



CIO Special

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Authors:
Markus Müller
Chief Investment Officer ESG & Global Head
of Chief Investment Office

Afif Chowdhury
Investment Officer EMEA

Nature-based Solutions and the climate crisis

Key takeaways

01 What are Nature-based Solutions (NbS)?

- Nature-based Solutions (NbS) are “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (according to the IUCN definition).
- The concept of NbS is aligned with the “nature as capital” approach i.e. a focus on the importance of natural assets in delivering ecosystem services. NbS, combined with changes in economic behaviour and technology, will help us combat the triple planetary crisis.
- Effective use of NbS depends on understanding both their economic and environmental value. Quantitative assessment is necessary and the UN’s SEEA will help develop new systems. Financial institutions will play a role too.

02 NbS versus engineered approaches

03 Assessing economic value

04 Conclusion

01 What are Nature-based Solutions (NbS)?

Definitions of Nature-based Solutions (NbS) attempt to reduce a very big concept to a very few words. According to one definition used by the International Union for Conservation of Nature (IUCN), NbS are “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”.

In other words, the focus is very much on managing and restoring ecosystems to ensure the future economic value of the ecosystem services they provide. It is important to remember that NbS are not “nature-derived” solutions (e.g., wind, wave or solar energy) or “nature-inspired” solutions (e.g., materials/products inspired by biological processes).¹

Forests serve as a prime example of the value of NbS. Forests house over 80% of the world’s flora and fauna (providing biodiversity benefits).² Pollutants in the air are largely caused by human activities; forests clean the air (e.g., particle and carbon oxides emitted by traffic and industry). Up to 22 kilograms of carbon dioxide per year can be stored by a single mature tree.³

Nature-based Solutions can be seen as operating across five dimensions – restorative, issue-specific, infrastructure, management and protection.⁴ Trees, to take one example, show the different dimensions in which NbS can deliver benefits. They are, among other things:

- **Issue-specific**
 - Ecosystem-based adaptation, ecosystem-based mitigation, climate adaption services (through CO₂ sequestration)
 - Ecosystem-based disaster risk reduction (e.g., trees slow floodwaters because their trunks, roots, and branches block, deflect, and change flow direction⁵)
- **Infrastructure**
 - Natural infrastructure (habitat for different species)

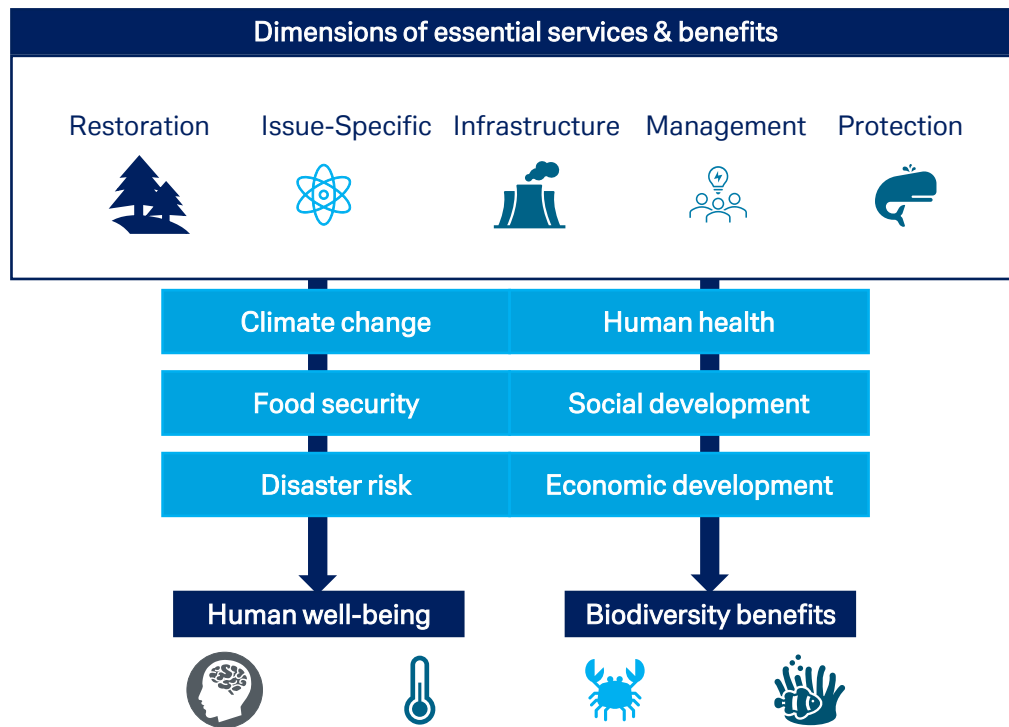


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Figure 1: How NbS impacts our life



Source: Core principles for successfully implementing and upscaling Nature-based Solutions. Data as of August 2019.

