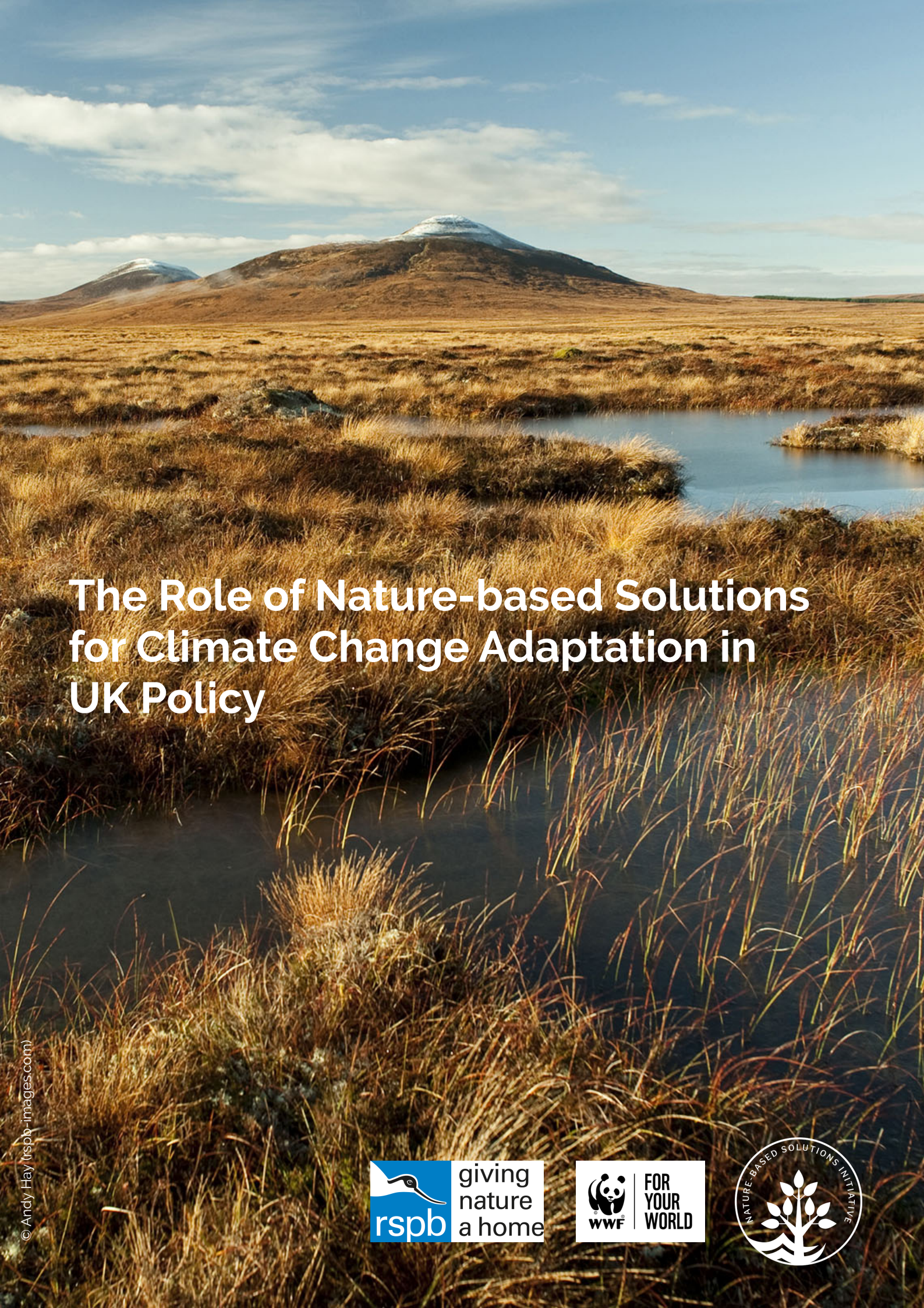

The Role of Nature-based Solutions for Climate Change Adaptation in UK Policy

rspb giving nature a home

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NATURE-BASED SOLUTIONS INITIATIVE

FOREWORD

If the UK is to achieve its Paris Agreement NDC goal of 'at least 68% reduction' in GHG emissions by 2030 on 1990 levels, then nature protection and restoration will need to form part of its overall strategy for success, as carbon is locked up and stored in natural ecosystems. However, in doing so, the UK and devolved governments will need to look beyond the role that these nature-based solutions (NbS) can play in climate change mitigation alone, not least to include how they can help build resilience to the changes in the UK climate which are already happening, and which we know are to come. As we consider how we adapt to a changing climate, we need to look for synergies and trade-offs as we seek to:

- protect vulnerable communities around the UK from the impacts of climate change - such as increased flooding and coastal erosion,
- deliver on the UK's net zero target,
- support sustainable land-management practices in the UK post-Brexit,
- secure sustainable UK food production, and
- address the nature emergency in the UK, as one of the most nature-impoverished nations[1].

