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CRITICAL REFORMS FOR EFFECTIVE AND TIMELY ACTION TO PREVENT IRREPARABLE HARM TO EARTH'S CLIMATE AND BIODIVERSITY:

A call for a Joint CBD & UNFCCC SBSTA Work Plan on Climate and Biodiversity Action

Policy Discussion Paper 3/23

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KEY RECOMMENDATIONS

1. We recommend that both the CBD and UNFCCC SBSTA's implement a joint work programme to fully operationalise the ecosystem provisions of the Paris Agreement to support and guide ecosystem-based and nature- based synergistic action in National Biodiversity Strategies & Action Plans (NBSAPs) and Nationally Determined Contributions (NDCs). We recommend that a joint CBD/UNFCCC SBSTA work programme:
    - Explore and articulate the ways in which the biodiversity and climate crises (and solutions) amplify each other;
    - Explain why protection is the priority and restoration is secondary;
    - Explain the functional dependencies and linkages between biological diversity, ecosystem integrity and effective climate mitigation and adaptation; and
    - Promote actions that buffer and reconnect existing biodiverse and carbon dense natural ecosystems – such as support for conservation management of Indigenous Territories and Connectivity Conservation.
2. We recommend that the new ecosystem accounting framework developed by the UN Statistical Commission (UNSEEA-EA) be integrated under both CBD and UNFCCC reporting to reveal the synergistic benefits, including economic benefits, from protecting and restoring carbon-dense and species-rich ecosystems.
3. We also recommend that the CBD:
    - Share its knowledge and expertise with the UNFCCC and promote the benefits for climate mitigation of encouraging the protection, improved conservation management and regeneration of Earth's high integrity, carbon dense ecosystems like primary forests in both NBSAPs and NDC's; and
    - Acknowledge its responsibility to guide low risk, long lived and synergistic climate and biodiversity action in natural ecosystems.

BACKGROUND

The latest World Meteorological Organisation (WMO) "Global Annual to Decadal Climate Update (GADCU), and the WMO State of the Global Climate 2022 Report should be the critical alarm call for urgent integrated global action to arrest the current trajectory of cascading collapses of climate, ecological and social systems. It was the WMO together with UNEP that in 1988 established the IPCC. The recent UNEP Emissions Gap Report and UNEP 2022 Adaptation Gap Report also reflect escalating alarm at the collective failure of effective action. Four former senior members of the IPCC Secretariat including Christina Figueres lamented serious shortcomings within the UN system (Kinley et al. 2021). They concluded that continuing as usual was unthinkable. Almost three years on, not much has changed to avoid the "unthinkable".

Both the CBD and UNFCCC have recognized the nexus between the biodiversity and climate change crises and the need for urgent mitigation action:

CBD COP 15, GBF Target 8

> ***"Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity."***

UNFCCC COP 27 Decision, CMA.4

"20. *Notes with serious concern* the finding in the latest synthesis report on nationally determined contribution, that the total global greenhouse gas emission level in 2030, taking into account implementation of all latest nationally determined contributions, is estimated to be 0.3 per cent below the 2019 level, which is not in line with least-cost scenarios for keeping global temperature rise to 2 or 1.5 °C;

The CBD first examined the linkages between climate change and biodiversity in 2009 in a report prepared by the second Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change, 'Connecting Biodiversity and Climate Change' (CBD Technical series No.41).