To fully understand what NbS are (and are not) capable of, we need a comprehensive understanding of this concept. But understanding NbS also involves comprehending the framework in which we are looking at it. Imposing a framework on this infinitely complicated subject is always going to be difficult. But it probably makes sense to start by defining broad criteria for NbS, before exploring potential measurement systems.

The IUCN has created a framework that identifies 8 criteria that NbS meet.⁶

1. NbS effectively address societal challenges.
2. Design of NbS is informed by scale.
3. NbS result in a net gain to biodiversity and ecosystem integrity.
4. NbS are economically viable.
5. NbS are based on inclusive, transparent and empowering governance processes.
6. NbS equitably balance trade-offs between achievement of its primary goal(s) and the continued provision of multiple benefits.
7. NbS are managed adaptively, based on evidence.
8. NbS are sustainable and mainstreamed with an appropriate jurisdictional context.

These criteria can then be broken down in turn into multiple problem areas. This granular breakdown serves a purpose since each challenge requires an individual approach.⁷

But to move from this sort of categorization to a real understanding of financial returns, we may need a quite different sort of accounting, which will evolve over time, as the area expands: this is likely to be linked to the concept of “nature as capital”, which ties in closely with the definition of NbS. We return to this issue in Section 3.

02 NbS, climate change and engineered solutions

Taking a closer look to the planetary circumstances humanity has created, it is quite clear that mankind needs both to mitigate climate change and adapt to the new conditions caused by it. Mitigation of climate change is focused on reducing net emissions of greenhouse gases.⁸ Adaptation is adjusting to ecological, social, or economic systems in response to real or anticipated climate change and related effects.⁹

There is great interest in using NbS to achieve both global climate change and development objectives (e.g. the UN’s Sustainable Development Goals). The example of climate change is the most prominent. Global energy-related carbon dioxide emissions increased by 6% to 36.3 billion tonnes in 2021, their highest level ever.¹⁰ Improvements in agriculture and management of terrestrial ecosystems (e.g., sustainable agriculture or reforestation) may have the ability to deliver about 30% of the CO₂ mitigation required through 2030 to maintain warming to less than 2°C.^{11, 12, 13}

In some countries (e.g., India), NbS can make its greatest contribution to reducing emissions through, among other things, targeted governance (politically limiting/regulating the usage of nature) and financing.

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In many tropical countries with low GHG emissions and extensive forest cover, NbS can contribute effectively to the reduction of national emissions, mainly through avoided deforestation.¹⁴

In a way, this is a balancing act. We have to focus on local conditions: how the effects of nature are felt in local communities. To do this, we need effective partnerships. As the IUCN has pointed out, projects and development plans rarely attempt to tap into this potential or spread local innovations within and between communities.¹⁵ Unified knowledge and greater clarity and specificity regarding what the concept means is needed as NbS is integrated into policy and used by projects on the ground. This should help boost decision-makers' trust in NbS.¹⁶

One important issue is the relative attractiveness of NbS and so-called "engineered approaches" (i.e. primarily technology-driven). Forests, for example, appear to offer a more proven method of removing carbon from the atmosphere than so called carbon dioxide removal procedures (CDR). Direct air carbon capture is, at the moment, pricey, energy-intensive, and not yet scaleable.¹⁷

