

Harnessing Nature's Power

Nature-Based Solutions for Carbon Sequestration

Introduction

The Earth is facing a pressing climate crisis, with rising greenhouse gas emissions driving global temperatures to unprecedented levels. Nature-based solutions have emerged as a powerful tool in the battle to mitigate climate change. One of the key roles of nature-based solutions is carbon sequestration, a process that captures and stores carbon dioxide (CO₂) from the atmosphere, helping to combat climate change, while also providing a multitude of additional benefits to ecosystems and communities. Another important role is that NbS is designed to provide measurable benefits for biodiversity.



What Are Nature-Based Solutions?

Nature-based solutions encompass a range of strategies that leverage natural ecosystems to address environmental and societal challenges. These solutions aim to restore, protect, and sustainably manage ecosystems, such as forests, agriculture, urban and nature, to enhance their capacity to sequester carbon and provide a wide array of ecosystem services. Sometimes a distinction is made between Intrinsic (make better use of existing ecosystems), hybrid (modify managed ecosystems), and Inspired (design new ecosystems) NbS (Groot, 2022).

What Nature-based Solutions work where?

Nature-based solutions are implemented quicker, depending on the challenges that come with the implementation. This does not mean that other factors do not play a role in adopting these solutions. Further reading will give an insight in specific solutions, depending on the ecosystem it is implemented and a broader overview of the role of Nature-based solutions in battling climate change.

The double role of Agriculture

The role of NBS in carbon sequestration in agriculture is critical for addressing climate change and enhancing the sustainability of food production. By promoting these practices, agriculture can contribute to both climate mitigation and adaptation efforts, while also improving soil health, water quality, and overall ecosystem resilience. It's an essential component of transitioning towards more sustainable and climate-resilient agricultural systems and is often described as part of regenerative agriculture.

Nature-based solutions in agriculture refer to a set of sustainable practices and techniques that integrate natural ecosystems and processes into agricultural systems to enhance their productivity, resilience, and sustainability. These solutions aim to address the environmental and social challenges associated with conventional farming while promoting more ecologically and economically viable approaches. Here are some key aspects of the role of nature-based solutions in agriculture:

1. **Cover Cropping and Crop Residues:** The use of cover crops and maintaining crop residues on the field surface is another NBS that aids carbon sequestration. These practices increase the input of organic matter into the soil, which enhances soil carbon levels. Carbon-rich soil is not only beneficial for climate change mitigation but also improves soil fertility and water-holding capacity.
2. **Conservation Agriculture:** Practices associated with conservation agriculture, including minimal soil disturbance, retention of crop residues, and diversified crop rotation, result in enhanced soil health and increased carbon sequestration. Reduced or no-till farming prevents the release of stored soil carbon, reducing the emission of CO₂ into the atmosphere.
3. **Diversified Crop Systems:** NBS encourage the cultivation of diverse crops in the same field. This approach helps sequester carbon through the development of deeper and more complex root systems and the incorporation of a variety of organic materials into the soil.
4. **Wetland and Riparian Buffers:** Wetlands and riparian buffers can be incorporated into agricultural landscapes. These ecosystems serve as carbon sinks and filter excess nutrients from agricultural runoff, protecting nearby water bodies and further reducing the carbon footprint of agriculture.
5. **Soil Carbon Farming:** Some NBS explicitly focus on increasing soil carbon content, such as through the application of biochar (a form of charcoal), compost, and other organic amendments. These practices enhance soil fertility and contribute to carbon sequestration.

6. Restoration of Degraded Lands: Restoring degraded lands and ecosystems within agricultural areas; these may include building of terraces, increase of plant material (described under aspect 1) addition of mulch, and catch crops. These examples help reduce soil and water losses.

7. Biodiversity Conservation: Promoting biodiversity in agricultural systems, through techniques like planting cover crops and providing habitat for beneficial insects and other wildlife, can enhance carbon sequestration. A diverse ecosystem can provide more efficient carbon cycling and sequestration processes.

8. Integrated Land Use Planning: NBS also involve strategic land-use planning that seeks to balance agricultural needs with carbon sequestration goals. This may involve setting aside specific areas for reforestation, wetland preservation, and conservation.

10. Agroforestry: Agroforestry is a prominent NBS in agriculture where trees and shrubs are intentionally integrated into farmland. Trees are excellent carbon sinks as they absorb CO₂ during photosynthesis and store it in their biomass. By incorporating trees into agricultural landscapes, carbon is sequestered in both the above-ground vegetation and the soil. In addition, the organic matter from fallen leaves and branches contributes to improved soil carbon content. This overlaps a lot with the description of NBS in forestry.

The Power of Forests

Forests, in particular, play a pivotal role in carbon sequestration. Trees act as carbon sinks, absorbing CO₂ through the process of photosynthesis and storing it in their biomass. Forest management practices that focus on reforestation, afforestation, and sustainable forest management can significantly enhance carbon sequestration. Restoring and protecting degraded forests is essential not only for carbon capture but also for preserving biodiversity and supporting communities.

Restoring Grasslands

Grasslands, which cover vast areas of the planet, have great potential for carbon sequestration. Sustainable management practices, such as rotational grazing and grassland restoration, can enhance soil carbon storage. In addition to mitigating climate change, healthy grasslands contribute to clean water, biodiversity conservation, and sustainable livestock production.



Other options for NbS: wetlands and coastal Ecosystems

Wetlands, including mangroves and seagrass beds, and coastal ecosystems are vital in capturing and storing carbon. These ecosystems act as both blue carbon and green carbon sinks. Blue carbon refers to carbon stored in coastal and marine environments, while green carbon is stored in terrestrial ecosystems. When preserved and restored, these habitats can sequester large amounts of carbon, protect against coastal erosion, and offer crucial breeding grounds for various species.

Nature-Based Solutions and Communities

Nature-based solutions offer numerous co-benefits, such as improved air and water quality, enhanced biodiversity, and support for local livelihoods. These solutions can enhance resilience to climate change and provide opportunities for ecotourism, sustainable agriculture, and disaster risk reduction. Stakeholders play a vital role in NbS design, as all stakeholders have different views on problems and will seek out different solutions.

Policy and Investment

Effective policies and financial investments are crucial to realizing the potential of carbon sequestration through NbS. Governments, international organizations, and private sectors must commit to supporting initiatives that protect and restore natural ecosystems. This includes implementing incentives for reforestation and sustainable land management, as well as investing in research and monitoring efforts to measure the impact of these solutions.

The Role of Individuals

Individuals also play a vital role in the success of nature-based solutions. Support can be given by making sustainable choices, reducing our own carbon footprint, and advocating for nature conservation. By participating in tree planting programs and engaging with local conservation organizations, we can contribute to the collective effort to combat climate change.

Conclusion

Nature-based solutions offer a promising path forward in the fight against climate change. By harnessing the power of natural ecosystems for carbon sequestration and embracing their multiple co-benefits, we can address the climate crisis while simultaneously protecting biodiversity and improving the well-being of communities. A collective commitment to the preservation and restoration of our natural world is crucial, as it is our planet's innate resilience and capacity for carbon capture that holds the key to a sustainable and vibrant future for all.

References

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