

Keywords:

Climate change adaptation, biodiversity, ecosystem-based approaches to adaptation (EbA), sustainable development



Issue date  
November 2018

## Policy pointers

**Policymakers should** consider the co-benefits and additional protections against climate change impacts offered by low-cost nature-based solutions (NbS) in comparison to expensive engineered responses.

**Building on the global** recognition of ecosystems' important role in climate change adaptation, high income nations should follow the example of developing nations by incorporating NbS into their Nationally Determined Contributions (NDCs).

**All nations would benefit** from implementing NbS across key ecosystems within their national adaptation strategies, explicitly addressing nationally relevant climate change risks while contributing to other aspects of sustainable development.

**Efforts to engage all** countries in NbS should include support for policymakers and practitioners from the ecosystem and conservation science community. Collaboration can begin now, with the development of National Adaptation Plans and revision of NDCs.

## Nature-based solutions: delivering national-level adaptation and global goals

Many of the world's vital natural ecosystems, and the communities reliant on them, are vulnerable to climate change. But there is increasing recognition that ecosystems — if sustainably restored and protected — can also form a strong line of defence against the direct impacts of climate change and support human adaptation over the long term. As the evidence base grows, ecosystems are increasingly prominent in climate change policy, especially in developing nations. Yet intentions rarely translate into robust and informed measurable targets, undermining action. As signatories to the Paris Agreement revise their Nationally Determined Contributions for 2020, we argue that nature-based solutions are a key tool for meeting global goals on climate change and sustainable development. We urge national policymakers to work with scientists to identify meaningful targets that benefit both people and the ecosystems on which they depend.

There is growing evidence and awareness that when nature-based (or 'green') solutions are applied strategically and equitably, the approach not only safeguards biodiversity and ecosystem services but also helps address climate change.<sup>1,2</sup> In this briefing, we define nature-based solutions (NbS) in the context of climate change adaptation; give an overview of their effectiveness; and highlight their prominence in the climate pledges of the Paris Agreement signatories. We then set out the need for policymakers to show increased ambition for nature as they revise national climate policies, by including robust and measurable targets for NbS. We present a policy platform to support this process.

### Defining 'nature-based solutions'

NbS are actions that work with and enhance nature to address societal challenges (see

Figure 1). Effectively restored and protected ecosystems produce a wide range of goods and services on which human wellbeing depends, from storing carbon, controlling floods, stabilising shorelines and slopes, to providing clean air and water, food, fuel, medicines and genetic resources.<sup>3</sup> According to the European Commission: "Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions."<sup>3,4</sup> (see Box 1 for examples).

In this briefing, 'nature-based solutions' encompass work that may also be defined as 'ecosystem-based adaptation' (EbA) — a term widely used to describe NbS that are *specifically targeted at helping people* adapt to the impacts and hazards of climate change and form part of an overall adaptation strategy.<sup>5</sup> NbS covers

interventions that focus on delivering direct positive adaptation outcomes for people as well as those purely centred on conservation outcomes.

*In contrast to engineered approaches, nature-based solutions can protect us against multiple hazards*

**Why adaptation should go 'green'**

NbS are often defined as being an alternative to 'grey' engineering, such as sea walls and irrigation infrastructure; in reality

there is a spectrum of interventions that include components of both (hybrid or 'grey-green' approaches). While the evidence base is still developing, it is clear that nature-based and hybrid solutions often provide low-risk low-cost solutions to many climate change-related hazards and offer advantages over engineered solutions.<sup>6</sup> For example, while the latter have immediate, measurable effects on reducing specific impacts, they can be expensive and deliver few if any co-benefits.<sup>6</sup> In contrast, NbS tend to be affordable and, if properly implemented, bring many co-benefits (see Figure 1).

In contrast to engineered approaches, NbS can protect us against multiple hazards; this is vital as these seldom occur in isolation. For example,

natural coastal forests can protect against flooding, strong winds and high temperatures, whilst also providing a range of ecosystem services and supporting more diverse livelihoods<sup>7</sup> (see further examples of multiple benefits in Box 1). There is also growing evidence of the economic benefits of maintaining natural habitats through avoided losses from climate change-related disasters. For example, the presence of coastal wetlands in northeast USA protected US\$625 million worth of property from direct flood damage during Hurricane Sandy, reducing damages by 20–30% in 50% of affected areas. The greater the extent of intact wetland habitat, the greater the protection provided.<sup>8</sup> Meanwhile, a recent international analysis revealed that annual expected damages from flooding would double and costs from frequent storms would triple in the absence of reefs globally.<sup>9</sup>

**Global recognition of ecosystems**

As evidence of the efficacy of NbS continues to grow, ecosystems are also receiving attention in the international policy fora. The Paris Agreement explicitly recognises nature's role in helping us deal with climate change, calling on all Parties to acknowledge 'the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth'; its Articles include several references to ecosystems, natural resources and forests.

