning, administration and co-ordinating (15% mark-up)		85
Optimism Bias (10% mark-up)		65
Total		714
BCR		5.2:1

Table 12: Average annual cost of when it is assumed that 80% coverage of species friendly land management options on farmed land will help achieve the proposed species targets

Actions required to meet species targets		Average annual cost, £m
Species friendly land management	Hedgerow	69
	Arable land	210
	Improved grassland	108
	Semi-improved/unimproved grassland	84
Targeted investment for threatened species	Assessment of species requiring targeted investment ⁷⁷	0
	Targeted species actions	49

⁷⁷ This does not reflect 0 annual costs for assessment of species requiring targeted investment but is the rounded value of the estimated annual cost. The estimated value to 2 decimal places is 0.08.

Increased investment in protected sites	Maintenance of protected sites	76
	Remedial actions on protected sites	63
Climate change adaptation		132
Central planning, administration and co-ordinating (15% mark-up)		119
Optimism Bias (10% mark-up)		91
Total		1,000
BCR		3.1:1

Tables 11 and 12 illustrate the estimated average annual cost of undertaking all the actions judged to be necessary to achieve the Environment Act species targets when assuming 50% or 80% of hedgerow, arable land, improved grassland and unimproved/semi-improved grassland would need to be covered by species friendly actions (on a small proportion of their land), to deliver the required improvements to species abundance.

When taking into account the £616m of funding in the Do Nothing option it has been estimated that under these low and high scenarios the additional average annual cost of meeting the species abundance and species extinction risk targets is £98m and £384m respectively, compared to baseline funding levels.

We assume that benefits are unchanged from the central scenario. The resulting estimated BCR in the low scenario is 5.2:1 and in the high scenario is 3.1:1.

Sensitivity 5: Climate change

Given the inherent uncertainty around the precise impacts of climate change on the costs of meeting the biodiversity targets over the long timeframes, sensitivity analysis has been undertaken to test the climate adaptation assumptions further. Two scenarios are adopted to present a range in which the costs might fall.

It is possible that the costs of climate change on the biodiversity targets are overstated in the central estimate. For example, if the positive impacts of climate change for certain species offset any additional adaptation costs. In the analysis by Frontier and Paul Watkiss Associates, it was noted that a large number of the modelled species may positively benefit from climate change and the proportion of species expected to benefit was actually higher than the proportion of species that were at high risk. As a cautious approach in the central estimates, only the negative impacts of climate change were accounted for in the cost benefit analysis. In this sensitivity analysis, the **low** scenario assumes that there will be no net extra costs resulting from climate change over the appraisal period.

It is also possible that the central estimate understates the impact of climate change on the costs of meeting the targets. For example, in the central estimate, additional costs are only assumed for those habitats and species expected to be at risk from climate change. In practice some additional adaptation actions may be required (e.g., a wildfire management plan, tackling pests and diseases) even for these low-risk habitats. Similarly, the CCRA3 also highlighted that climate change increases the potential for non-native species (including pests and pathogens) to establish and spread; these effects have not been considered. Therefore, the **high** scenario arbitrarily assumes that the proportion of adaptation costs incurred on top of baseline costs will be 50% higher than the central scenario described earlier. These scenarios therefore present a lower and higher bound of the potential costs to meet targets given climate change impacts. The tables below present the costs of achieving the targets under the low and high climate change scenarios.

Table 13: Average annual cost and present value of all biodiversity targets under a low climate change scenario (PV calculated over a 78 -year period, 2022-2100)

Target	Average Annual Cost, £m	Present Value, £m
Species friendly land management	400	5,202
Targeted investment for threatened species	49	701
Increased investment in protected sites	139	3,119
Wider habitats	64	1,514
Climate change adaptation	0	0
Central planning, administration and co-ordinating (15% mark-up)	98	1,580
Optimism Bias (10% mark-up)	75	1,212
Total	825	13,328
BCR	6.2:1	