The Chair of AHTEG noted that in addition to the likely impacts of climate change on biodiversity:

> ***"The links between biodiversity and climate change flow both ways. Biodiversity, and associated ecosystem services are the cornerstone of sustainable development. This relationship has long been recognized through the decisions of the Conference of Parties to the CBD and through the adoption of Millennium Development Goal number seven on environmental sustainability. Biodiversity also has a very important role to play in climate change mitigation and adaptation. The importance of this relationship is only now coming to light, spurred by decision IX/16 of the Conference of the Parties to the CBD. The good management of ecosystems such as wetlands and forests, remains an effective mitigation option given the high sequestration potential of natural systems. The permanence of carbon sinks is also tied to the maintenance or enhancement of the resilience of ecosystems."***

Fourteen years later the urgency of ensuring policy and practice responds to the entwined biodiversity and climate crises is now inestimably greater. This juncture may be the last chance to change the trajectory of biodiversity loss and ecosystem decline, help reduce greenhouse gas (GHG) emissions from ecosystems, and avoid ecosystem tipping points.

Long-lived, stable and resilient carbon stocks stored in ecosystems with high levels of integrity act as a reservoir in the biosphere, and thus serve to keep carbon out of the atmosphere (Mackey at al., 2008; Barber et al., 2020; WEF, 2020). The degradation of ecosystems from human land use, interacting with climate change impacts, has a negative impact on biodiversity, reducing the stability and resilience of ecosystems and increasing the likelihood of carbon emissions into the atmosphere – creating a mutually reinforcing downward spiral. Some globally significant ecosystems, such as the Amazon rainforest, are even approaching tipping points, where a changing climate combined with deforestation and degradation, threaten widespread conversion of forest to savanna. Conversely, improving the protection of primary forests and ecologically restoring degraded natural forests can improve the outlook for biodiversity, increase carbon storage and improve the resilience and stability within forest ecosystems, and thus lower the risk of emissions and tipping points.

The stability, resilience and adaptive capacity of all ecosystems, including forests, in the face of climate and anthropogenic pressures depends on maintenance of their biodiversity, and allowing ongoing evolutionary processes and natural selection to enable them to persist and adapt. Maintaining biodiversity and natural processes is therefore key to ongoing ecosystem integrity and the foundation for effective climate mitigation and the provision of all ecosystem services on which humanity relies.

INTRODUCTION

The provision of all ecosystem services depends on protecting and restoring the integrity of ecosystems (Millennium Ecosystem Report 2005, AHTEG 2009, Rogers et al 2022). The CBD recognised this in the post-2020 Global Biodiversity Framework (Goal A) and in Target 1 which calls for the retention of all areas with high ecological integrity.

While keeping fossil carbon out of the atmosphere is straightforward – simply stop extracting and burning fossil fuels – retaining carbon in ecosystems is far more complex. Carbon in ecosystems naturally cycles through different pools – both emitting to and removing carbon from, the atmosphere as a result of Earth system dynamics. In addition, human activities have disrupted natural carbon cycles and reduced ecosystem integrity (AHTEG 2009; Mackey et al. 2013; Keith et al. 2022a; Rogers et al 2022).

We cannot protect the equable climate in which human societies have flourished and reverse the trajectory of biodiversity loss unless both the CBD and UNFCCC encourage improved protection and restoration of carbon dense natural ecosystems. Yet, neither treaty process has grappled with the changes in approach needed to succeed. Current UNFCCC Land Use, Land Use Change and Forestry (LULUCF) accounting rules are inadequate and fail to recognise the importance of protecting and restoring carbon stocks in natural ecosystems - notably primary and other natural forests (Keith et al. 2021, 2022a). These rules ignore the importance of forest ecosystem integrity for reducing risk and improving longevity of carbon storage, while allowing state parties to offset fossil fuel emissions through annual net forest sequestration – a problematic interpretation of the global 'Net Zero' goal.

The CBD has also failed to clearly identify and discourage climate actions that harm biodiversity. The rapid intensification of logging in natural forests to satisfy a burgeoning forest based bioenergy industry – demand created by inappropriate UNFCCC forest carbon accounting rules - being a devastating case in point (Booth 2018, Booth 2022)). Nor has the CBD contributed to the scientific discussion that invalidates the use of Nature-based Solutions (NbS) or Ecosystem based approaches (EbA) for the purpose of offsetting fossil fuel emissions Mackey et al. 2013).