This notion has translated into high-level national intent, as revealed in comparative analyses of the Nationally Determined Contributions (NDCs) submitted to UNFCCC by signatories of the Paris Agreement:<sup>10,11,12</sup>

- Two thirds state that ecosystems are important and vulnerable to climate change
- A similar proportion credit ecosystem protection as the motivation for their adaptation planning
- Ecosystem protection is the fifth most frequently noted intended outcome of adaptation planning, ranked below disaster risk reduction and food or water security, but above protection of the economy or human health.

Many nations articulate a broadly 'nature-based' vision for adaptation in their NDCs and propose a range of 'green' actions to achieve these visions, involving the restoration and/or protection of natural ecosystems or agroforestry.<sup>10,12</sup> For example, Ethiopia aims to 'enhance the adaptive capacity of ecosystems, communities and infrastructure through an ecosystem rehabilitation approach'. In total, 103 nations highlight one or more NbS actions in the

Figure 1. What are nature-based solutions?



adaptation component of their NDC; a further 27 countries emphasise NbS in their mitigation plans.<sup>10,12</sup> In total, 66% of Paris Agreement signatories include NbS actions in their NDCs.

Broad global acceptance of natural ecosystems as adaptation tools is to be welcomed. However, in reality, national intentions to deliver NbS vary by level of economic development, region and habitat type, and rarely translate into robust targets and on-the-ground action.

### Developing nations lead the way

On closer inspection, the NDCs tell a familiar story of climate change leadership: it is the developing nations that show the greatest movement towards embracing NbS as an adaptation tool. Every nation classified as 'low income' by the World Bank has included NbS in its NDC, including all but four of the 48 least developed countries — this compares to only 27% of high-income nations. Moreover, no Annex 1 country (industrialised OECD members and economies in transition) has highlighted NbS adaptation actions in their NDC.

Developed nations have some catching up to do in terms of recognising NbS at high level. But given the huge potential for this approach to support climate change adaptation across different ecosystems,<sup>8,9</sup> it is in the interests of both developed *and* developing nations to be more explicit in their NDCs. All national adaptation visions should include specific robust targets for named NbS interventions. An informative online policy platform is now available to support nations as they revise their NDCs (see Box 2).

### Time for robust targets

While many countries articulate a theoretical acceptance of NbS, this rarely translates into clear measurable targets in their NDCs (targets may appear in other national policies, such as National Adaptation Plans). Of the 103 nations that highlight NbS actions in the adaptation component of their NDCs, only 30 provide broadly measurable targets. These mostly relate to the protection or restoration of specific areas within given timeframes,<sup>12</sup> and then to agroforestry. For example, Bolivia states an intention to 'increase forest areas with integrated and sustainable community management approaches with 16.9 million hectares in 2030, in reference to 3.1 million hectares by 2010' (for a full list of NbS targets, see: Seddon *et al.* (in press) and the Nature-based Solutions Policy Platform).<sup>10,12</sup> However, most NDCs include targets that are more difficult to measure and track; for example, Guinea-Bissau aims to 'develop a national reforestation and sustainable management of forest and agroforestry ecosystems programme by 2025'.

## Box 1. Nature-based solutions to climate change adaptation

Approach	Effects
Protecting forests and wetlands in catchment areas (for example, in headwaters and along rivers)	<ul style="list-style-type: none"> <li>• Secures and regulates water supplies</li> <li>• Protects communities from flooding, soil erosion and landslides (for example, Huang <i>et al.</i> (2012))<sup>13</sup></li> </ul>
Restoring coastal ecosystems (for example, mangroves, reefs and salt marshes)	<ul style="list-style-type: none"> <li>• Protects communities from storm surges, salt water intrusion and erosion (for example, Temmerman <i>et al.</i> (2013))<sup>7</sup></li> </ul>
Planting trees among crops or crops within forest (that is, agroforestry)	<ul style="list-style-type: none"> <li>• Maintains and enhances yields in drier, more variable climates (for example, Clough <i>et al.</i> (2011))<sup>14</sup></li> </ul>
Creating green roofs and walls, and planting trees in and around urban centres	<ul style="list-style-type: none"> <li>• Moderates impacts of heatwaves</li> <li>• Captures storm water</li> <li>• Decreases pollution (for example, Kabisch <i>et al.</i> (2016))<sup>15</sup></li> </ul>