Table 14: Average annual cost and present value of all biodiversity targets under a high climate change scenario (PV calculated over a 78 -year period, 2022-2100)

Target	Average Annual Cost, £m	Present Value, £m
Species friendly land management	400	5,202
Targeted investment for threatened species	49	701
Increased investment in protected sites	139	3,119
Wider habitats	64	1,514
Climate change adaptation	255	3,720
Central planning, administration and co-ordinating (15% mark-up)	136	2,138
Optimism Bias (10% mark-up)	104	1,639
Total	1,148	18,034
BCR	3.1:1	

The resulting estimated BCR is 6.2:1 in the low climate change scenario and is 3.1:1 in the high climate change scenario.

It should be noted that this has taken into account the impacts of climate change on the costs of delivering the target but not the benefits. Climate change could have implications for the benefits of achieving targets by reducing the ecosystem services they deliver. The research undertaken by Frontier Economics and Paul Watkiss Associates (2021) suggests that climate change will likely reduce the benefits. For example, the potential impact of climate change on regulating and cultural services are outlined below.

- **Regulating services:** Climate change may lead to additional vegetation growth and extended seasons, which could increase carbon sequestration on average. However, extreme events such as wildfires and droughts would be expected to reduce carbon storage and would also impact on other regulating services such as water management.

- Cultural services: The marginal impact on recreation benefits and associated amenity and health values are likely to be low. However, climate change has the potential to have very high impacts when it leads to major changes to habitats or loss of important species

However, it has not been possible to quantify the impact of climate change on the benefits of the targets in this analysis.

Sensitivity 6: Benefits

As previously noted, there is uncertainty surrounding the extent to which the species recovery benefits (eftec, 2022) overlap with the IFC and eftec regulating and cultural services benefits (2021). More broadly there is uncertainty about the full scale of benefits as some of the benefits of the biodiversity targets, such as pollination or resilience benefits, have not been quantified as part of this impact assessment.

The central scenario presented earlier in the IA takes the cautious approach of excluding cultural services benefits as they pose some risk of overlap with the species recovery benefits. However, given the high level of uncertainty this sensitivity test assesses the benefits from the targets if lower benefit assumptions (regulating services + cultural services) and higher benefit assumptions (species recovery + regulating services + cultural services) are adopted. The assumptions and outcomes for these scenarios are described below.

Under the **low** benefit scenario, the willingness to pay values from eftec (2022) are not used. Instead, only the ICF and eftec regulating and cultural services benefits (2021) are included.

The **high** benefit scenario assumes that species recovery, regulating services and cultural services all contribute towards the total benefits of achieving the targets. This scenario may be an overestimate due to the potential double-counting of cultural benefits. On the other hand, it should be noted that some other important benefits have not been monetised in the estimate due to evidence limitations and, as outlined previously, some of these could be considerable.

The results of the sensitivity analysis are shown in Table 15.

Table 15: Present value estimates of low and high benefits of all biodiversity targets (PV calculated over a 78 -year period, 2022-2100)

Benefit	Low Scenario PV, £m	High Scenario PV, £m
Carbon sequestration	8,414	8,414
Air quality regulation	1,474	1,474
Recreation	10,795	10,795

Physical health	3,405	3,405
Species Recovery	0	18,689
Total Benefits	24,088	42,776
BCR	3.1:1	5.5:1

The estimated costs under both of these scenarios are the same as in the central scenario. The resulting estimated BCR is 3.1:1 in the low benefit scenario and is 5.5:1 in the high benefit scenario.

Summary of Sensitivity Analysis

Table 16 shows the total costs, benefits, NSPV and BCR for the central scenario and all the sensitivity tests described in detail above. Sensitivity 3 (higher unit costs for species abundance measures) produces the highest overall cost estimates, while Sensitivity 5a (low climate change costs) produces the lowest cost estimates. Sensitivity 6b (high benefits) produces the highest overall benefit estimates, while sensitivity 6a (low benefits) produces the lowest benefits estimates. The overall cost range is £4,577m to £11,928m and the overall benefits range between £24,088m and £42,776m. The NSPV range is between £16,373m and £35,062m indicating that achieving the targets under a range of scenarios is likely to represent good value for money.