The scale of the potential problem for both biodiversity and climate mitigation is revealed when the current proposed contribution of land to Nationally Determined Contributions (NDCs) is examined. Of the 1.3 billion hectares of land included in NDC's in 2022, roughly half (633 million ha) involve planting new trees - 225 million ha of which are clearly identifiable as monoculture plantations (Dooley et al, Land Gap Report 2022). The contribution of BECCS (Bioenergy Carbon Capture and Storage) to NDC's from only 4 countries where the contribution could be identified, requires 85 million hectares of new planting. Worryingly, the use of bioenergy is projected to increase by 250% over this decade (Environmental Paper Network, 2023) despite massive negative impacts on biodiversity, agriculture, human health and social justice, and the fact that carbon capture and storage remains completely theoretical with no short-term prospect of success at scale.

As concluded in the Land Gap Report: "Governments' reliance on land for carbon dioxide removal in climate pledges would require the equivalent to the entire area of global crop-land, increasing global pressure for land for food and biodiversity."(Dooley et al. 2022). The report also notes that the same pledges pay far too little attention to the importance of mitigation actions that focus on protecting and restoring existing carbon stocks in ecosystems.

The CBD's apparent reluctance to "trespass" on the territory of the UNFCCC is not justifiable as it leaves the fate of carbon-dense natural ecosystems, especially natural forests, solely to the purview of the UNFCCC. This has resulted in forests being governed by rules that are blind to the functional importance of biodiversity and ecosystem integrity for the longevity and stability of the carbon sequestered and stored in them.

We have seven years to move from a global 0.3% to 43% below 2019 emissions levels. The stability of carbon sequestered and stored in natural ecosystems is an important component of climate mitigation efforts but will be of little and declining benefit unless rapid and deep cuts to fossil fuel emissions are made by 2030 and overshoot of 1.5 degrees prevented. Achieving these highly challenging objectives will require close cooperation between the CBD and the UNFCCC

Failure to reflect ecosystem dynamics when operationalizing the forest provisions of the Paris Agreement or fully operationalise the ecosystem provisions of the Agreement, has resulted in failure to develop common principles, approaches and safeguards to conserve and enhance biological sinks and reservoirs that are grounded in a rights-based approach and recognise the functional role of biodiversity in underpinning ecosystem integrity and the stability and longevity of ecosystem carbon storage.

Addressing this failure is now an urgent priority. To do this, we recommend that both the CBD and UNFCCC SBSTA's implement a joint work programme to fully and appropriately operationalise the ecosystem provisions of the Paris Agreement to support and guide ecosystem-based and nature- based synergistic action in NBSAP's and Nationally Determined Contributions (NDCs).

Further, we recommend that the new ecosystem accounting framework developed by the UN Statistical Commission (UNSEEA-EA) be integrated into both CBD and UNFCCC reporting to reveal the synergistic benefits, including economic benefits, from protecting and restoring carbon-dense and species-rich ecosystems.

FINDINGS OF THE IPBES/IPCC 2021 WORKSHOP

The IPBES/IPCC workshop in 2021 was a welcomed 'clarion call' for synergistic climate and biodiversity action.

It was echoed in *Science* this year:

> ***"mounting scientific evidence points to the need to prioritize protection of remaining undamaged carbon- and species-rich environments and to implement targeted restoration projects, with more attention to effectively sustaining biodiversity and fairly distributed societal co-benefits" (Portner et al 2023)***

The seriousness of the workshop conclusions should not be ignored - notably that the biodiversity and climate crises amplify each other; that neither crisis can be solved unless they are solved together – 'if we fail on one we fail on both'; and that 'synergistic climate and biodiversity action must be encouraged' (Ipbes Media Release 10 June 2021).

