EXPERT PERSPECTIVE FOR THE NDC PARTNERSHIP

Nature-Based Solutions for Better Climate Resilience: the Need to Scale up Ambition and Action

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The Paris Agreement's goal of staying under 2° Celsius and aiming for 1.5°C global warming, as compared to pre-industrial average global temperature, scientifically translates to limiting emissions of greenhouse gases within a finite global carbon budget. For carbon dioxide (CO_2, the dominant greenhouse gas), the remaining carbon budget for humanity to emit, beyond which we have a high likelihood of missing the Paris target, amounts to approximately 800 gigatonnes CO_2 equivalent ($GtCO_2e$). With approximately 50 $GtCO_2e$ emitted each year, this hints at the deep decarbonisation pathway the world now needs to follow. 800/50 $GtCO_2e$ gives us only 16 years remaining—at the current rate of emissions—in a fossil fuel-based world economy.

We know the current national pledges that were submitted to the United Nations Framework Convention on Climate Change (UNFCCC) at COP21 in Paris are insufficient to enable the world to stay below 2°C–the global emissions gap is a fact. This gap represents the difference between the level of greenhouse gas emissions, consistent with meeting the UNFCCC's 2°C and 1.5°C targets, and the emissions reductions that governments have committed through the initial Nationally Determined Contributions (NDCs).

The 2016 global Emissions Gap Report from the United Nations Environment Programme (UNEP) estimates that it will be between 3–12 $GtCO_2e$ in 2025 and 12–25 $GtCO_2e$ in 2030, based on existing reductions commitments. In its fifth assessment report, the Intergovernmental Panel on Climate Change (IPCC) estimates that the land use sector accounts for approximately 25 percent of global greenhouse emissions. Of this, agricultural emissions account for 5.0–5.8 $GtCO_2e$ (50 percent of which is attributed to livestock production) while land use change (e.g., deforestation, ecosystem conversion) accounts for 4.3–5.5 $GtCO_2e$. The IPCC further estimated the total mitigation potential of supply-side measures in the agriculture, forestry and other land uses (AFOLU) sector at between 7.2 and 10.6 $GtCO_2e$ per year by 2030. To achieve the UNFCCC's 1.5°C target, the global emissions gap is greater by up to an additional 7 $GtCO_2e$ by 2030.

This expert perspective is part of a series that invites internationally recognized experts to explore key issues countries face as they implement their Nationally Determined Contributions (NDCs) under the Paris Agreement on climate change. The views expressed are the authors' own, and do not necessarily represent the views of the NDC Partnership Support Unit, its member countries or organizations. Read the series at **www.ndcpartnership.org/perspectives**

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In summary, the global emissions gap that needs to be closed for 2030, in order to stay on target, is currently estimated at around 14 GtCO2e. This means that the projected global emissions of up to 56 GtCO2e must be reduced to 42 GtCO2e by 2030. The commitments in current NDCs would only reduce emissions by roughly 5 GtCO2e by 2030. This only closes the global emissions gap by approximately 36 percent of what is required, and major effort is required to upscale commitments.

Despite the NDC of the European Union Member States setting out a commitment to cut at least 40 percent in greenhouse gas emissions (Latvia Presidency 2015), Sweden's new Climate Act sets its own domestic targets higher at 70 percent by 2030 and 100 percent by 2045. It also requires annual climate reports in the country's Budget Bill (Government of Sweden 2017).

THE ROLE OF NATURE-BASED SOLUTIONS

The global emissions gap, the related effort required to upscale NDCs, and estimated impacts from climate change create a need for nature-based solutions in building resilience. The IPCC's Fifth Assessment Synthesis Report states "that impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability. Future risk is indicated to be high by the observation that natural global climate change, at rates lower than current anthropogenic climate change, caused significant ecosystem shifts and species extinctions during the past millions of years. Magnitudes and rates of climate change associated with medium-to-high-emission scenarios pose an increased risk of abrupt and irreversible regional-scale change in the composition, structure, and function of marine, terrestrial and freshwater ecosystems, including wetlands (medium confidence)."

Resilience defines the capacity of a system to deal with change and to continue to develop. Fundamentally, it is the ability to deal with shocks and stress without crossing tipping points and applies to human and environmental systems, from individual households to financial systems, ecosystems, and the biosphere as a whole. Resilience also includes the capacity to adapt to the change, i.e., to deal with change without crossing a threshold, and the ability to transform in situations of crises – essentially, the capacity to rebuild livelihoods or functioning ecosystems after crossing a tipping point.