Table 16: Summary of monetised costs and benefits for sensitivities (PV calculated over a 78 -year period, 2022-2100)

Sensitivity Test	Total benefits (PV, £m)	Total Costs (PV, £m)	Net Social Present Value (PV, £m)	BCR
Central scenario	28,576	7,714	20,862	3.7:1
Sensitivity 1a: 100% creation	29,119	6,777	22,342	4.3:1
Sensitivity 1b: 100% restoration	28,034	6,815	21,219	4.1:1
Sensitivity 2: higher habitat creation and restoration unit costs	28,576	8,835	19,741	3.2:1
Sensitivity 3: higher unit costs for species abundance measures	28,576	11,928	16,648	2.4:1
Sensitivity 4a: lower coverage of species friendly land management options	28,576	5,483	23,093	5.2:1
Sensitivity 4b: higher coverage of species friendly land management options	28,576	9,202	19,375	3.1:1
Sensitivity 5a: low climate change costs	28,576	4,577	24,000	6.2:1
Sensitivity 5b: high climate change costs	28,576	9,283	19,293	3.1:1
Sensitivity 6a: low benefits	24,088	7,714	16,373	3.1:1
Sensitivity 6b: high benefits	42,776	7,714	35,062	5.5:1

7. Direct costs and benefits to business calculations

The costs outlined above are the costs to society associated with delivering the scale of direct conservation actions likely to be required to meet the biodiversity targets. The targets are a duty on government and have been introduced to hold government to account. They do not create any direct requirements for the private sector.

However, meeting the targets will require efforts from a wide range of stakeholders and the government will need to consider the full range of policy levers – including incentives, regulation and creating the conditions for private sector investment – to deliver. These targets, together with the policies and incentives to implement them, will provide the regulatory certainty that could inspire businesses to invest in nature at scale. They are aimed at helping to stimulate investment in green technology and innovative practices by providing long-term certainty for business.

However, as outlined previously, the policy decisions that will be made over the next 20 years which support these targets cannot be known and analysed at this stage. Any future regulations that impact businesses will be subject to detailed Impact Assessments.

At this stage, the potential contribution of the private sector towards the actions identified as necessary in the cost assessment has been considered. At present, private sector contributions represents 3% of total funding for the species targets and 17% of total funding towards to wider habitats target.

This is expected to grow. The government has set an ambitious target to raise at least £500m in private finance for nature's recovery every year by 2027, rising to more than £1bn a year by 2030. Defra is taking action in four areas to mobilise new forms of funding for the protection and restoration of nature, and pivot businesses away from harmful activities:

- Developing ecosystem services markets across biodiversity, nature-based carbon and water/catchment services, ensuring there are predictable revenue streams for high-quality environmental outcomes;
- Accelerating natural capital investment, to unlock the upfront capital expenditure needed to implement nature recovery projects – including project pipeline development and public-private blended finance;
- Building skills and capabilities on the ground and in the finance sector to enable the step-change in investment; and,
- Nature-related financial risks in capital markets: shifting financial flows away from activities harmful to nature and towards nature-positive investment.

Additionally, Defra has been working with the Financing UK Nature Recovery Coalition, which is bringing together leader from the business, environment and land management sectors to better understand how we can scale up investment in nature.

If the private sector contributed 3% towards the species targets and 17% towards the wider habitats target, then the total cost to business of the proposed biodiversity targets would be £27m.

However, this is not a direct cost. Much of biodiversity funding from the private sector is expected to be voluntary (with businesses only likely to contribute investment towards the biodiversity targets if the private benefit exceeds their contribution) or as a result of existing/forthcoming regulatory measures (for example Biodiversity Net Gain).

Additionally, the direct costs to businesses of a legally binding wider habitats will be dependent on how the target is implemented. While regulatory levers could create additional costs to businesses, any future regulatory change will be subject to an Impact Assessment in which the costs to businesses will be explored.