The workshop clearly identified a cascading set of priorities for synergistic action - firstly improve protection and secondly restore, carbon-dense and species-rich natural ecosystems, "especially forests, wetlands, peat-lands, grasslands and savannahs; coastal ecosystems such as mangroves, salt marshes, kelp forests and sea grass meadows; as well as deep water and polar blue carbon habitats". (IPBES-IPCC 2021)

Conclusions drawn by the IPCC AR6, outlined below, support the workshop conclusion that protection, followed by restoration of carbon-dense and species-rich ecosystems should be a high priority for climate action.

The findings of the workshop should be carefully considered and examined through either a joint SBSTA work programme or a joint IPBES/IPCC Special Report or both.

KEY FINDINGS FROM IPCC AR 6 WORKING GROUPS II& III

Importantly, IPCC AR6 WG III (IPCC 2022) concluded that protection offers the highest mitigation value of any action in the agriculture, forests and other land uses (AFOLU) sector:

> ***"Among the mitigation options, the protection, improved management, and restoration of forests and other ecosystems (wetlands, savannas and grasslands) have the largest potential to reduce emissions and/or sequester carbon at 7.3 (3.9–13.1) $GtCO_2$-eq yr-1 (up to USD100 tCO_2-eq), with measures that 'protect' having the single highest total mitigation and mitigation densities (mitigation per area) in AFOLU (Table 7.3, Figure 7.11)....."; and that "the protection of high biodiversity ecosystems such as primary forests (SDG15) deliver high synergies with GHG abatement... ".***

WG111 also concluded that carbon lost from carbon dense ecosystems will be irrecoverable by 2050.

> ***"Most mitigation options are available and ready to deploy. Emissions reductions can be unlocked relatively quickly, ...The protection of natural ecosystems, ... Avoiding the conversion of carbon-rich primary peatlands, coastal wetlands and forests is particularly important as most carbon lost from those ecosystems are irrecoverable through restoration by the 2050 timeline of achieving net zero carbon emissions (Goldstein et al. 2020). ... ".***

The importance of maintaining and improving ecosystem integrity for climate adaptation was highlighted by WG II, with the Summary for Policy Makers (IPCC 2022) noting that:

> ***"Safeguarding biodiversity and ecosystems is fundamental to climate resilient development, in light of the threats climate change poses to them and their roles in adaptation and mitigation (very high confidence) drawing on a range of lines of evidence, suggest that maintaining the resilience of biodiversity and ecosystem services at a global scale depends on effective and equitable conservation of approximately 30% to 50% of Earth's land, freshwater and ocean areas, including currently near natural ecosystems."***

And:

> ***"Protecting and restoring ecosystems is essential for maintaining and enhancing the resilience of the biosphere (very high confidence). Degradation and loss of ecosystems is also a cause of greenhouse gas emissions and is at increasing risk of being exacerbated by climate change impacts, including droughts and wildfire (high confidence). Climate resilient development avoids adaptation and mitigation measures that damage ecosystems (high confidence). Documented examples of adverse impacts of land-based measures intended as mitigation, when poorly implemented, include afforestation of grasslands, savannas and peatlands, and risks from bioenergy crops at large scale to water supply, food security and biodiversity."***

RELEVANT CBD DECISIONS

While most CBD decisions relating to climate change focus on preventing or minimising harm to biodiversity from climate change impacts, CBD decision 14/5 expresses "deep concern" that *"escalating destruction, degradation and fragmentation of ecosystems would reduce the capacity of ecosystems to store carbon and lead to increases in greenhouse gas emissions, reduce the resilience and stability of ecosystems, and make the climate change crisis ever more challenging."* The CBD needs to reflect on the implications for GHG emissions if biodiversity loss and related loss of ecosystem integrity are not reversed and in particular from loss and damage to primary forests and other carbon-dense natural ecosystems.

