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Voices

Decarbonizing through nature

Offsetting residual emissions of greenhouse gases will be critical in our aims to limit global warming. Nature-based solutions (NbS) have been proposed as an opportunity to mitigate climate change while protecting and restoring the world's natural capital. This Voices asks: what is the mitigation potential of NbS and the main needs for their succesful implementation?

Pete Smith
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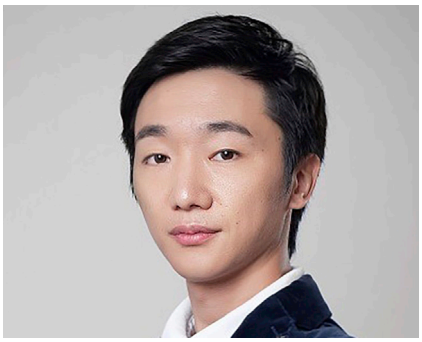
Nature-based solutions for greenhouse gas removal

Given that there will still be some residual greenhouse gas (GHG) emissions in 2050, to achieve net zero, we will need some options that remove GHG from the atmosphere. Solutions for GHG removal can come from both engineering and nature (nature-based solutions [NbS]) and even from initiatives that include components for both. Blue-carbon- and ocean-based approaches for GHG removal are promising but currently less developed than land-based ones. For the latter, implementation is the key concern at this stage. If implemented appropriately, most land-based GHG-removal options can prove benefitial to the delivery of ecosystem services and to the UN Sustainable Development Goals (SDGs), but if implemented poorly, many land-based GHG-removal options could harm biodiversity and ecosystem services and impede delivery of the SDGs. The way in which land-based GHG-removal options are implemented is critical to whether they can be considered as NbS. Because NbS should be implemented with the full engagement and consent of Indigenous peoples and local communities in a way that respects their cultural and ecological rights and should be explicitly designed to provide measurable benefits for biodiversity, not all land-based GHG-removal options constitute NbS. Land-based GHG-removal options that can be implemented in a way that is consistent with NbS should be prioritized because they deliver multiple co-benefits. As such, NbS can be great allies in our path to net zero while contributing to different SDGs, but they are not a substitute for immediate and aggressive emission reduction in all sectors of the economy.



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The clock is ticking

NbS provide by far one of the most cost-effective and readily available options for mitigating climate change and delivering multiple SDGs. However, time is running out for achieving the Paris Agreement goal of limiting global temperature rise. As a means of removing residual or hard-to-abate GHG emissions, NbS can avoid significant emissions and offer large carbon sinks; however, they have to be deployed at large scales (regional to global) and at the earliest opportunity. Delayed or lack of action on NbS implementation would largely undermine the potential to deliver the climate and ecosystem benefits. The lack of global action would simply put the top player on the bench and leave NbS as an "armchair strategy," which would inevitably delay any meaningful mitigation opportunities. Delayed action would further reduce the actual power of NbS because for most NbS pathways, years to decades are required for them to reach their maximum potential for climate mitigation and other ecosystem benefits as a result of the time required for large-scale technology deployment and natural ecosystem responses. Worldwide NbS must involve governments, stakeholders, landowners, and also relevant programs and projects aimed at sustainable ecosystems. Global, regional, and local ecosystem-management efforts need to be directed toward climate mitigation and sustainability goals, and potential pitfalls and unintended consequences should be avoided if at all possible. The clock is ticking; we need to act now, act fast, and act properly to avoid any delays or detours in NbS implementation.

Catherine E. Lovelock
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Overcoming implementation hurdles for blue carbon

Blue carbon is a promising NbS, where conservation and restoration of coastal ecosystems contribute to reductions in GHG emissions while providing other important ecosystem services for humans and other species. Although the potential of NbS and the need to act immediately to implement NbS are clear, implementation of blue-carbon strategies faces challenges. For example, although mangroves, saltmarshes, and seagrasses have been represented in global GHG policies since 2013, they are not widely included in national policies or actions. Conservation and restoration projects tend to be small scale. Additionally, although there are some methods for blue carbon in carbon markets, few projects generate carbon credits. Action on blue carbon could be stimulated by additional guidance from the International Panel on Climate Change for accounting for seagrass and seaweed carbon in national inventories. Nations can develop policies that stimulate large-scale conservation and restoration of blue-carbon ecosystems, including those that facilitate aggregation of smaller community-led projects into larger projects that can attract investment while maintaining safeguards for communities. Implementation of blue carbon would benefit from further development of methods and technologies to characterize and verify climate change mitigation, adaptation, and other benefits of ecosystem services. Although blue carbon is likely to contribute only 1%–3% of the needed GHG mitigation, the benefits that blue-carbon ecosystems provide to global societies are immense, and their conservation and restoration are vital for sustaining coastal communities.