8. Risks and assumptions

There are a number of assumptions underpinning the cost benefit analysis for meeting the 2030 species abundance target and three long-term proposed biodiversity targets. Most substantial are the assumptions made surrounding the actions that have been deemed necessary to achieve each target. As the targets are outcome based (except for the wider habitats target), a given target may be achieved by a different set or combination of actions to what has been assumed. As a result, the actual cost and resulting benefits of achieving the targets could differ from the estimated costs and benefits presented in this IA.

The actions assumed in this IA have been informed by independent research which has taken account of the available evidence and sought input from the relevant experts in Natural England. It is believed that this provides a reasonable approximation of the costs and benefits given the available information and evidence, but there cannot be complete certainty that the actions that have been defined and quantified under each target will result in the achievement of the respective target. While there is a good understanding of the type of actions that are required to meet the proposed targets, the evidence base quantitatively linking actions to outcomes in biodiversity at national scale is limited, not least because the systems affecting outcomes for species and habitats are highly complex and dynamic. This results in difficulties in modelling the impact of the actions on each of the instruments that measure each target. If the monitoring and evaluation of progress reveals that additional actions or policy changes are required in future, the costs of meeting the targets may be higher.

To achieve the species abundance and extinction risk targets, the actions defined under the wider habitats target need to be undertaken in addition to the actions defined under the species targets. It is not possible for Defra's species ambitions to be achieved without widespread creation or restoration and of habitats. This approach was taken to limit double counting between the proposed biodiversity targets that this IA covers, as far as possible.

Moreover, as some of the target areas are heavily interlinked there is also a risk of double counting of costs and benefits between the biodiversity target areas and other target areas discussed in the other Environment Act IAs. As explained in the analysis, wildlife-rich woodland creation under the proposed woodland cover target would contribute towards the wider habitats' biodiversity target. To minimise double counting, both the costs and benefits have been quantified in the woodland IA and cross referenced in this IA. It is likely that other overlaps remain. For example, there is a strong dependency between biodiversity and water quality and the costings in this IA include some pollution abatement measures identified as necessary to improve the condition of protected sites.

In this IA there has been no detailed consideration of the impact of other targets on the achievability of the biodiversity targets. Using the example above, if the woodland cover target is not met and there is insufficient woodland creation then this could impact the achievability of the wider habitats target. Additionally, it would mean that the costs and benefits of the delivering the wider habitats target have been underestimated in this IA. Similarly, tackling water and air pollution will also be important to deliver biodiversity targets.

There has also been no consideration of action sequencing across different target areas, although this could affect the timing and achievability of the biodiversity targets. For example, action that contributes to the water quality target may be necessary to help achieve the species related targets, but ecological lags may mean the species response occurs over a longer timeframe. As such, action would need to be taken sufficiently early to help achieve the species extinction target, the 2030 species abundance target and the long-term species abundance target.

While analysis has been undertaken to explore the potential impact of climate change on the achievability and costs of meeting the biodiversity targets, given the long-term nature of the targets, there remains a degree of uncertainty about the precise impacts that will occur over the 20-year period. It was also not possible to quantify any changes to the benefits as a result of climate change due to high uncertainty.

The analysis does not consider action on the landscape level. This may result in costs overestimated and benefits undercounted due to economies of scale.

Several assumptions have been made to monetise the costs of the legally binding species abundance targets. Most substantially, the unit costs of species friendly land management actions judged as necessary to achieve the targets have been informed by payments rates for the Sustainable Farming Incentive. It is possible that the average future unit costs to deliver species friendly land management at sufficient scale may be higher than assumed in the IA. Sensitivity analysis has been undertaken to explore this uncertainty.