Successive CBD decisions aimed at ensuring climate action avoids harm to biodiversity have had no discernible impact on UNFCCC rules - which have fostered forest-based climate action, such as tree planting and rotation harvesting, that is biodiversity blind - resulting in ongoing losses and damages to irreplaceable primary and other high conservation value natural forests (Rogers et al. 2022) and which hide emissions from logging (Mackey et al 2022).

There has never been a CBD SBSTA work programme to examine the impact of carbon accounting rules for land, forests and other ecosystems on outcomes for biodiversity and ecosystem integrity. Nor has the importance of biodiversity and ecosystem integrity for climate mitigation ever been assessed by the UNFCCC.

UNFCCC ECOSYSTEM PROVISIONS AND RELEVANT DECISIONS

The ecosystem provisions of the UNFCCC, article 4.1(d) have never been fully operationalized, even though Article 5 of the Paris Agreement reinforces this provision, and the preamble to the Paris Agreement (1.CP 21 (2015)) exhorts parties to protect biodiversity and ensure ecosystem integrity.

Article 4.1(d) of the Convention sets out the legal basis for the "conservation" and "enhancement" of GHG sinks and reservoirs, as well as the foundation for the development of LULUCF and REDD+ rules. It stipulates that:

> ***"1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:***
>
> ***(d) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems."***

Article 5 of the Paris Agreement states that:

> ***"1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.***
>
> ***2. Parties are encouraged to "take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches."***

Eight years after Paris, and despite its importance, Article 5 is yet to be operationalized to the degree required to deliver on its critical objectives. Despite pertaining to all ecosystems (5.1) and referring to a large set of decisions and guidance already agreed under the Convention (5.2), its focus has remained limited to forests, and in particular REDD+ activities. Moreover, the rules developed under 5.2 favour wood production forests and fail to adequately reflect the importance of biodiversity and natural forest ecosystem dynamics in primary and other natural forests.

Given the various challenges mentioned above, operationalizing Article 5 through a much broader and comprehensive approach is paramount to establish robust enabling conditions for effective and synergistic climate and biodiversity action, including in natural forests.

Recent UNFCCC COP decisions recognise both the linkages between the climate and biodiversity crises and the need for synergistic action, viz:

In 2018 the UNFCCC recognized the need for integrated action to prevent biodiversity loss and climate change (1.CP/25 para.15).

In 2021, article 38 of the Glasgow Climate Pact at Cop 27 emphasises:

> ***"... the importance of protecting, conserving and restoring nature and ecosystems, including forests and other terrestrial and marine ecosystems, to achieve the long-term global goal of the Convention by acting as sinks and reservoirs of greenhouse gases and protecting biodiversity, while ensuring social and environmental safeguards"***

And in 2022, COP 27, CMA 4 para. 1 underlines:

> ***"...the urgent need to address in a comprehensive and synergistic manner, the interlinked global crises of climate change and biodiversity loss in the broader context of achieving the Sustainable Development Goals, as well as the vital importance of protecting, conserving, restoring and sustainably using nature and ecosystems for effective and sustainable climate action".***

But without a UNFCCC SBSTA work programme to operationalize Article 5 it will be difficult, if not impossible, to reflect these decisions and key IPCC findings in NDC's. And without collaboration with the CBD SBSTA, there is a high risk that critical ecological principles and risks for longevity of carbon storage will be missed and ongoing damage to biodiversity from climate action in land, forests and other ecosystems will continue.

A specific work programme is needed to agree on a set of common principles and guidance – including further guidance on accounting – to help guide integrated climate and biodiversity responses, while ensuring that human rights, including the rights of Indigenous Peoples are respected, and that ecosystem integrity is protected and where needed, restored.

PROTECTING BIODIVERSITY IS CRITICAL FOR SUCCESSFUL CLIMATE MITIGATION IN FORESTS

Given that forests cover one third of Earth's land surface and harbor half its biodiversity, It is imperative that forest-based climate action appropriately integrates biodiversity protection and recovery.