Without specific, measurable targets and suitable indicators, it is impossible to assess progress towards broad adaptation goals. For the adaptation needs of communities and ecosystems to be met by NbS, the design must be informed by the best available science *and* local knowledge. Applying both would help identify the most relevant NbS intervention for each context, maximising the capacity for adaptation and avoiding assumptions that set projects up to fail (see Box 3). Effective project design, target setting and implementation therefore requires detailed knowledge of:

- Climate impacts — on ecosystems and people
- The effectiveness of different forms of NbS in reducing climate impacts
- How far different forms of NbS provide positive outcomes for people and ecosystems.

To this end, the research community must consolidate and translate relevant knowledge and

## Box 2. Nature-based Solutions Policy Platform

This free policy tool provides information about climate change adaptation planning. It aims to facilitate a global stocktake of the Paris Agreement and provide a baseline against which changes in ambition for NbS to climate change adaptation can be monitored and increased. At [www.nbspolicyplatform.org](http://www.nbspolicyplatform.org), users can:

- **Explore** policies and data in a global analysis or by country
- **Understand** and compare nations' plans for adaptation and assess the role of NbS
- **Link** directly to the underlying evidence for the effectiveness of NbS to climate change hazards and impacts.

### Box 3. Matching NbS interventions to local geographies and local need

The most commonly planned or implemented NbS actions involve conservation, management, restoration and/or afforestation in terrestrial forests or woodlands (appearing in 41% of NDCs). This is followed by similar actions in coastal and marine habitats (28%) and river catchments including wetlands (28%), agroforestry appears in 23% of relevant NDCs (47% of African NDCs).

Far rarer are plans to work with montane habitats (4%) or grasslands and rangelands (10%). Almost all examples of the latter come from Africa, despite the extensive presence of grasslands and rangelands elsewhere. Yet there is evidence that these overlooked habitats can deliver adaptation benefits, offer significant carbon sequestration and are resilient to climate change impacts.

make it accessible to policymakers.<sup>12</sup> This can be a virtuous cycle if policymakers simultaneously commit to scaling up research into what makes NbS effective for people and ecosystems, which will strengthen the scientific basis for future adaptation planning. Many NDCs already recognise that action plans addressing climate threats should be science-based and make high-level commitments to this, which could provide a helpful springboard to action.

### Embedding NbS in the 2030 development agenda

Protecting and/or restoring natural ecosystems is central to the climate change ambition of many countries, yet nations often present a mismatch between high-level vision and on-the-ground action.<sup>11,12</sup> In a handful of cases, detailed plans are not provided in NDCs but do appear in other national policy documents — this suggests the need for greater coherence among different national policy processes. For the majority, however, the mismatch indicates a lack of understanding on how best to integrate NbS within adaptation planning; it also highlights the need for policymakers and practitioners to be better supported as they translate theoretical NbS approaches into locally relevant actions.<sup>10,11</sup>

This support should include much greater involvement from the ecosystem and conservation science community, starting with

the continuing development of National Adaptation Plans and the next iteration of NDCs. To address the mismatch between ambition and action, the science, practitioner and policy communities must work together to:

- Clarify and properly disseminate information on what makes NbS effective
- Build practitioners' capacity to develop robust adaptation plans, fine-tuned to local socio-ecological contexts
- Access suitable levels of adaptation finance and/or technical support
- Ultimately implement effective NbS for the benefit of human societies and the ecosystems on which they depend.

With drivers including the Bonn Challenge, New York Declaration on Forests, Aichi Biodiversity Targets and the CBD post-2020 Biodiversity Framework, more and more countries are pledging to protect and restore their natural ecosystems. NbS represent a powerful way of allowing nations to deliver on international commitments, meet the Sustainable Development Goals with limited finance, and ultimately achieve sustainable and equitable development in a warming world.

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### Notes

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## Knowledge Products

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ISBN 978-1-78431-635-8

Support for Nathalie Seddon provided by Natural Environment Research Council Knowledge Exchange Fellowship. The first tranche of NDC analysis and this briefing have been supported by the International Climate Initiative (IKI) funded project: Ecosystem-based Adaptation: Strengthening the Evidence and Informing Policy. The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supported the IKI on the basis of a decision adopted by the German Bundestag. The views expressed are those of the authors and do not necessarily reflect those of the project partners or funding organisations.

Supported by:



based on a decision of the German Bundestag