As previously noted, widespread adoption of land management which supports the recovery of species (to increase the abundance of wider countryside species that are more likely to be reliant on farmed habitats) has been judged as necessary to achieve the species targets. To estimate the costs of such action for this IA, it has been assumed that that species friendly land management actions (such as those set out in proposed Sustainable Farming Incentive options and prescriptions) would be needed on 68% of hedgerow, arable land, improved grassland and unimproved/semi-improved grassland would need to be covered by to deliver improvements to species abundance. This assumption was informed by modelling undertaken by UKCEH. However, due to data limitations, there is uncertainty around this assumption, thus sensitivity analysis has been undertaken.

The government has decided not to proceed with a legally binding terrestrial protected sites target as part of the first suite of targets, but action to improve the condition of protected sites is important for the achievement of the proposed species targets. Restoration works on protected sites takes longer for some habitats and sites than others, and different sites are at varying stages of recovery. For the IA it was not possible for timelines of when favourable condition is likely to be achieved, or precisely the timing of actions needed to meet the targets to be modelled. As a result, in the analysis it has been assumed that remedial actions are needed across all SSSIs that are not currently in favourable condition. There is a risk that the costed actions will not deliver the improvement in condition of protected sites within the specified timescales, because of the uncertainties and lengthy timescales for responses in SSSI condition

in response to remedial action. If so, this could have implications for the species abundance and extinction targets.

The analysis presented in this Impact Assessment provides only a partial assessment of the benefits of the biodiversity targets based on pragmatism and on what it was possible to include given data limitations, the available evidence and due to the policy ambitions not being spatially defined. The benefits of the species targets abundance and species extinction risk focused policy interventions have been estimated by eftec (2022) using a contingent valuation approach. Although eftec's survey approach was subject to an iterative design and testing process to ensure its robustness, there exist limitations to this approach. Willingness to pay estimates are based on a simulated market context (rather than observed behaviour) and there is a potential for hypothetical bias. Eftec acknowledge this bias and judge it to not be a significant concern in this study due to respondent's perceptions of the credibility of the valuation scenario and the low proportion of protest results. Non-monetised benefits have been detailed in the benefits section of the IA.

9. Impact on medium, small and micro businesses

The Environment Act biodiversity targets are legally binding government targets that are not prescriptive in terms of delivery mechanisms. Medium, small and micro businesses have a role to play in taking action to help achieve the targets, but any action they do take is expected to be largely on a voluntary basis, or because of existing regulatory measures (for example Biodiversity Net Gain). The introduction of the targets is not expected to have a disproportionate impact on medium, small and micro businesses.

The impact of future policies for target delivery on medium, small and micro businesses will be dependent on whether a given policy has a regulatory or incentive basis. Any regulatory policy which is brought forward will be subject to an Impact Assessment in which the impacts of that particular policy on medium, small and micro businesses will be appraised.

The impact of existing/forthcoming legislation such as Biodiversity Net Gain on small and micro businesses has already been assessed in a published Impact Assessment. The impact of future policies for target delivery on medium, small and micro businesses will be dependent on whether a given policy has a regulatory or incentive basis. Any regulatory policy which is brought forward will be subject to an Impact Assessment in which the impacts of that particular policy on medium, small and micro businesses will be appraised.

10. Wider impacts

Setting long-term targets to protect and restore biodiversity will help to secure long-term economic security and prosperity, globally and in the UK. While there is inherent uncertainty around estimates of the long-term impact of biodiversity loss, at the global level the cost of inaction is much higher than the cost of action, as set out in the Dasgupta Review. Without government intervention individual efforts to halt and reverse the decline in species abundance are unlikely to succeed on a sufficient scale.

Targets will be set at the national level. Targeting actions in particular areas will not be mandated as part of these targets and so it is not possible to estimate the regional impacts of the biodiversity targets in this IA. The regional impacts of introducing the targets will depend on how the targets are implemented. Further detail on the impacts of individual future policies that contribute towards the targets will be assessed within their individual future Impact Assessments. However, it is expected that policies which support the delivery of these targets can create and support green jobs across the country – for example the £80m Green Recovery Challenge Fund is demonstrating the employment impact of investment in nature’s recovery, creating and supporting up to 2,500 jobs across 159 projects. Research from Green Alliance/WPI Economics shows that those constituencies with the greatest employment challenges have considerable potential for new nature-based green jobs, demonstrating that progress against targets can contribute to the levelling up plan. Defra is planning to commission research to strengthen our evidence base of the skills needed to deliver the 25 Year Environment Plan, to help us ensure there is a pipeline of appropriately skilled people for these jobs.