Carlos A. Joly
Biology Institute, University of Campinas

Brazil emission drawdown depends on forest restoration

Brazil's nationally determined contribution (NDC)—the national climate plan to reduce its GHG emissions by 37% in 2025 compared with 2005—is strongly based on fostering NbS through forest restoration. There is a commitment to restore 12 million ha to avoid having to cut emissions from industry, transport, and cattle ranching. However, appropriate implementation of forest restoration projects will be key to reaching that projected NDC, and this can be much more complicated than it initially seems. First, most restoration projects give preference to native fast-growing trees; although this process quickly restores an architecture that looks like a forest and might also restore some ecosystem services, in the medium and long term it will not function like a real forest because most of the functional groups of a forest will be lacking, which could affect its carbon-sink potential. Second, the engagement of relevant communities in decision making and implementation is essential; project leaders should discuss with all stakeholders a fair sharing of the benefits generated by restoration from both local (i.e., training of local people and job generation) and global (i.e., matching funders' expectations and contributing to solve the climate crises) perspectives. A mismatch of expectations can result in failure, driven by local stakeholders' disappointment and funders' and policymakers' discouragement. Adaptive management of forest restoration, considering not only ecological and mitigation outcomes of replanted areas but also stakeholder engagement, will be key to ensuring NbS success and achieving mitigation goals in Brazil.

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Natural solutions for multiple urban challenges

Applied to urban environments, NbS can play significant roles in reducing net GHG emissions and mitigating impacts of climate change. For example, green roofs can reduce stormwater runoff and the associated energy use for stormwater handling in the wastewater system, as well as energy needs for cooling and heating. As such, enhancement of green roofs and other urban green spaces, especially in close proximity to industrial activities, can help mitigate over 10% of local industrial emissions. At the same time, urban NbS can also provide the additional benefits of regulating local climate, reducing water pollution, improving human health and well-being, and enhancing aesthetic, cultural, recreational, and other societal values. They can further positively influence and nudge pro-green human behaviors, for example, by involving civic organizations in NbS management. To maximize co-benefits, we need to understand and address urban problems holistically and plan for multi-purpose initiatives. Suburban green belts and streetscapes that increase access to green spaces, for instance, can be part of a multi-functional urban NbS toolbox that provides more and better space for relaxation, leisure, and social interactions along with substantial potential for carbon neutrality and urban sustainability, for example, by saving 20%–30% of vehicle travels and heating and cooling consumption. The potential is large, but complex challenges require complex solutions: achievement of such multifaceted gains will require novel inter-disciplinary collaborations in urban planning and infrastructure development.

Lalisa Duguma
Office of the Director Africa, CIFOR-ICRAF

NbS for climate mitigation and adaptation in Africa

Africa's ecosystems keep facing severe degradation mainly driven by unsustainable exploitation that also increases emissions from the various land-based sectors. As a way to solve this, Africa has currently set an ambition to pursue several high-potential nature-based mitigation options that also offer significant adaptation and livelihood benefits. Efforts are focused on restoring degraded ecosystems primarily through ambitious projects even at the continental scale (for example, AFR100 aims to restore 100 million hectares of forest by 2030) but also through conserving biodiversity in rich ecosystems such as tropical forests, savannahs, and wetlands and managing agricultural lands and agrobiodiversity, especially by fostering those that integrate perennial crops and trees. However, effective implementation of these interventions will require a few critical enablers. To maximize co-benefits, there should be a deliberate move in making nature-based approaches the mainstream effort to address climate change. The continent needs a guiding NbS implementation framework built on inclusive multi-institutional engagement at national, subnational, and local levels, and institutional capacity building is critically needed for effective implementation and monitoring of progress and outcomes. And, at the policy and local implementation levels, there is a need to look at nature and its components from an interconnected system level. For NbS to be effective, we need to see beyond a one-sector approach and embrace multi-sectoral engagement to strengthen partnerships. These enablers would provide the needed elements for NbS to substantively address the climate crisis in the continent.

DECLARATION OF INTERESTS

P.S. has research projects funded by various public bodies (including UK Research Councils and the EU), is the science director for Scotland's ClimateXChange, is a member of various science advisory boards for research projects or environmental charities, is a paid part-time science team member of Carbon Direct, and is a trustee of the local environmental charity SEAchange. Z.Q. serves as deputy director for Future Earth Global Hub China. C.A.J. is chair of the Brazilian Platform on Biodiversity and Ecosystem Services (BPBES) and participates in the Steering Committee BIOTA/FAPESP Research Program of the São Paulo Research Foundation (FAPESP).