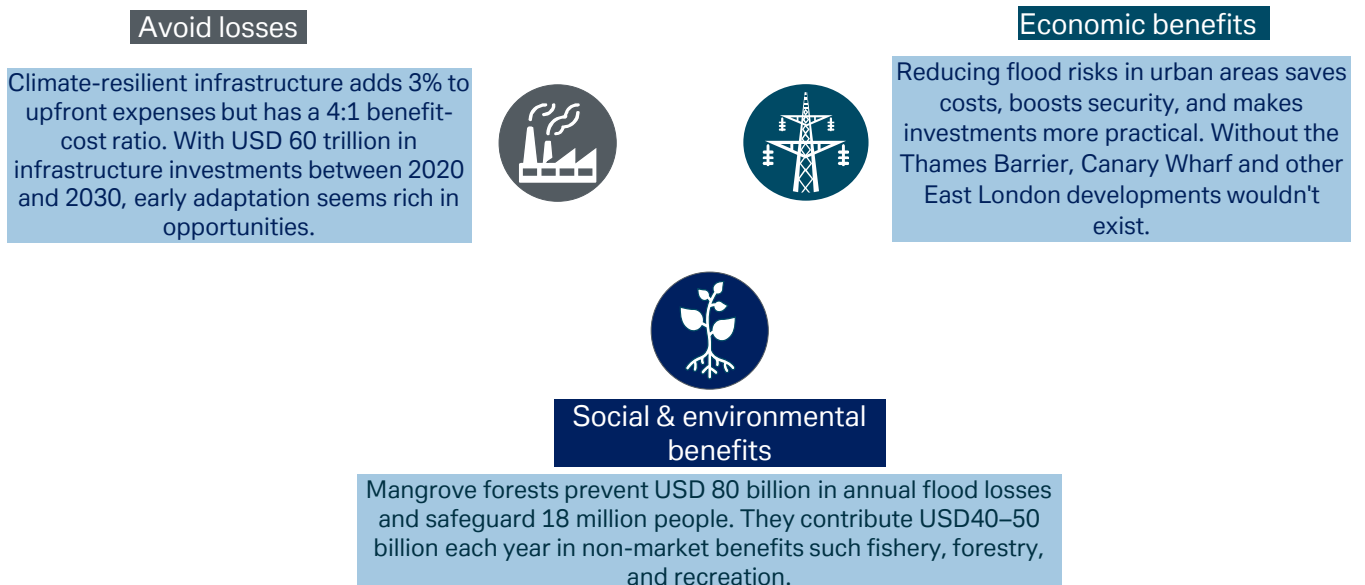
So far, however, the main strategy for reducing the risks posed by extreme weather, natural disasters and climate change has involved these engineered approaches – such as sea walls, levees, or irrigation infrastructure.¹⁸ For example, in Bangladesh, a country that suffers particularly badly from the consequences of climate change, almost 90% of all adaption initiatives have been engineered approaches.¹⁹ But NbS could also make a significant contribution here: a report by the Global Commission on Adaptation has discussed the potential "triple dividend" of NbS – in that they can avoid economic losses, bring positive gains, and delivers additional social and environmental benefits, as outlined below.²⁰ It is also worth noting that while engineered approaches are static and inflexible, potentially limiting their economic value, more adaptive NbS can make an increasing contribution to ecosystem services.

Alternative engineered approaches offer theoretically appealing concepts such as solar radiation management (SRM, reflecting sunlight back to space) or CDR, discussed above. The consensus within the scientific literature seems to be clear. While these approaches prove to be useful to some extent: a large-scale implementation of CDR could result in global negative CO₂ emissions (meaning that anthropogenic CO₂ removals exceed anthropogenic emissions) – this in turn could compensate for historical emissions and help us achieve our long-term climate stabilization goals after a temperature overshoot.²¹

Still, engineered approaches face two kinds of problems, the first of which lies in the nature of these approaches. Problems can occur from poor adaption and unfavourable impacts: the use of SRM harbours risks to humans, ecosystems that are not yet fully understood, especially if implemented on a large scale.²² The second problem lies in the strategies in which engineered approaches are often embedded. These strategies often assume an – at least temporary – overshoot of the 1.5° target and, so to speak, expect that we will solve the problem later with the help of these technologies – as soon as they are mature enough. Apart from the fact that this does not address the actual, underlying problem of emissions, there are major risks in these strategies. Of course, there is the risk of uncertainty. We don't know whether we will be able to scale these approaches globally, whether they will be even effective enough at scale, and certainly we don't know – as described above – what the side effects of these methods might be. And then there are the irreversible effects of overshooting the 1.5° limit. Even if we break this limit only temporarily, we will have to deal with irreversible consequences that may last for millennia.²³

We need to be clear about the role that engineered approaches can play in this transformation. Engineered approaches, such as CDR and SRM, can and probably must contribute to limiting climate change, but their contribution is likely to be limited.^{24, 25} They are not something we should put all our hopes and efforts into: using them to complement NbS helps create a multi-dimensional strategy.

Figure 2: The Triple Dividend of NbS



Source: The Triple Dividend of NbS. Global Commission on Adaptation: Adapt Now: A Global Call For Leadership On Climate Resilience. Data as of September 2019.

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03 Assessing economic value

Effective use of NbS however depends on understanding their economic value, as we noted above. Quantitative assessment is necessary not only for scientific researchers, but also for decision makers (e.g., politicians or future investors). It simplifies planning as well as priority setting and calculation of economic liability.²⁶ It will also support a belief that NbS can be cost-effective and provide numerous social and ecological co-benefits.²⁷ However, these social and ecological co-benefits are particularly difficult to measure. The value attached to these benefits are highly dependent on the perspectives and needs of those involved.