Resilience provides a framework, or a way of thinking about how complex adaptive systems change at multiple interacting scales. Humanity has entered the Anthropocene, where the human world constitutes the largest driver of change on planet Earth, with rising social-ecological turbulence as a result. Shocks and stresses are therefore on the rise making resilience for development more important than ever.

Ecosystem resilience therefore plays a fundamental dual role, both as a strategy for climate mitigation and for climate adaptation (or climate resilience building). It is of fundamental importance to recognise that, despite exponential rise of unsustainable human pressures on Earth over the past 60 years (since the onset of the Anthropocene in the 1950s), the Earth's resilience has stayed largely intact.

Ecosystems on Earth continue to dampen and buffer human disturbance through negative feedbacks, which are a core feature of maintaining resilience. For example, land-based natural ecosystems and marine systems provide humanity with the world's single largest subsidy to the world economy, but also function as a natural carbon sink taking up ~50 percent of the annual human emissions of CO_2 from fossil-fuel burning. This is the planet's resilience at play. The Earth applies biophysical processes that allow it to remain in its current (and conducive for humanity) Holocene inter-glacial state, where it has been in since the last Ice Age, some 12,000 years ago.

Conservation, restoration, and the management of ecosystems play a crucial role in climate change mitigation (for instance, through land use forms that maintain carbon stocks, carbon sequestration and the reduction of greenhouse gas emissions). Likewise, such practices can be important for climate change adaptation, buffering societies from the impacts of climate change and reducing disaster risk. Safeguarding biodiversity through the sustainable management of ecosystems is therefore a strategic way of building climate resilience through mitigation (maintaining and enhancing carbon sinks) and adaptation (building more stress-tolerant ecosystems), forming a cornerstone of efficient policies for an integrated use of land and natural resources.

That means that a set of nature-based solutions to reduce the emissions gap should be deployed. Improved land use and management such as low-emissions agriculture, agro-forestry, and ecosystem conservation and restoration could achieve this task if properly implemented. Integrated land use lies at the heart of sustainable spatial and economic development, thus land use planning must be mainstreamed into climate/ecosystem (NDCs, Natural Biodiversity Strategies and Action Plans [NBSAPs], Land Degradation Neutrality plans), development (Sustainable Development Goals [SDGs]) and economic (Gross Domestic Product) policy and planning.

Furthermore, climate-smart land use planning could be activated at relatively low costs. It is not only required in the rural sector but at the landscape scale which accounts for its interface with urban, peri-urban, and other areas impacted by infrastructure development (UNCCD 2015). Hence, there is an urgent need to promote a more integrated climate/biodiversity/land agenda.

As noted by Naumann *et al.*, both nature-based climate change mitigation (where ecosystem services are used to reduce greenhouse gas emissions while conserving and expanding carbon sinks) and nature-based climate change adaptation (the conserving of ecosystem services that are necessary for human life and to reduce the impact of anticipated negative effects of climate change) seek to increase the resilience of ecosystems and thereby to stabilize the provisioning of important services. Stabilization and strengthening of the functional relationships within the ecosystem and between species to increase their resilience is an important requirement for this goal. Recognised synonyms of these practices include nature-based approaches or solutions and ecosystem-based approaches/adaptation (EbA).

Nature-based solutions combine climate change mitigation, adaptation, disaster risk reduction, biodiversity conservation, and sustainable resource management. That's why these approaches are often called "no-regret" options, meaning that the outcomes are fundamental for the maintenance of the economy and livelihoods in any scenario. They are often cost-efficient measures and flexible in dealing with a constantly changing climate and its associated risks.

Brazil's NDC intends to reduce greenhouse gas emissions by 37 percent below 2005 levels by 2025, while at the same time implementing policies and measures to adapt to climate change though building the resilience of populations, ecosystems, infrastructure and production systems by reducing vulnerability and through the provision of ecosystem services (FRB 2016). Linked to the NDC, as well as other international and national commitments on biodiversity and sustainable development, a presidential decree was signed in January 2017 to create the National Policy for Native Vegetation Recovery (*Política Nacional de Recuperação da Vegetação Nativa*) which will develop a National Native Vegetation Recovery Plan (*Plano Nacional de Recuperação de Vegetação Nativa*) in the first half of 2017, accelerate the implementation of existing related policies, encourage the creation of financial incentives and recovery technologies, promote the adoption of beneficial agricultural practices and establish markets for goods and services generated from the recovery of native vegetation (FRB 2017).

Such nature-based solutions for climate change can also complement existing technical approaches and—in some cases—even replace them. As policymakers have the tendency to implement traditional engineering solutions for adaptation, rather than investing in natural solutions, they must be made aware of these approaches.

