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POLICY BRIEF

Governing Nature-Based Solutions to Carbon Dioxide Removal

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According to the Intergovernmental Panel on Climate Change (IPCC), large-scale Carbon Dioxide Removal (CDR) is now required in all pathways to keep global warming under 1.5°C. Ecosystems play a critical role in the removal and long-term storage of around half of all CO_2 emissions produced by human activities. Enhancing this capacity with the adoption of 'Nature-Based Solutions' (NBS) (also referred to as 'Natural Climate Solutions') could play an important role in delivering the large-scale CDR now required.

Nature-Based Solutions (NBS) to CDR include techniques such as large-scale planting of forests, replacing previously lost forests, and restoring wetlands. With the right policy, political and governance conditions in place, the United Nations Environment Programme (UNEP) estimate that forests, wetlands and soils could remove up to 4–12 $GtCO_2e$ per year, while some studies indicate a significantly higher potential.

The need for governance

Deploying NBS CDR would take place in or affect environments that provide essential ecosystems services, ranging from oxygen and food supply, to income generation, flood and storm protection. To manage negative impacts on ecosystem services and other sustainable development goals, careful consideration will be required to maximise synergies and minimize trade-offs, as part of the governance of any deployment. Furthermore, sequestration delivered through NBS techniques is not permanent. For example, a forest's ability to sequester CO_2 diminishes with age (as it saturates), and trees die and decay (e.g. as a result of age, drought, forest fires, pests or deforestation), removing their CDR potential and releasing CO_2 and other gasses back into the atmosphere. This creates longer term governance challenges around how to maintain NBS CDR gains over time.

Governing Nature-Based Solutions to CDR

The IPCC recently highlighted how existing governance mechanisms for CDR are scarce, targeted at particular options, and only operate at national or regional scale. Many important governance questions still require consideration, including:

- who would deploy, monitor and pay for the use of one or more NBS techniques;
- who would be responsible for ensuring long-term storage, preventing leakage and insuring against harms; and,
- how might trade, food production and the sustainable development goals be affected?

Fora, processes and communities which do, or could contribute to this governance process include governments at all levels, the UN Framework Convention on Climate Change (UNFCCC), the UN General Assembly (UNGA), the Convention on Biological Diversity (CBD), UN Food and Agriculture Organisation (FAO), the International Union for Conservation of Nature (IUCN), Civil Society Organizations, research communities, the commercial sector, regional bodies; and other interested and affected publics. As the governance of NBS evolves, it may become necessary for different processes, such as the CBD, the UNFCCC and their related science bodies, the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), to come together and explore synergies and trade-offs between potentially competing objectives.

NBS CDR Techniques, Readiness and Governance Challenges

Proposed Technique	Technological Readiness	Specific Governance Challenges
 **Afforestation and reforestation** Planting and restoration of forests that result in long-term storage of carbon.	• Already widely practiced. • Could be deployed at scale with little further development. • Estimates suggest potential to remove up to 3-18 $GtCO_2$ per annum globally.	• Questions remain regarding social justice (i.e., land-use issues). • A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.
 **Biochar** Biomass burning under low-oxygen conditions (pyrolysis) creates 'biochar' which is then added to the soil to enhance soil carbon levels.	• A well-established technique with an evolving market. • Estimates suggest potential to remove up to 1.8-4.8 $GtCO_2$ per annum globally.	• Better reporting, monitoring and verification is required. • A transboundary trade in biochar may require international agreement re: carbon credit allocation. • A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.
 **Building with biomass** Using carbon embedded in biomass (such as timber) in construction.	• Widely practiced. • Estimates suggest potential to remove up to 0.5-1 $GtCO_2$ per annum globally by building with biomass in place of conventional materials.	• Imported timber may, in the future, require international agreement regarding carbon credits allocations. • Potential governance issues around land-use change. • A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.
 **Macroalgal cultivation for sequestration** The large-scale growing and sequestration of marine macroalgae.	• Techniques are readily available. • Development may be required to maximise methane and CO_2 capture and use. • Estimates suggest potential to remove up to 19 $GtCO_2$ per annum globally.	• Dependent on the location of cultivation which could be within in-shore or off-shore waters. • A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.
 **Carbon sequestration in soils** Land management changes that increase soil carbon concentration.	• No significant barriers. • Some have adopted the practice. Limited knowledge of the techniques in the agriculture community. Modeling estimates suggest potential to remove 1-11 $GtCO_2$ per annum globally.	• A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.
 **Restoring wetlands** Rewetting and reclaiming of wetlands, e.g., peatlands and mangroves to enhance carbon storage.	• Requires little new technology. Estimates suggest potential to remove up to 1 $GtCO_2$ per annum globally.	• A requirement for better monitoring, verification and reporting of achieved sequestration, longevity of storage and potential negative effects.

This briefing is based on the latest literature. Please notify contact@c2g2.net of any suggested corrections.