Protecting biodiversity and ecosystems helps mitigate climate change: The contribution of the Aichi Biodiversity Targets to land-based climate mitigation

Better protection, management and restoration of natural and managed ecosystems can make significant contributions to climate mitigation by reducing emissions from deforestation and other land use change, and by enhancing carbon sinks.

This report explores the interrelated – and interdependent – issues of biodiversity conservation and climate mitigation, highlighting why an integrated approach is needed to tackle these twin challenges and to contribute to other sustainable development goals. It describes the contribution of the Aichi Biodiversity Targets to the climate agenda.

Summary findings, facts and figures

The global carbon budget

- The global carbon budget over the first decade of the 21st century (2000-2009) can be summarized by the following fluxes (all in PgC/yr): 7.8 = emissions from fossil fuels and cement; 1.0 = emissions due to land use change; 2.4 = terrestrial sequestration; 2.4 = ocean sequestration; 4 = accumulation in atmosphere (Le Quéré et al. 2015).

Protecting natural ecosystems and restoration

- Ecosystem-based climate mitigation strategies including the halting of the conversion of natural terrestrial ecosystems (Aichi Targets 5 and 11) and restoring degraded ecosystems (Aichi Target 15) could make significant contributions to climate mitigation, although there is uncertainty in the magnitude of these contributions. Protection of ecosystems with large potential emissions of greenhouse gases upon conversion, such as forests and coastal ecosystems, is estimated to be one of the most cost effective means of climate mitigation.

    - Contributions to global carbon sequestration from afforestation, reforestation, avoided deforestation and improved forest management are in the range of 0.4 to 3.8 PgC/yr (IPCC WGII 2007). The estimated upper limit for mitigation through avoided deforestation is 1.6 PgC/yr (Birdsey & Pan 2015).

    - Ecosystems in protected areas of Brazil store about 32 PgC, and natural forests and savannahs on private properties store approximately 29 PgC (Soares-Filho et al. 2014). If all of the vulnerable carbon stocks were released from these areas, this would be the equivalent of about 7 to 8 years of current total global fossil carbon emissions, highlighting the high stakes in maintaining protected areas and minimizing habitat loss on private lands.

Bioenergy and ecosystem-based strategies as alternative approaches

- Avoiding deforestation and restoring ecosystems may currently be more effective than bioenergy as climate mitigation strategies. Existing biofuel crops are also often associated with large greenhouse gas emissions, direct and indirect land use change, and pollution. In the future, however, second-generation biofuels combined with carbon capture and storage could be more effective in climate mitigation.

    - The greenhouse gas mitigation potential over 30 years is substantially higher for planted forests than "first generation" biofuels currently in use (Evans et al. 2015). For example, planted forests in tropical regions have average mitigation potential of 127 Mg/ha/yr, compared to sugar cane (75 Mg/ha/yr) and oil palm (41 Mg/ha/yr) biofuels. Passive forest recovery through natural succession is also more efficient than most current biofuel crops.

Aichi Biodiversity Targets

The *Aichi Biodiversity Targets* are part of the Strategic Plan for Biodiversity 2011-2020 – A ten-year framework for action by all countries and stakeholders to save biodiversity and enhance its benefits for people. It was adopted by the Parties to the Convention on Biological Diversity and is comprised of shared vision, a mission, strategic goals and 20 ambitious yet achievable targets, collectively known as the Aichi Targets. Four of the Aichi Biodiversity Targets are directly related to land cover management and are particularly relevant to land-based climate mitigation. These targets are:

- *Target 5*: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
- *Target 7*: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
- *Target 11*: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.
- *Target 15*: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

UNEP

Convention on Biological Diversity

United Nations Decade on Biodiversity

Sustainable agricultural intensification

- Sustainable agricultural practices, including promoting soil carbon sequestration, could also potentially contribute to climate mitigation while reducing direct and indirect impacts on biodiversity (Aichi Target 7).

    - Reductions of greenhouse gas emissions from agricultural systems of 0.3 to 1.2 PgC/yr could be achieved in the near future through measures including conservation tillage, use of biochar (a type of charcoal) additions to some types of soils, improved fertilizer and water management and mitigation of non-CO_2 emissions especially methane from rice paddies and livestock (UNEP 2013, Campbell et al. 2014).