Looking at mitigation and adaptation together, and considering the environmental services and benefits offered by NbS in the wider sense, creates opportunities to deliver multiple and related policy wins and outcomes. New analysis by WWF UK and RSPB shows the significant role that natural ecosystems should play in meeting emissions reduction targets, and highlights that with the right choices, biodiversity can also be protected[20]. With the equivalent of over 36 years' worth of annual UK greenhouse gas emissions stored in our ecosystems, many of which are degrading, their protection and restoration will be crucial to reduce UK emissions. The UK Government's approach to implementing the Adaptation Communication to 2030 (alongside the NDC and Long Term Strategy) in the land and forests sector should also prioritise an NbS approach, following the principles set out in the NbS Guidelines (see Box 1).


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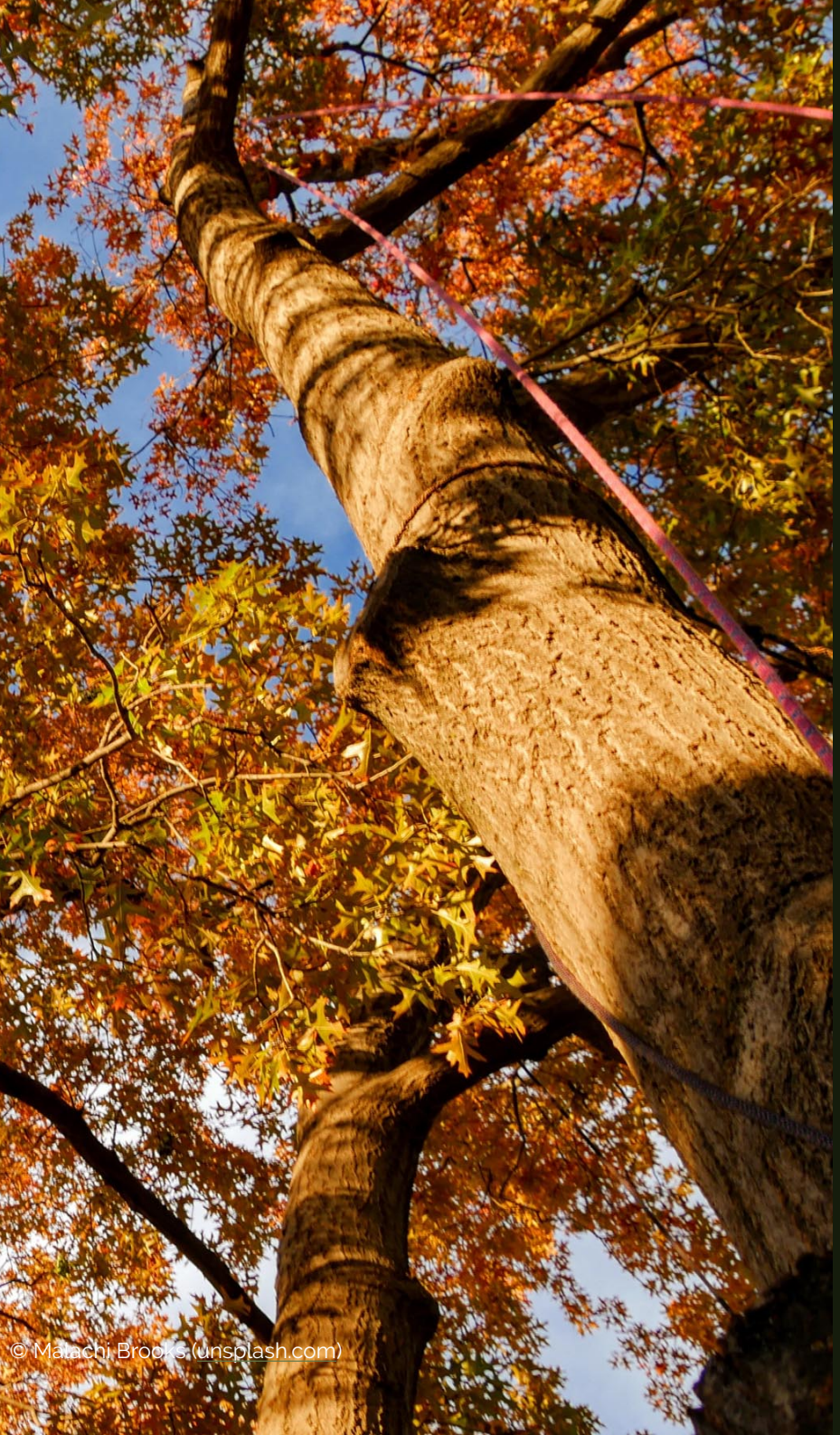
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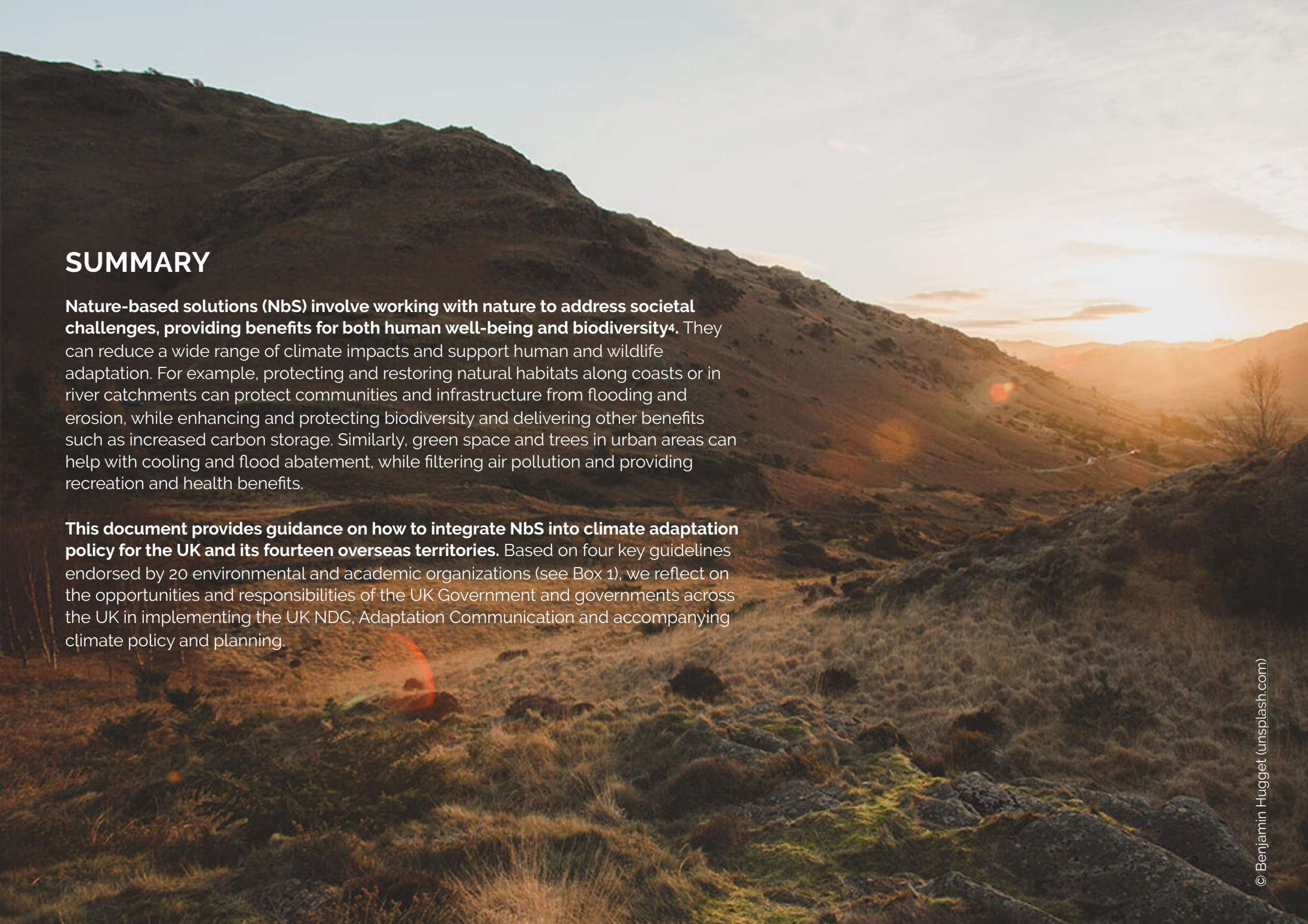
We encourage the UK Government and devolved administrations to take advantage of the wide range of opportunities for NbS identified in this publication, including interventions involving protection, restoration, creation and management of natural ecosystems. WWF's Global Futures study found that the biggest costs to losing natural capital in future would be in the adaptation benefits of coastal ecosystems (around £14bn/yr globally)[2]. A broader list of opportunities can be found in Table 1, looking across a range of ecosystems on land and sea, as well as in agricultural lands and urban landscapes. An approach supporting NbS for climate change adaptation could also yield a range of societal co-benefits – including climate mitigation, improved air and soil quality, flood prevention, physical and mental health benefits and rural job creation as ecosystems are restored and maintained. These multiple benefits are to be welcomed as we seek to recover from the COVID-19 pandemic. Forthcoming research by Cambridge Econometrics commissioned by RSPB (to be published early 2021) further explores these economic opportunities; this is also the subject of a recent study by WWF UK[3].