It is therefore salutary that the UNFCCC definition of forests, which fails to distinguish between biodiverse natural forests and mono-culture plantations, combined with LULUCF and REDD+ rules developed to help retain forests, have failed to foster improved protection and ecological recovery of primary and other natural forests in both developed and developing countries. Worse, they have served to foster "solutions" such as burning forest biomass for energy which has intensified logging, harmed biodiversity and resulted in net increases in GHG emissions into the atmosphere (Booth 2022; Giuntoli et al. 2022).

Forests contribute to a comprehensive climate mitigation strategy by:

- Retaining an accumulated stock of living and dead biomass carbon & soil organic carbon (i.e., their "carbon retention" value);
- Maintaining the natural terrestrial carbon sink to buffer some of the impact of elevated atmospheric CO_2 concentration from fossil fuel emissions; and
- Removing CO_2 from the atmosphere through ongoing growth of primary forests and restoration of secondary natural forests and other degraded forest land.

Forests remove carbon continuously from the atmosphere and are currently estimated to provide a sink of −7.6 ± 49 Gt CO_2e per year, with 30 percent from tropical and subtropical forests, 47 percent from temperate forests, and 21 percent from boreal forests (Harris et al., 2021). This sink has been declining due to emissions from forest loss and degradation, interacting with increasing impacts from climate change (Raupach et al., 2014; Brienen et al., 2015; Steffen et al.; 2017, Gatti et al.; 2021, Zhu et al., 2021; Anderegg et al.,

Primary forests represent the highest level of ecosystem integrity along a continuum of ecosystem condition that reflects the impacts of human activities – from minimal to severe. This highest level is thus the reference condition (or benchmark) for assessing change in ecosystem condition in the past and potential gains in the future (Mackey et al. 2020; Rogers et al (2022). Ecosystem integrity is defined as the system's capacity to maintain composition, structure and function over time within a natural range

of variability at landscape scales, and based on ecological and evolutionary processes. Ecosystems with a high level of integrity have the capacity for self-organization, regeneration and adaptation by maintaining a diversity of organisms and their interrelationships (UN et al., 2021; IPCC, 2022a). Yet forests are still being lost at a rate of 3.4 million ha every year when they are irreplaceable for both their biodiversity and carbon retention value in any relevant time frame – 2030, 2050 and 2100.

Ecosystem integrity is underpinned by the functional role of biodiversity in ecological processes that results in a forest having a maximum degree of resilience and adaptive capacity (Thompson et al., 2009). Biodiversity refers to the diversity of species, the genetic diversity within species, and the diversity of ecological communities, including interactions across trophic levels. At the ecosystem level, it encompasses the diversity in composition, structure and function, and stabilizing feedbacks such as nutrient cycling. Consequently, if forests are degraded, species are lost and the functioning of the ecosystem, including its mitigation capacity, is diminished. Naturally evolved patterns of biodiversity comprise the most stable and resilient ecosystems and, within their system limits, provide natural resistance to threats that are increasing with climate change, such as pests, disease, drought and fire (Rogers et al. 2022). It follows that the carbon stored in ecosystems with higher levels of integrity are more stable and resilient. (Keith et al 2022b).

Forest restoration will only help climate mitigation if it is linked, and additional to, protecting existing primary forest ecosystems. The current focus on forest restoration creates a false sense that the destruction of primary and other natural forests can continue unchecked, ignoring the fact that full forest recovery, if allowed to occur, will take decades to centuries – time we simply do not have.

Current forest carbon accounting rules obscure the fact that any natural forest 30 years or older cannot regain the carbon lost to the atmosphere from logging by 2050. Net accounting of emissions and removals between the fossil fuel and AFOLU sectors hides the mitigation opportunity costs associated with logging natural forests and completely ignores the impact of logging on biodiversity and forest ecosystem integrity, as well as the increased risk of future loss. Allowing natural forests to reach their ecological potential (old growth or primary stage) maximises forest ecosystem carbon stocks, improves forest ecosystem integrity and stability and thus improves the longevity of carbon storage - both reducing GHG emissions and maintaining carbon sequestration. This is in large part due to recovery of their natural biodiversity (including structure and composition) which in turn improves ecosystem integrity and the forest's stability and resilience (Rogers et al. 2022).