Under Section 149 of the Equality Act (2010),⁷⁸ public authorities have a duty to consider how their policies and decisions affect individuals who are protected under the Equality Act (2010). As this Impact Assessment concerns only the decision on the overall level of the targets, rather than the policies needed to meet it, it is not possible to identify specific equality impacts. The government will consider equality impacts further as appropriate when additional policies and proposals are developed to meet the targets.

⁷⁸ Section 149 of the Equality Act (2010). Available from: www.legislation.gov.uk/ukpga/2010/15/section/149

11. A summary of the potential trade implications of measures

The potential trade implications of the Environment Act biodiversity targets are difficult to predict as they would be dependent upon future policies which may be brought forward to help contribute towards the achievement of the targets.

It is not expected that the terrestrial biodiversity targets will have a considerable effect on the UK internal market and international trade.

12. Monitoring and Evaluation

12.1. Monitoring progress towards biodiversity targets

The Environment Act creates a new statutory cycle of monitoring, planning and reporting. Long-term targets will be supported by interim targets, which will set a five-year trajectory towards meeting the long-term targets. The Act requires Government to set interim targets in the Environmental Improvement Plan. This will ensure that there is always a shorter-term goal Government is working towards, as well as the long-term target and will allow for an ongoing assessment of whether the government is on track to meet its long-term target ambitions.

For a target to be considered measurable, the government needs to either have or be in the process of developing a relevant indicator based on routinely collected data. The 25 Year Environment Plan Outcome Indicator Framework provides a suite of indicators to track environmental change towards delivering an ecologically resilient network for thriving plants and wildlife, whilst making best use of our biodiversity data. The proposed targets build on the indicators in this framework, which represents our best available data.

Further information about the monitoring approach for each proposed target area is set out below.

Habitat monitoring

There is currently no consistent or comprehensive approach to monitoring to enable a robust assessment of the current extent and condition of semi-natural habitat outside of protected sites, even for those habitats classified as being of 'principal importance for biodiversity' under the Natural Environment and Rural Communities (NERC) Act 2006.

In time, the aim is to be able to monitor changes in the quality of these habitats. An indicator to directly monitor the quantity, quality and connectivity of habitats is currently being developed. However, this will require new data collection, for example, through the Natural Capital and Ecosystem Assessment⁷⁹ and will take several years to implement. An action-based habitats target rather than a condition target has been proposed at this time.

Under the Biodiversity 2020 Strategy (Outcome 1A)⁸⁰ of 'Better wildlife habitats with 90% of priority habitats in favourable or recovering condition', an action-based assessment has in part been used as a proxy for habitat condition. The lack of a standard condition assessment process for measuring the precise condition of habitat outside SSSIs means that it has been

⁷⁹<https://www.gov.uk/government/speeches/george-eustice-speech-on-environmental-recovery-20-july-2020> Natural Capital and Ecosystem Assessment Programme - GOV.UK (www.gov.uk)⁸⁰ Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Defra. 2011. Available from: www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services

⁸⁰ Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Defra. 2011. Available from: www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services

necessary to rely on the SSSI reporting process, combined with an assessment of the extent of additional priority habitat under 'favourable management,' i.e., within an Agri-Environment Scheme agreement or similar arrangement. For this, a selection of 'beneficial management' options are selected matching the 'right option against the right feature' to ensure that reporting results are as ecologically sound as possible. For some habitats achieving good condition will take many years or decades, but AES management, based on 'right option-right feature,' can be considered as a good indicator that habitat improvement is taking place.