Prioritising an NbS approach in UK adaptation policy could also help to deliver the UK Government's commitment in September 2020 to protect 30% of land and seas by 2030 and transition towards net-zero and nature-positive ways of working, by ensuring this includes measures which will help secure adaptation outcomes while protecting or enhancing biodiversity and natural carbon stocks. Committing to further work to establish overlaps with the species and habitats of principal importance under Section 41 of the NERC Act could also help shape an action plan towards species recovery in the UK through a NbS approach. This would support the delivery of the Nature Recovery Networks and the 25 Year Environment Plan ambition for 500,000 ha of wildlife-rich habitat creation and restoration in England, and equivalent goals in the devolved administrations. Across these policy opportunities, and to support a just transition, it is key to explore and facilitate bottom-up and participatory processes with people and communities as appropriate in the UK context.

We have already locked in significant climate risks - the need for cost-effective adaptation is critically important for the UK. If the UK does not address this now, we will be deferring significant risk into the future[3]. In order to inform the development of future climate change adaptation policy, WWF and RSPB will work with the University of Oxford to develop further the role of NbS in UK climate change adaptation objectives and will expand on the work set out in this document ahead of a revision of the Government's Adaptation Communication expected in Summer 2021.



SUMMARY

Nature-based solutions (NbS) involve working with nature to address societal challenges, providing benefits for both human well-being and biodiversity[4]. They can reduce a wide range of climate impacts and support human and wildlife adaptation. For example, protecting and restoring natural habitats along coasts or in river catchments can protect communities and infrastructure from flooding and erosion, while enhancing and protecting biodiversity and delivering other benefits such as increased carbon storage. Similarly, green space and trees in urban areas can help with cooling and flood abatement, while filtering air pollution and providing recreation and health benefits.

This document provides guidance on how to integrate NbS into climate adaptation policy for the UK and its fourteen overseas territories. Based on four key guidelines endorsed by 20 environmental and academic organizations (see Box 1), we reflect on the opportunities and responsibilities of the UK Government and governments across the UK in implementing the UK NDC, Adaptation Communication and accompanying climate policy and planning.

KEY MESSAGES

The implementation of the UK NDC, Adaptation Communication and supporting climate policy should recognise the key role of NbS for cost-effective adaptation to climate change. NbS can reduce exposure to climate risks such as flooding; reduce people's sensitivity to climate hazards, such as by providing additional income streams for farmers; and enhance the capacity of communities to adapt to change by giving them a stronger voice in the governance of their natural resources. They can work with and sometimes improve upon engineered approaches, often at lower financial cost, and they can deliver multiple benefits for climate change adaptation, mitigation, biodiversity, health, and the economy, supporting a fair and resilient economic recovery from the COVID-19 crisis with significant potential for creating green jobs. To deliver these benefits we recommend that:

1 **NbS for climate change adaptation should be integrated with other policy areas, to unlock synergies and avoid adverse impacts.** Well-designed NbS deliver multiple benefits, but poor policy integration can result in adverse impacts, such as if tree-planting destroys species and carbon-rich open habitats, or if an over-emphasis on NbS as a climate mitigation option delays the rapid phase-out of fossil fuels.

2 **Policy support should explicitly recognize the need for a landscape approach involving a diverse portfolio of NbS** that encompasses protection, restoration and sustainable management of a wide range of rural, urban, coastal and marine ecosystems, with a strategy to reduce degradation of vulnerable habitats. This is crucial to deliver coherently managed and resilient landscapes that reduce climate change risks to people and economic activities.