Forest carbon cycles between trees, coarse woody debris on the forest floor, forest soils and the atmosphere, resulting in forest ecosystems accumulating substantial and long-lived carbon stocks. Primary forests store on average 50% more carbon than natural forests managed for wood production (Keith et al. 2021), with most of the above ground carbon stored in big old trees that are irrecoverable in human lifetimes (Keith et al. 2010, Lutze et al., 2018). Studies have shown that in all forest biomes, 40-60% of the above ground carbon is stored in big old trees which can comprise as little as 1-4% of the trees in a given area of forest (Clark and Clark 1996, Keith et al. 2010, Lutz et al. 2018, Mildrexler et al. 2020). Moreover, the natural composition and structure of forests play an important role in the longevity of carbon storage and reducing the risk of GHG emissions to the atmosphere. Despite global temperature rise and associated increased risks from drought and fire, primary forests are still resistant to and resilient in the face of risks that are increasing with climate change (Mackey et al 2020; Rogers et al 2022).

Well managed Protected Areas, Indigenous territories including Indigenous Protected Areas that support traditional management, and ' connectivity conservation' initiatives provide the best global examples of conservation management that delivers synergistic outcomes for climate mitigation, adaptation, biodiversity protection and ecosystem integrity and resilience (Mackey et al. 2023). Yet these essential biodiversity conservation measures, which also deliver robust climate mitigation and adaptation outcomes, are hard to identify in NDC's.

Much more needs to be done to increase knowledge and understanding of the essential and functional role biodiversity plays in underpinning every ecosystem service, including relatively stable carbon storage, on which humanity relies and the importance of conservation measures **including, inter alia, formal Protected Areas, supporting Indigenous lands, and connectivity conservation Initiatives, in retaining and recovering high integrity, relatively stable and low risk carbon stores.**

Given the strong emphasis on climate action in forests in NDC's and the relentless loss and damage to primary and other natural forests – fostered by a focus on forest cover, rather than forest quality and integrity in both SDG 15 and the UNFCCC – it is critically important for the CBD to work with the UNFCCC to ensure climate action in forests and other natural ecosystems is based on maintaining and improving the outlook for biodiversity and ecosystem integrity.

Improved management approaches are needed to:

- Protect primary forest for their carbon retention and biodiversity values;
- Restore biodiversity and carbon stocks in secondary natural forests to improve carbon sequestration and storage and reduce

climate risks; and

- Improve the stability for wood supply of high-risk monoculture plantations through improving their diversity (Keith et al 2021; Dooley et al. 2022).

A key challenge for the CBD is communicating and translating into policy the scientifically supported facts that:

- Ecosystems with naturally evolved patterns of biodiversity are the most stable and resilient and, within their system limits, confer natural resistance to threats that are increasing with climate change, particularly drought, fire and pests.
- Conversely, monoculture plantations and planted forests are at high risk of loss and damage. Though this is less of a concern when they are planted as tree crops for commodity productions as they are harvested on short rotations and are of negligible climate benefit.
- Agro-ecological plantings designed to improve the biological health of soil and provide food and other ecosystem services, or to deal with severe land degradation such as salination, desertification, wetland recovery and soil erosion, benefit from the additional stability and resilience of more biodiversity plantings.
- The ecological condition and integrity of ecosystems is important for the longevity of carbon storage - poor condition and low integrity are major factors increasing the risk of emitting additional GHG to the atmosphere.