The indicator for this target will be based on action to restore or create diverse wildlife-rich habitats through a range of measures which include our Agri-environment schemes, Biodiversity Net Gain, the Nature for Climate Fund and as well action funded through other sources, including private capital e.g., actions by external partners including utilities companies, banks and mineral companies.

Species monitoring

Much of the data on species is collected through well-established volunteer-based recording schemes, many of which are run through partnerships between government bodies, NGOs, and research organisations (Box 1). In addition to the schemes supported by JNCC (Joint Nature Conservation Committee), national recording schemes exist for pollinators, moths, amphibians and reptiles.

Structured schemes follow a strict pre-determined protocol, allow reliable conclusions to be derived from the data on the status of species and how their populations are changing in the long term. The methods used vary by scheme to allow data collection to be appropriate for the target taxonomic group, but include repeat sampling in randomised stratified surveys, complete censuses, and targeted surveys. Schemes may weight sampling to areas of interest e.g., the NPMS (National Plant Monitoring Scheme) sample locations are weighted towards sampling semi-natural habitats, but planned biases of this nature can be accounted for in analysis to understand national species trends.

Alongside these national structured schemes, there are also many UK schemes aimed at engaging the public with recording wildlife (e.g., the Big Garden Bird Watch, the Great British Wildflower Hunt). These more "entry level" schemes involve recording at more self-selected monitoring sites and may focus on recording a subset of more common species.

As well as contributing to recording schemes, each year amateur recorders submit many thousands of ad hoc species records to publicly available databases (e.g., to the NBN Atlas via the iRecord online recording system). These data are more numerous than records submitted from structured schemes and cover a greater breadth of taxonomic diversity. They can provide information on species distribution rather than abundance but may introduce greater bias in the data as sampling is more common for easily recognised species and in accessible locations. Both ad hoc recording and more "entry level" recording schemes are important for developing and maintaining taxonomic skills and encouraging engagement with biological recording. Additional unstructured species data will exist at the local level (including the Local Environmental Record Centres) and academic institutions.

Box 1. JNCC supported UK species recording schemes:

Structured schemes

Breeding Bird Survey (BBS)

Wetland Bird Survey (WeBs)

Goose and Swan Monitoring Programme (GSMP)

Avian Demographics Scheme

Seabird Monitoring Programme (SMP)

National Bat Monitoring Programme (NBMP)

UK Butterfly Monitoring Scheme (UKBMS)

National Plant Monitoring Scheme (NPMS)

Ad hoc recording schemes

Rare Breeding Birds Panel (RBBP) collation of breeding bird records

Support of recording schemes and societies through the Biological Records Centre (BRC)

The information gathered from these schemes is used to assess trends in distribution and/or abundance at UK, GB, or country scales, and to produce evidence both on current status and long and short-term changes. Many of the results feed into the UK biodiversity indicators, as well as being used for wider reporting purposes, including for international commitments. Data collected through these schemes also contributes to national official statistics on UK biodiversity. Some ad hoc data contribute to Red List assessments and distribution indicators for some species.

12.2. Evaluating progress towards biodiversity targets

The evaluation programme for the biodiversity targets, which is currently being scoped out, will be crucial for measuring, understanding, and driving progress. The evaluation will test the effectiveness and impact of different actions, work to understand causal relationships related to the Theory of Change, analyse cost and benefits and progress towards biodiversity outcomes.

As part of ongoing scoping work, a wide range of factors including timing of key activities, data requirements and evaluation design are being considered. The evaluation design must consider the complexity of the biodiversity policy landscape. The system that supports the delivery of biodiversity targets comprises numerous inter-related policies and programmes, there is considerable uncertainty about the detailed specification of key programmes and there will be substantial change in the policy landscape during the life of the targets. In addition, the nature system that the targets programme aims to influence is itself complex and the impacts of interventions cannot be predicted with certainty.

To have the best prospect of achieving the government's ambition for nature recovery, Defra will need to adopt a dynamic, adaptive management approach that 'steers' the system towards the target outcomes.