3 **NbS should be carefully designed and implemented through a bottom-up and participatory approach involving multiple stakeholders.** This helps tailor NbS to meet multiple local needs in different contexts, helps to ensure an equitable distribution of benefits, reduces undesirable trade-offs, and ensures that NbS are effective, legitimate and sustainably managed in the long term.

4 **NbS should be planned to deliver measurable benefits for biodiversity** through enhancing the health, diversity and connectivity of ecosystems and their habitats and species. This underpins the long-term adaptability of NbS to climate change and other risks, and in turn the sustainable delivery of benefits for people and the economy.

5 **Adaptation policy should set well-defined time-bound objectives and build capacity to effectively monitor NbS outcomes over the long term.** Lack of data on the costs, benefits and effectiveness of NbS for climate change adaptation and other outcomes is currently hampering their wider uptake, and more research is needed to inform better design that delivers multiple benefits.

Table 1: NbS options in the UK and overseas territories that can contribute to climate change adaptation and other benefits

Protection, restoration, creation or sustainable management of:	Inland flooding and erosion	Coastal flooding and erosion	Heatwaves	Water scarcity	Air quality	Livelihoods	Cultural value	GHG reduction	Biodiversity
Natural or semi-natural woodlands	x		x	x	x		x	x	x
Shrubland and hedgerows	x		x		x		x	x	x
Agroforestry[a] *	x		x		x	x	x	x	x
Wood pasture and parkland with scattered mature trees	x		x	x	x	x	x	x	x
Natural or semi-natural grasslands	x			x		x	x	x	x
Heathland and montane	x			x			x	x	x
Peat bogs	x			x			x	x[e]	x
Wetlands	x		x	x		x	x	x[e]	x
Freshwater	x		x	x		x	x		x
Saltmarshes		x				x	x	x	x
Seagrass		x				x	x	x	x
Beaches, dunes and sea cliffs		x				x	x	x	x
Coral reefs[b]		x				x	x		x
Mangroves[b]		x	x			x	x	x	x
Sustainable agriculture	x		x	x	x	x	x	x	x
Urban green infrastructure[d]	x		x	x	x	x	x	x	x

**Please see appendix for notes on this table*

Considerations on the role of NbS for climate change adaptation in UK policy

Recognise the key role of NbS in cost-effective adaptation to climate change

1. **Outline and spatially map (where possible) climate change impacts and vulnerabilities** that can be reduced through NbS[7] (see Table 1). For example, key risks in the UK include coastal flooding and erosion, inland flooding, droughts and heatwaves, with risks to property, transport infrastructure, agriculture and health.

2. **Recognise that NbS contribute to reducing our vulnerability to these impacts in three ways:** by reducing the exposure of people and assets to climate hazards, such as by using green roofs to reduce stormwater runoff in urban areas; reducing the sensitivity to climate shocks, such as by diversifying livelihoods and enhancing the resilience of timber and food production to reduced water availability, pests, and pathogens; or enhancing the adaptive capacity of people and communities, through governance reform, empowerment, and improving access to natural resources[8,9].

3. **Consider how NbS can be deployed to reduce climate risks within individual sectors.** For example, natural vegetation cover is a cost-effective option for slope stabilization to protect transport infrastructure; appropriately sited silvo-pasture can help the livestock sector adapt to hotter summers; and raingardens can mitigate surface water flooding in urban areas.

Integrate NbS for climate change adaptation with other policy areas

4. **Recognise and make explicit the potential for NbS to deliver multiple benefits for** climate adaptation, mitigation, the economy, society, and biodiversity[9,22].

    - Recognise and explore how NbS can work with and sometimes improve upon engineered approaches, often at lower economic cost[10,11].

    - Recognise the significant potential of NbS to deliver green jobs,[12] for instance in ecosystem restoration and maintenance.

5. **Outline an integrated cross-sectoral and cross-boundary vision for delivering NbS.**

    - Prioritize NbS actions that optimize multiple adaptation, mitigation, and biodiversity benefits (such as restoring native woodland on erosion-prone slopes) and avoid those with unacceptable trade-offs (such as planting trees on species- rich grassland or peat) [13,18,20].

    - Integrate infrastructure planning with conservation, restoration, and ecosystem management goals, and outline policies for compensating the impacts of infrastructure development on ecosystems following the conservation mitigation hierarchy[14,15].

    - Acknowledge the need for strong coordination across jurisdictional boundaries to implement NbS,[6] and outline mechanisms for cross-jurisdictional decision making[22].