One example of this is provided by coral reefs. These provide significant protection for coastal areas, but the social benefit from this is significantly smaller for a European than for a person in the Maldives. This seemingly self-evident example illustrates an important lesson: we should not focus only on developing simple standardized indicators of NbS effectiveness that work across scales and incorporate social-ecological factors. We simultaneously have to think about context-specific metrics. This will lead to a more targeted understanding of NbS, i.e., we will take more local circumstances and aspects into account.²⁸

With the help of these context-specific metrics, we will be able to establish the economic value of NbS, although much of the information value is likely to be limited to the specific project. We already have examples of research showing that the benefits of NbS can outweigh the costs of implementation and maintenance. A cost-benefit analysis of three different nature areas provides an interesting example of this.²⁹

One far-reaching approach with international scope and relevance in terms of implementing the economic value of nature into national accounting is the SEEA – System of Environmental-Economic Accounting by the United Nations. The Central Framework of this is a set of international statistical standards with the purpose of measuring the environment and its relationship with the economy.

The relevant variables (e.g., input from nature or produced assets) are considered in both physical and monetary terms. This combined presentation comes with four major benefits:

1. Users of SEEA can find relevant and consistent information in a single location.
2. It encourages debate between those focused on economic accounting and those focused on assessing natural inputs.
3. Combined indicators can be derived from this combined presentation.
4. Offers a data foundation for the creation of models and for in-depth examination of how the economy and the environment interact.³⁰

SEEA will force us to identify areas of imperfect understanding or conceptual disagreement and enables us to identify issues of poor data quality. All in all, SEEA results in a systematic approach.³¹

The relevance of including the environment in corporate reporting is being recognized by the private sector more and more. Companies are creating sustainability reports and

integrating financial and environmental data. For example, in 2020, in Europe, North America and Asia a total amount of 2,402 companies published sustainability reports,³² although there will be room improving the depth and quality of these reports.

This will be supported by efforts already underway to make a unified framework available to businesses as well. The Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) project workstream on business accounting aims to assess the alignment between the SEEA Experimental Ecosystem Accounting (SEEA EEA) and business accounting. The aims are to align natural capital accounting approaches between public and private sectors, utilize synergies between the two in gathering and applying data for natural capital accounting and offer technical guidance to encourage alignment.³³

Measuring NbS is part of a necessary, fundamental change in how we measure value creation as a whole. Gross domestic product (GDP) has long been the main indicator used to assess economic progress but fails to take environmental deterioration into account. As a consequence, economic decisions may not include adequate consideration of the planet's limited resources and drive development in detrimental directions.³⁴

Financial sector can contribute to this change in approach in many ways. They can expand methods for measuring risk by developing forward-looking and scenario-specific analyses that help capture the consequences of climate change. They can help countries and businesses to develop and implement such approaches and measurement methods.³⁵ Financial institutions are already starting to use appropriate standards to disclose the environmental implications of their investments and financial regulators may want to take this process further. Overall, knowledge needs to go beyond optimizing short-term economic profits to examining the positive and negative side effects of investments on their stakeholders.³⁶

04 Conclusion

Nature-based Solutions (NbS) will help us tackle the climate crisis. But to fully harness the potential, we need a precise conceptual understanding of what they are and the benefits they provide. Looking at the whole picture, engineered approaches will continue to be a part of the solution but they are no panacea.

Methods of measuring the value of NbS will be key to future progress. The SEEA already provides a comprehensive guide and central framework for measuring environmental and economic impacts. This framework can be supportive of project developers, scientists and decision makers.

Looking forward, we need a coordinated and united leap forward, meaning that we require international efforts to develop NbS projects on a large scale combined with the development of sophisticated measurement methods that are both applicable extensively and also take regional features into account.

Overall, we emphasize what we have stated in previous reports: We have to start thinking in terms of "nature as capital".



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Glossary

Biodiversity means variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.

Ecosystems are created by the interaction of plants, animals, weather and landscape.

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.

Greenhouse gases (GHG) are gases that trap heat in the atmosphere; carbon dioxide is the primary contributor to GHG emissions.

The **Global Commission on Adaptation** was launched in 2018 to accelerate climate change adaptation; its mandate came to an end in 2020.

The **International Union for Conservation of Nature (IUCN)** was established in 1948 and is composed of both governments and civil society organizations.

Natural capital refers to the elements of the natural environment including assets like forests, water, fish stocks, minerals, biodiversity and land.

National Capital Accounting and Valuation of Ecosystem Services (NCAVES) is a project launched in 2017, funded by the European Union and focused on pilot testing ecosystem accounting.

The **System of Environmental Economic Accounting (SEEA)** is a framework that tries to integrate economic and environmental data.

UN Sustainable Development Goals (SDGs) were set in 2015 by the United Nations General Assembly and are intended to be achieved by the year 2030, it is a collection of 17 interlinked global goals designed to be a blueprint to achieve a better and more sustainable future for all.

UN stands for United Nations and is an international non-profit organisation to increase political and economic cooperation among its member countries.



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