Reducing waste and over-consumption

- Promoting healthy levels of global meat consumption and reducing losses in food systems are among the most important alternatives for contributing to climate mitigation and protection of the environment (Aichi Target 4).

    - Sustainable and healthy diets could reduce global greenhouse gas emissions by the equivalent of ca. 0.3 to 0.6 PgC/yr compared to current trends, while also reducing disease (diabetes, cancer and coronary disease) and mortality. Healthy diets, compared to diets rich in red meat, are also projected to greatly reduce expansion of cropland area to feed a growing global population and substantially reduce loss of biodiversity (Powell & Lenton 2013, Tilman & Clark 2014).

    - A third of food is currently lost due to spoilage and waste (Foley et al. 2011). Processing losses are estimated to be 0.06 PgC/yr and food waste losses 0.08 PgC/yr: decreasing these losses would reduce the need to expand cropland area (Bajzelj et al. 2014).

Integrated insights on land-based mitigation: Looking into the future

- Scenarios that explore plausible future development pathways can help to evaluate the benefits and limits of various land-based climate mitigation schemes.

- Many current scenarios - including all of the recent RCP scenarios highlighted in the IPCC's fifth assessment report - foresee large-scale deployment of biofuels and corresponding land use changes and/or high rates of greenhouse gas emissions that are likely to be detrimental to biodiversity (Davies-Barnard et al. 2015, Newbold et al. 2015) .

- New scenarios are becoming available that explore ways to mitigate climate and minimize impacts on biodiversity (e.g., van Vuuren et al. 2015). There are plausible scenarios in which biodiversity protection, climate mitigation and human-development targets are broadly met simultaneously. The climate and biodiversity scientific communities will be working closely together to further explore these scenarios of sustainable futures.

- Overall, such scenarios converge on relatively similar conclusions about the components for achieving a sustainable future, even though there are important differences in relative contribution of each component and underlying mechanisms. These scenarios require:

    - Protecting intact forests and restoring ecosystems (Aichi Targets 5, 11, 15), as well as creating incentives for this protection and restoration (Aichi Target 3).
    - Focusing deployment of bioenergy crops on land with low carbon and biodiversity values, and avoiding incentives favoring undesirable land conversion, water use and pollution (Aichi Target 3).
    - Promoting "healthy" diets and reductions in losses in food systems (Aichi Target 4).
    - Sustainable intensification of agriculture with a focus on increasing efficiency (Aichi Target 7).
    - A rapid shift to renewable energy sources and increased efficiency of energy use (Aichi Target 4).

- A comprehensive understanding of the benefits and tradeoffs of a large set of land-based mitigation strategies is lacking and uncertainties associated with alternative strategies are high. Thus reducing fossil fuel based emissions must remain a priority.

References: Bajzelj et al. 2014. Nature Clim. Change. / Birdsey & Pan . 2015. Forest Ecol. Mgmt 355:83-90 / Campbell et al. 2014. COSUST 8:39-43 / Davies-Barnard et al. 2015. Global Biogeochem. Cycles 29:842-853 / Evans et al. 2015. Science & Tech. 49:2503-2511 / IPCC WGII. 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge University Press, Cambridge, UK / Le Quéré et al. 2015. Earth System Science Data Discussions 7:47-85. / Newbold et al. 2015. Nature 520:45- / Powell & Lenton. 2012. Energy & Environmental Science 5:8116-8133. / Soares-Filho et al. 2014. Science 344:363-364. / Tilman & Clark 2014. Nature 515:518-. / UNEP 2013. The Emissions Gap Report 2013. United Nations Environment Programme (UNEP), Nairobi / van Vuuren et al. 2015. Tech. Forecast. & Social Change 98:303-323.

Learn More

- A fully referenced version of this note, and the full paper on which it is based, are available at: www.cbd.int/climate/UNFCCCCOP21.shtml
- Strategic Plan for Biodiversity 2011-2020 - www.cbd.int/sp