6. **Deliver the ambition of the Adaptation Communication, including on NbS, through national plans, and align with wider environmental policy and commitments under other international processes** such as National Adaptation Plans, the UNFCCC and the Paris Agreement, and the Convention on Biological Diversity, with common frameworks and indicators for reporting and tracking NbS-related actions under these[9,15,22].

    - Explicitly outline the contribution of NbS to national and international targets, strategies, commitments and policies for climate change, biodiversity, and disaster risk reduction.[22]

    - Consider NbS for adaptation alongside other key elements of sustainable development, and incorporate NbS in development planning processes[16].

    - Policy design in the agriculture, forestry and land use (AFOLU) sectors must reflect wider environmental policy, including for biodiversity.

Support a landscape approach involving a diverse and resilient portfolio of NbS

7. **Support a wide range of NbS** including interventions involving protection, restoration, and management of natural ecosystems, sustainable food production (land and sea), sustainable forestry and woodland management, and urban green infrastructure (see Table 1) [9,17].

    - Recognize the importance of hybrid approaches combining 'green' and 'grey' elements, such as managed realignment of sea walls to create saltmarshes, to reduce flooding risk and increase coastal protection[6,15].

    - Support sustainable agricultural management (including agroforestry, hedgerow creation, conservation agriculture, silvo-pasture, regenerative and climate-smart agriculture, and improved soil and nutrient management) to promote resilience of farming systems and sequester carbon[18].

8. **Acknowledge the need for an integrated landscape and seascape approach** involving dialogue and negotiation between all stakeholders, to balance objectives such as mitigation, adaptation, biodiversity, and production of food and wood products[19,22]. This can be delivered through specific objectives within current and future land-use and marine policies (e.g. ELMS, Nature Recovery Networks and Strategies, Catchment Partnerships, and Flood and Coastal Erosion Risk Management Strategy).

9. **Explicitly acknowledge risks to natural capital** which threaten the long-term viability or functionality of NbS, including climate change (hazard intensity, duration, frequency, and climate variability), ecosystem conversion and degradation (e.g. through development or agriculture) and pollution[20,21].

10. **Outline strategies to minimize and mitigate the vulnerability of NbS** to climate change and other risks, including maintenance of diverse, healthy and connected ecosystems to build resilience[20,22].

    - When designing NbS, ensure that the species and sites selected will be resilient to the current and future impacts of climate change such as temperature increases, water shortages or sea level rise[13].

    - Ban damaging practices such as rotational burning on peatland and peat extraction[13].

    - Reduce other stresses on ecosystems such as from pollution or invasive species.

    - Use adaptive management to respond to change and address uncertainty.

Design and implement NbS through a participatory approach

11. **Recognise that NbS should be carefully designed and implemented through a bottom- up and participatory approach involving all stakeholders.** This helps tailor NbS to meet multiple local needs in different contexts, reduces undesirable trade-offs, and ensures that NbS are effective, legitimate and sustainably managed in the long term.

    - Identify key stakeholders or consultation processes related to planning NbS for climate action to promote cross-sectoral approaches[15]. This could include farmers, other landowners or managers, utility companies, local communities, local authorities, wildlife groups, businesses and government agencies.

    - NbS should be implemented as part of a 'just transition' that respects local livelihoods and ensures an equitable distribution of benefits.

NbS should be planned to deliver measurable benefits for biodiversity

12. **Recognise that NbS should be planned to deliver measurable benefits for biodiversity through enhancing the health, diversity** and connectivity of ecosystems and their habitats and species. Biodiversity underpins the healthy, functioning ecosystems on which human communities depend, ensuring the long term adaptability of NbS to climate change and other risks, and in turn the sustainable delivery of benefits for people and the economy[9].

    - Encourage use of diverse native species, and explore options for rewilding or natural regeneration if appropriate. This will enhance benefits for biodiversity and resilience to change.

    - Avoid NbS that damage existing carbon-rich and biodiverse habitats, such as planting trees on native grassland, heathland, wetland or bog. A 'nature-based solution' that in practice harms nature is an oxymoron that must be avoided in future policy frameworks.

Set well-defined objectives and build capacity to effectively monitor NbS outcomes

13. **Set well-defined, ambitious and time-bound objectives within national policies,** measurable where appropriate, to optimize the delivery of adaptation and other benefits. Targets could include number of people with reduced exposure to climate risks; value of assets with reduced exposure; length of protected or restored coastal habitats; proportion of working landscapes under sustainable management (e.g. low input no till regimes); increase in area of urban greenspace; area (hectares) of restored habitats that target specific opportunities (e.g. woodlands in appropriate locations and on suitable soil types to reduce flood risk).

