Response prepared by:
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1. BACKGROUND

1.1 The British Trust for Ornithology (BTO, https://www.bto.org/) is an independent charitable research institute (Registered Number: 216652) combining professional and citizen science aimed at providing evidence of change in wildlife populations, particularly birds, to inform the public, opinion-formers and environmental policy- and decision-makers.

1.2 The BTO's purpose and public benefit is to deliver objective information and advice, through undertaking impartial research and analysis about birds, other species and habitats, to advance the understanding of nature. We inform policies and evidence-based decisions that impact on the environment such that future generations can benefit from a healthy and wildlife-rich environment [1]. The BTO does this by:

- Sustaining long-term extensive programmes and smaller scale intensive research to study the population trends, movements, breeding, survival, ecology and behaviour of wild birds;
- Encouraging, enthusing, training and supporting volunteers to take part in scientific studies;
- Bringing together professional scientists and volunteer birdwatchers in surveys of wildlife (particularly, but not exclusively, birds);
- Analysing the data gathered through these studies, making information available to Government and other bodies, and publishing the results in the primary scientific literature and via the internet, the birdwatching and conservation press and the media more generally.

1.3 Our impartiality enables our data and information to be used both by Government and NGO campaigners. Our long-term monitoring data on the status of UK birds sets the standard worldwide for understanding the effects of environmental change on wildlife.

2. RESPONSE

2.1 In what areas should interventions be targeted to deliver both economic and environmental benefits in the short and long term?

2.1.1 *Farming, Forestry and the Environment*

Farming and forestry systems need to be better integrated with environmental protection and conservation measures in order to make them more sustainable in the context of changing landscapes and climates. Additional economic benefits can be achieved, in principle, via marketing of environmental benefits to support premium pricing and people's experience of the countryside is also enhanced by increasing biodiversity, which can also have positive health effects, bringing a longer-term benefit [2]. In particular this would entail promoting more diverse landscapes (avoiding agricultural monocultures or even-aged structured forests) and adding semi-natural habitats (back) into the matrix, coupled with promotion and facilitation of public access. In addition, we have

1 https://www.bto.org/our-science/publications/research-reports/ world-informed-science-impact-bto-2012–18

2 Cox et al. 2018 *Landscape & Urban Planning* 179:72 https://doi.org/10.1016/j.landurbplan.2018.07.013; Cox et al. 2018 *Journal of Applied Ecology* 55:2308 https://doi.org/10.1111/1365-2664.13146

evidence that merely increasing cropping heterogeneity (without taking land out of production) can have benefits for biodiversity and ecosystem services within agricultural landscapes [3] and that increasing structural heterogeneity can have multiple benefits in forested landscapes [4]. Cropping changes are rapid to achieve and mutable [5], but are less influential than broad-scale landscape structure changes, which although they require long-term policy commitment, have the largest effect on biodiversity.

The above would suggest that a degree of extensification and re-integration of environmental and conservation management into agriculture and forestry would be beneficial. Ongoing research and monitoring has identified management measures within agri-environment schemes that can integrate environmental management with agricultural production and that can be successful in benefiting target species and communities [6]. Similarly, different silvicultural systems can benefit different species and environmental benefits while retaining other objectives such as commercial production, but with crop rotations typically measured in decades management decisions can have longer-term consequences [7]. For both agriculture and forestry, decisions about the best combinations for specific contexts remain complex and better evidence is needed at the appropriate spatial and temporal scales. It has been proposed that national biodiversity targets might be met most effectively by a land-sparing strategy allowing further intensification of production areas while environmental management is removed to other, dedicated locations [8]. Such an approach, however, does not account for the non-biodiversity benefits of integrating environmental management with production (e.g. human access, carbon sequestration and water quality protection) so may yield fewer benefits in today's multi-functional landscapes.

2.1.2 *Offshore renewable energy*

Offshore wind is a key part of strategies to mitigate the impacts of climate change by reducing reliance on fossil fuels. Current government policy is for 30GW of energy to be generated using offshore wind by 2030. However, there are significant environmental challenges, particularly in relation to our internationally important seabird populations [9]. As the scale of this development increases, there are significant concerns about the cumulative impact of multiple wind farms on vulnerable species such as the black-legged kittiwake. Indeed, at present, the predicted impact of collision with turbines represents a significant consenting risk to future offshore wind developments; in part, this reflects uncertainty both in relation to the parameters underpinning models used in assessments but, also in relation to how appropriate the models are themselves [10]. This has been highlighted as a key concern for at least the past decade, yet developing a robust approach to cumulative impact assessment has proven to be a "wicked" challenge. Progress will depend on the availability of information on demographic processes to robustly assess the cumulative effect of