THE NEED FOR COHERENT ACTION

Rockström *et al*. set out a roadmap for rapid decarbonisation over the coming decades to 2050, and translating our current scientific understanding of what is needed to meet the Paris Agreement, this roadmap shows that reduction in emissions of CO_2 from burning fossil fuels must follow a "global carbon law" of halving emissions each decade. It furthermore requires an agricultural revolution by transforming the world's agricultural systems from major carbon source to carbon sink, by mid-century, and further shows that the world needs to safeguard ecosystem resilience for carbon sinks across the world. All of this, including investments in carbon, capture and storage (CCS), are required to stand a chance to deliver on the Paris Agreement targets.

This is a major transformation, requiring the wide-scale use of well-proven policy instruments such as carbon tax schemes, cap-and-trade systems, feed-in-tariffs, and quota approaches during the remainder of the current decade. This transformation also includes the universal development of decarbonisation strategies for all industrialised world cities and major corporations, greater national commitments to becoming carbon neutral, and appropriate sustainable food system strategies. The major changes would happen between 2020–2030 where economic systems would drive greater energy efficiency through carbon pricing and taxes, and public and private investment in the research and development of climate solutions should increase by an order of magnitude including on bio-energy with CCS (BECCS) or direct air CCS. Between 2030–2040, all construction must become carbon-neutral or negative, coal will be phased out, and BECCS schemes rolled out. Between 2040–2050, national commitments to net-zero CO_2 emissions will be attained, and BECCS systems scaled up.

It must be recognised, however, that poorly conceived climate change interventions may harm biodiversity and even reduce resilience to climate change. Governments have recognised this through the UNFCCC, where decision 1/CP.16 affirmed that the implementation of REDD+ (Reducing Emissions from Forest Degradation and Deforestation) activities should promote and support the 'Cancun Safeguards'. These are a series of social and environmental safeguards that include avoiding the conversion of natural forests, incentivizing the protection and conservation of natural forest ecosystems and their services, and enhancing other social and environmental benefits.

Similarly for BECCS systems, scaling up of such measures needs to be done in a manner that does not jeopardise the livelihoods, food security, and ultimate well-being of local populations through land grabs and inequitable economic pressures leading to negative outcomes to indigenous peoples' and local communities' rights, biodiversity conservation, and societal acceptance. As such, safeguards must be put in place to recognize the role of biodiversity in underpinning local livelihoods and resilience, and acknowledge and ensure people's rights and access to natural resources and traditional practices. Therefore, local- and country-specific concerns must be suitably linked to the international level with appropriate governance, institutional frameworks, and accountability mechanisms in place.

OPPORTUNITIES AND CHALLENGES AHEAD

The carbon law presents a unique opportunity to transform policies (e.g., legislation, regulation, subsidies) that provide incentives and drive investment towards more sustainable, climate-smart land use management and planning. The challenge is to increase the capacity of land use planners to identify low-cost mitigation opportunities and manage resilience to climate and weather-related risks at progressively larger scales.

The development of a regenerative economy requires allowing nature to recover its strength and actively promote healing processes. This new rationale for the economic development can be deployed by an integrated agenda towards action, considering the current Anthropocene epoch. Human activity has reached and surpassed some planetary boundaries, but at the same time a set of international agreements create new opportunities for the post-2015 period. The Paris Agreement itself demands a strong consideration of carbon sinks to reach both the 2°C and 1.5°C scenarios. This cannot be reached without nature-based solutions as carbon sinks for facing climate changes dangerous and complexes impacts.

At the same time, Articles 3 and 4 of the Paris Agreement state that all Parties are to undertake and communicate ambitious efforts as NDCs (the Intended Nationally Determined Contributions are to be transformed to NDCs in 2018) to the global response to climate change. The efforts of all Parties will represent a progression over time and the opportunity for mainstreaming biodiversity into climate change mitigation and adaptation at national contexts is sizeable.

In addition to the Paris Agreement, countries have committed themselves to achieve the SDGs by 2030. This set of goals comprises a challenging scenario and an ambitious vision that should be fully valued and integrated into national decision making. Climate-related targets are therefore more likely to be reached by ensuring coherent national on economic and social development policies with biodiversity and climate change. Therefore, climate change policy development should align with other ecosystem-based planning (e.g., NBSAPs) on national mitigation and adaptation policies, and economic and social development plans should also recognise the role of nature-based solutions.

Countries, especially those least developed, face a number of challenges in implementing such plans and in reporting on their progress. Building national capacity to develop appropriate plans, to effectively implement them, and to improve data collection and metrics is therefore also required. A role for the NDC Partnership would be to support such capacity building through the provision of guidance, and the facilitation of and peer-to-peer knowledge sharing on the development and implementation of appropriate policy on using nature-based solutions to mitigate and adapt to climate change.

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