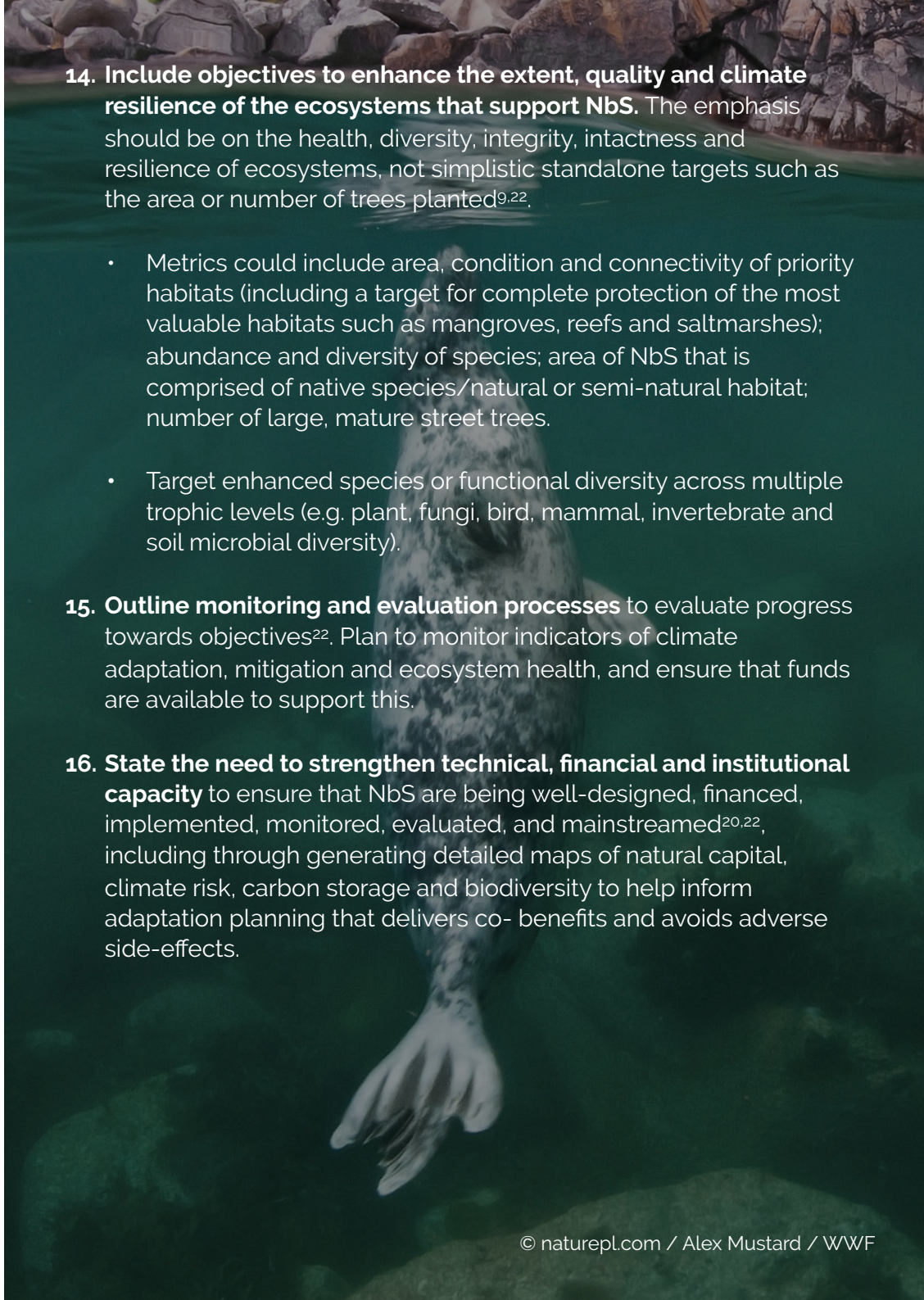
14. **Include objectives to enhance the extent, quality and climate resilience of the ecosystems that support NbS.** The emphasis should be on the health, diversity, integrity, intactness and resilience of ecosystems, not simplistic standalone targets such as the area or number of trees planted[9,22].

    - Metrics could include area, condition and connectivity of priority habitats (including a target for complete protection of the most valuable habitats such as mangroves, reefs and saltmarshes); abundance and diversity of species; area of NbS that is comprised of native species/natural or semi-natural habitat; number of large, mature street trees.

