

NATURE-BASED SOLUTIONS

WHAT ARE NATURE-BASED SOLUTIONS TO CLIMATE CHANGE?

Nature-based solutions to climate change, sometimes called “natural climate solutions,” involve conserving, restoring, or better managing ecosystems to remove carbon dioxide (CO₂) from the atmosphere. Examples include allowing forests to regrow, restoring coastal wetlands, and switching to restorative agricultural practices, such as cover crop rotation, that support healthy soils. These ecosystems reduce climate change by capturing CO₂ from the air and sequestering it in plants, soils, and sediments. They also provide a wide range of other important benefits, such as cleaner air and water, economic benefits, and increased biodiversity.

Some nature-based solutions, such as conserving existing wetlands, serve mainly to prevent greenhouse gas emissions. Others, such as restorative agriculture and regrowing clear-cut forests, actively remove CO₂ from the atmosphere. This makes them a form of [carbon removal](#). (Many nature-based solutions both prevent emissions and remove carbon, so the distinction is fuzzy.) Nature-based forms of carbon removal are often portrayed as distinct from “engineered” approaches, such as bioenergy with carbon capture and storage (BECCS), direct air capture with carbon storage (DACCS), and ocean alkalization. The distinction between nature-based solutions and engineered approaches, which [some scholars have contested](#), has important implications for the politics of carbon removal: [publics are generally more supportive of approaches perceived as “natural.”](#)

NATURE-BASED SOLUTIONS' ROLE IN CLIMATE POLICY

Nature-based solutions can help reduce climate change, but they cannot “solve” climate change on their own: they need to be combined with rapid cuts to greenhouse gas emissions and potentially with engineered forms of carbon removal. Bronson Griscom and colleagues recently estimated that cost-effective nature-based solutions could contribute about 20% of the mitigation needed between now and 2050 to keep global warming below 2°C. The other 80% will have to come mainly from emissions reductions in the energy, transportation, building, and industrial sectors and, perhaps, from other approaches to carbon removal. It is also important to note that each hectare of forest or soil can only hold so much carbon. Once an area of land reaches that maximum carbon storage, it will not sequester any additional carbon dioxide. This is another reason that nature-based solutions cannot replace emissions reductions.

TYPES OF NATURE-BASED SOLUTIONS

Nature-based solutions span a wide range of practices, and people sometimes disagree about exactly what counts as a nature-based solution. Broadly speaking, nature-based solutions fall into four categories: forestry practices, wetland-related practices, restorative agriculture, and ocean-based practices. Forestry practices include planting new forests, allowing forests to regrow naturally where they have been cut down, and improved forest management. Wetland-related practices focus on conserving and restoring peatlands and coastal wetlands, such as mangroves. Restorative agriculture ranges from practices that build soil carbon, such as no-till agriculture and cover crop rotation, to agroforestry and improved livestock management. Ocean-based practices include restoring seagrass meadows or growing kelp or shellfish to restore or expand marine ecosystems.

NATURE-BASED SOLUTIONS

CO-BENEFITS AND CONCERNS

- + **Protecting biodiversity:** because they conserve or expand ecosystems, nature-based solutions protect biodiversity against both climate change and habitat loss.
- **Reversibility:** because they store carbon in biomass rather than more permanent reservoirs, nature-based solutions' carbon sequestration is reversible, meaning that the captured carbon could be released back into the atmosphere by wildfires, changes in land-use or land management, or climate change itself.
- **Method-specific co-benefits and concerns:** different methods come with different co-benefits, ranging from cleaner air and water to erosion control, flood protection and more, as well as different concerns and challenges. See [our other fact sheets](#) for details.

GOVERNANCE CONSIDERATIONS

- **Outreach, education, and training:** many stakeholders may not know about the benefits of nature-based solutions or may need training to implement them correctly.
- **Financing and incentives:** while many nature-based solutions pay for themselves over time, many potential adopters will need help financing up-front costs (e.g., new supplies and equipment), and additional incentives can speed adoption.
- **Right-sizing:** since some nature-based solutions, such as forestation, compete for land with other uses, good governance can ensure that these solutions get implemented at appropriate scales.
- **Monitoring, reporting, and verification:** measuring and accounting for captured carbon can be challenging, but good governance can streamline the process and help verify carbon storage.
- **Protecting captured carbon:** good long-term governance is needed to minimize the release of captured carbon back into the atmosphere.

FURTHER READING

- Griscom, B. W., et al. 2017. "Natural Climate Solutions." *Proceedings of the National Academy of Sciences* 114 (44): 11645–50. doi [10.1073/pnas.1710465114](https://doi.org/10.1073/pnas.1710465114).
- Fargione, J. E. et al. 2018. "Natural Climate Solutions for the United States." *Science Advances* 4 (11): eaat1869. doi [10.1126/sciadv.aat1869](https://doi.org/10.1126/sciadv.aat1869).
- Bellamy, R. & S. Osaka. 2020. "Unnatural Climate Solutions?" *Nature Climate Change* 10: 98–99. doi [10.1038/s41558-019-0661-z](https://doi.org/10.1038/s41558-019-0661-z).

Our web site provides method-specific fact sheets for many nature-based solutions at <https://carbonremoval.info/factsheets>.