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3 Sirami et al. 2019 *Proceedings of the National Academy of Sciences* 116:16442 https://doi.org/10.1073/pnas.1906419116
4 Peura et al. 2018 *Biological Conservation* 217:104 https://doi.org/10.1016/j.biocon.2017.10.018
5 Siriwardena et al. 2012 *Ecography* 35:162 https://doi.org/10.1111/j.1600-0587.2011.06839.x
6 Baker et al. 2012 *Journal of Applied Ecology* 49:871 https://doi.org/10.1111/j.1365-2664.2012.02161.x
7 Calladine et al. 2018 Plantations of non-native tree species. In: *Ecology and Conservation of Forest Birds*. Cambridge University Press, Cambridge. Pp 350 – 386.
8 Finch et al. 2019 *Conservation Biology* 33:1045 https://doi.org/10.1111/cobi.13316
9 Furness et al. 2013 *Journal of Environmental Management* 119:56 https://doi.org/10.1016/j.jenvman.2013.01.025; Thaxter et al. 2019 *Journal of Applied Ecology* 56:2410 https://doi.org/10.1111/1365-2664.13488
10 Cook & Robinson 2017 *Journal of Environmental Management* 119:113 https://doi.org/10.1016/j.jenvman.2016.12.025; Cook et al. 2018 *Marine Environmental Research* 140:278 https://doi.org/10.1016/j.marenvres.2018.06.017

multiple stressors at a population level, which can be achieved through support for citizen science monitoring schemes [11].

At present, the UK is a world leader in relation to installed offshore wind capacity meaning that there is significant opportunity to export some of the expertise that we have developed in relation to the assessment of the environmental impacts of offshore wind and efforts to minimise any adverse effects on the environment. There may be particular opportunities in relation to emerging markets in the Far East (Japan, Taiwan and China) and the US. Efforts should focus on approaches such as marine spatial planning to minimise interactions between vulnerable bird populations and offshore wind farms and methods to mitigate any impacts (e.g. raising turbine hub height in order to reduce collision risk, increasing turbine spacing to reduce displacement risk [12]). In addition to this, there is the potential to consider win-win approaches whereby the methods used to mitigate impacts on birds may also have a positive impact on the energy generated (e.g. raising turbine hub height may increase turbine availability).

2.2 How can the economic recovery stimulus be used to deliver green jobs at a time of potentially high unemployment?

The UK is fortunate to have a diverse and active community of environmental non-governmental organisations (NGOs), supported by well over a million members and tens of thousands of volunteers. Many of these volunteers are highly skilled, collectively contributing over 7.5 million hours annually towards the survey and monitoring of our wildlife in an incredibly cost effective manner for society [13]. Their efforts provide the vital data and evidence used by Government and others to assess the challenges facing the natural world, from biodiversity loss to climate change, and to identify and test solutions, such as the effectiveness of protected sites or agri-environment schemes [14].

JNCC's portfolio of surveillance schemes collectively provide robust long-term data on the abundance of a range of species from plants to insects to mammals and birds, together these provide information about the provision of a range of ecosystem services (pollinators, species of cultural value) or dis-services (pests and invasive non-natives), aspects of ecosystem function and environmental quality. At the BTO we run many of these schemes, and others, through our network of thousands of skilled volunteers, which not only deliver vital evidence and information to inform decision-making, but also contribute significantly to the mental health and wellbeing of those participating in addition to the public understanding of science [1]. As demonstrated by our collaboration with JNCC on Terrestrial Surveillance Development and Analysis (TSDA) and other work, there is considerable potential to deliver significant additional information to support government decision-making around these schemes, and to develop other approaches to data collection such as around passive acoustic monitoring [15] or eDNA.

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11 Cook et al. 2019 Review of the Potential of Seabird Colony Monitoring to Inform Monitoring Programmes for Consented Offshore Wind Farm Projects. BTO, Thetford. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/809454/BTO_2019_Seabird_colony_monitoring_and_offshore_renewables.pdf

12 Johnston et al. 2014 Journal of Applied Ecology 51:31 https://doi.org/10.1111/1365-2664.12191

13 Hayhow et al. 2019 *The State of Nature 2019*. State of Nature Partnership; Butchart et al. 2019 *Nature* 566:182 https://doi.org/10.1038/d41586-019-00549-4

14 Robinson et al. (2018) Terrestrial evidence review part 1: The value of JNCC's terrestrial evidence programme. http://data.jncc.gov.uk/data/819af873-5b9c-424a-9c0f-c73aec2e181f/JNCC18-01-Terrestrial-evidence-review-part1.pdf; https://www.bto.org/sites/default/files/shared_documents/publications/bto-jncc/BTO-JNCC-Partnership-brochure-web.pdf

15 Newson et al. 2015 *Biological Conservation* 191:39 https://doi.org/10.1016/j.biocon.2015.06.009; Newson

The NGO conservation sector has suffered a 34% decline in public sector funding on biodiversity since 2008/9 [16]. Reversing this decline will provide additional capacity to deliver much needed development around these schemes and outputs to inform decision-making and to report on the environmental responses to the green recovery. In addition, it is estimated that every £1 investment in nature volunteer projects delivers £8.50 in societal return, whilst also providing opportunities for the public, students and young people to develop new skills to support potential future careers.