    - Target enhanced species or functional diversity across multiple trophic levels (e.g. plant, fungi, bird, mammal, invertebrate and soil microbial diversity).

15. **Outline monitoring and evaluation processes** to evaluate progress towards objectives[22]. Plan to monitor indicators of climate adaptation, mitigation and ecosystem health, and ensure that funds are available to support this.

16. **State the need to strengthen technical, financial and institutional capacity** to ensure that NbS are being well-designed, financed, implemented, monitored, evaluated, and mainstreamed[20,22], including through generating detailed maps of natural capital, climate risk, carbon storage and biodiversity to help inform adaptation planning that delivers co- benefits and avoids adverse side-effects.



Box 1: NbS Guidelines

These four guidelines for ensuring that NbS deliver sustainable, equitable benefits for climate change adaptation, mitigation, and other societal challenges are endorsed by 20 environmental and academic organizations[17]. Full guidelines and references are at **https://nbsguidelines.info/**

1 **NbS are not a substitute for rapid decarbonisation of the economy.** While NbS are essential to meet both climate and biodiversity targets, some options such as planting trees are limited by finite land area, risks of carbon loss (e.g. due to harvesting, fire or pests), and the slowing of carbon uptake when ecosystems mature[23]. NbS should not be used to justify the continuation of 'business as usual' for high-emitting activities, such as in recent campaigns that encourage people to 'drive carbon neutral'. Inclusion of NbS in NDCs should not reduce the level of climate mitigation ambition in other sectors.

2 **NbS should be supported across a range of ecosystems on land and sea**, as well as in agricultural lands and urban landscapes[18,20,15] (see Table 1). Support and pledges for NbS focus mainly on forests, but other habitats such as grasslands, peatland, riparian, coastal and marine habitats play vital roles in storing carbon[21,24] and shielding people from climate change impacts[25]. It is essential to prevent inappropriate tree-planting on naturally open ecosystems, especially priority habitats such as semi-natural grasslands and peatlands. Protection of all types of intact ecosystems is key to ensure they function as carbon sinks, rather than sources[20]. Sustainable land and fisheries management, including nature-based practices such as agroforestry, can help to reduce greenhouse gas emissions while enhancing soil and ocean health, supporting biodiversity, reducing waste and harmful impacts of fertilizers and pesticides, and building fairer supply chains.

3 **NbS should be designed and implemented with full engagement and consent of local communities**, through carefully negotiated stakeholder management processes. They should apply robust social safeguards and be designed to build human capacity to adapt to climate change. Ecosystem protection and restoration will only yield benefits if livelihoods and human rights are recognised, respected and upheld throughout[20,22,15].

4 NbS should be explicitly designed to enhance or support biodiversity. Biodiversity plays a vital role in the healthy functioning and resilience of ecosystems, secures the flow of essential services, reduces trade-offs among them and builds human capacity to adapt to climate change in urban and rural areas[8]. While commercial forestry is needed, successful NbS avoids large-scale tree-planting with single, non-native species or low diversity plantations. Compared to forests of mixed native species, low diversity plantations typically store less carbon, compromise water availability, have lower biodiversity value, are more susceptible to pests, diseases, fire and climate extremes, and can exacerbate poverty[20,8,26,27].

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APPENDIX

Notes on table 1

The table is based on UK habitats of particular importance for climate adaptation, plus key overseas territory habitats (coral reefs and mangroves) and specific NbS options (agroforestry, sustainable agriculture, and urban green infrastructure).

a. Agroforestry includes silvo-pasture (trees on pasture) and silvo-arable (trees amongst crops).

b. Mangroves and coral reefs are applicable to overseas territories and for international policy, although cold water corals are also found in UK seas.

c. Sustainable agriculture options include addition of organic matter to soil, use of cover crops, minimum tillage (to preserve soil health), use of buffer strips to intercept runoff from fields, and species-rich arable field margins to support pollinators.

d. Urban green infrastructure includes created wetlands, parks, street trees, green walls and roofs, allotments, community orchards and sustainable drainage systems[5].

e. Wetlands and peat can store vast amounts of carbon in soil and sediments, but can also emit carbon dioxide or methane if degraded, turning from a carbon sink to a source.

f. Hybrid solutions (not listed in the table) combine ‘green’ and ‘grey’ elements to optimize benefit delivery[6].

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A more detailed, expanded version of this document will be produced in early 2021 to inform the next revision of the UK Adaptation Communication

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