The coronavirus pandemic has had major impacts on the work of environmental NGOs. As charities, our organisations are experiencing a dramatic loss of income with a consequent impact on jobs and capacity to deliver. If the UK is to follow the "build back better" approach being outlined by various governments, and to adopt nature-based solutions to societal challenges such as climate change, then the surveillance and monitoring that we deliver through our networks of skilled volunteers and professional staff will be vital to inform future decision-making and to test and evaluate solutions [17]. This cannot happen if our ability to maintain and develop our monitoring schemes is constrained by a lack of funding. Without a diverse, well-supported and vibrant NGO sector, the UK Government will fail to meet its laudable environmental commitments. Without a landscape rich in wildlife, society will be the poorer, with consequent additional health and well-being costs.

2.3 The pause in economic activity, fall in traffic and increase in working from home during the lockdown has resulted in rapid reductions in air pollution and greenhouse gas emissions; what measures can be utilised in the recovery to continue these trends as economic activity resumes?

Urban green spaces have significant potential to support, and to enhance, local biodiversity, so could therefore reduce the ecological trade-offs with development with appropriate spatial planning [18]. Moreover, strategically planned networks of multi-functional green spaces are expected to deliver not only positive biodiversity conservation outcomes, but also to improve the provision of essential ecosystem services, such as climate change resilience, and with direct benefits to human well-being [19]. At the same time there are significant associations between the abundance of breeding birds and proximity to roads, with particularly negative associations close to major roads [20]. Similarly, changes in agricultural productivity are linked to changes in farmland birds as measured by the farmland bird index [21]. These examples illustrate how long-term biodiversity surveillance data can be re-purposed to test for and track future changes in aspects of the environment in response to increasing economic activity and show the importance of maintaining and supporting biodiversity monitoring, much of which is volunteer-based so highly cost-effective, to provide measures of the impacts (beneficial or otherwise) of recovery activities.

2.4 In the run up to Conferences of the Parties to UN conventions on climate change and biodiversity next year, how can the UK use its influence, as both host of COP26 and when holding the Presidency of the G7 in 2021, to influence the nature of economic rescue packages around the world?

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et al. 2017 *Biological Conservation* 215:61; Newson et al. 2017 *Methods in Ecology & Evolution* 8:1051 https://doi.org/10.1111/2041-210X.12720
16 https://hub.jncc.gov.uk/assets/42bca044-0e1b-449b-8e8f-e357e65e3822
17 Morecroft et al. 2019 *Science* 366:eaaw9256 https://doi.org/10.1126/science.aaw9256
18 Plummer et al. 2020 *Journal of Applied Ecology* in press https://doi.org/10.1111/1365-2664.13703
19 Cox et al. 2017 International Journal of Environmental Research and Public Health 14:172 https://doi.org/10.3390/ijerph14020172
20 Cooke et al. 2020 *Ibis* 162:885 https://doi.org/10.1111/ibi.12787; Cooke et al. 2020 *Nature Communications* 11:3125 https://doi.org/10.1038/s41467-020-16899-x
21 Eglington & Pearce-Higgins 2012 *PLoS One* 7:30407 https://doi.org/10.1371/journal.pone.0030407

The UK is a recognised world-leader in the use of citizen-based biodiversity recording [22], providing unparalleled evidence on the impacts of climate change and other, more direct, anthropogenic pressures on biodiversity and the environment, facilitating the design of effective mitigation and adaptation strategies. We would suggest that promoting surveillance and monitoring of biodiversity and environmental conditions is important to ensure robust decision-making, track the impacts of decisions made and engage the public with the degree of environmental change. There can be significant trade-offs between aspects of environmental recovery, such as around nature-based solutions for climate change mitigation and adaptation which may provide win-win solutions for people and the environment but, if inappropriately planned, may result in perverse consequences (e.g. around tree-planting). Monitoring and evaluation of the success of such solutions in relation to clear objectives is essential [17].

22 Roy et al. 2014 *Celebrating 50 years of biological recording.* Centre for Ecology & Hydrology http://nora.nerc.ac.uk/id/eprint/510479/1/N510479BK.pdf