Forest age structure is an important factor in resistance to extreme disturbances, such as wildfire and drought (Lindenmayer et al. 2022). Increased moisture retention and reduced fire severity is clearly evident in older natural forests compared to younger more recently logged forests (Wilson and Bradstock 2022)

All of these factors point to the urgent need to develop a new holistic framework for climate and biodiversity action in land, forests and other ecosystems.

THE ROLE OF FORESTS AND OTHER ECOSYSTEMS IN ACHIEVING NET ZERO

A joint CBD and UNFCCC work programme should include a sound scientific assessment of the role of forests and other ecosystems in achieving Net Zero goals.

Fossil fuel carbon and ecosystem carbon are not fungible and they are fundamentally different in terms of the stability of their carbon stocks and cycling through the atmosphere (Keith et al. 2021). The reporting in GHG inventories of net emissions allows the removals from natural forest growth to offset an equivalent amount of the emissions from fossil fuel use (Mackey et al., 2022a) with the perverse outcome that this use of forest removals as an offset mechanism has lessened the incentives and market pressure to reduce fossil fuel emissions.

The lifetime of the airborne fraction of a pulse of CO_2 has a very long tail, with a significant proportion (20-35%) persisting in the atmosphere for 2–20 millennia (Archer et al. 2009). It is the accumulated stock and longevity of atmospheric carbon that are the critical metrics for the climate, not the annual rate of net emissions. Hence, emissions and removals that occur over different time horizons should not be allowed as offsets.

The difference in timing between instantaneous emissions from combustion, and the long-term (decades to centuries) of removals by plant growth, means the elevated atmospheric CO_2 concentration cannot be compensated by forest removals in the critical decades to 2050 that matter for limiting global warming (Keith et al 2022).

The risks of losing carbon sequestered in ecosystems is directly linked to their integrity. A tonne of carbon retained in a primary forest is at much lower risk of loss that a tonne of carbon in a monoculture plantation or degraded forest. And no matter how safely a tonne of carbon is stored in an ecosystem, it is always at higher risk of loss than carbon stored in highly stable fossil fuel deposits.

Preventing and reducing emissions from all sectors is the highest mitigation priority – including from loss and damage to carbon-dense ecosystems as the carbon stored in them is “irrecoverable by 2050” (IPCC AR6 WG 111, chpt 7; Goldstein et al. 2020).

Priorities for retaining and recovering ecosystem carbon stocks must be based on scientific knowledge, which reveals that:

- The mitigation value of forests and other carbon-dense ecosystems resides in their ongoing capacity to sequester and store carbon.
- It is not just the rate at which carbon is input to an ecosystem (that is, the net primary productivity) that matters, but also the rate of carbon output (combustion and decomposition), which combined determines the carbon residence time.
- It is the size and longevity of the accumulated stock of carbon that matters most for climate mitigation.
- Biodiversity provides natural resistance, resilience and adaptive capacity to ecosystems and enables larger and longer-lived ecosystem carbon stocks. (Mackey et al. 2020, Rogers et al. 2022).

Both the CBD SBSTA and UNFCCC SBSTA should aim to increase understanding that Nature is integrally part of complex, interacting, adaptive social, economic and Earth systems, each with thresholds that determine transitions

to alternative states. Just as integrity and resilience of natural ecosystems are fundamental to addressing climate change, failure to control fossil-fuel carbon emissions will result in increased intensity and frequency of droughts and fires that undermine Nature's critical role in carbon storage (Brando et al. 2019). New forms of governance that holistically and adaptively manage all these factors will be essential.

We must move away from assuming tree planting and ecosystem restoration can offset ongoing fossil fuel emissions and offset emissions from the loss of primary forests and other carbon-dense natural ecosystems. Instead, focus in the land sector should be on reducing emissions by improving the integrity, stability and longevity of carbon sequestration and storage in carbon-dense natural ecosystems. Additionally, emissions should be avoided or reduced from intensive logging of natural forests. Many mitigations strategies are available to reduce emissions from agricultural practices. In this way, the AFOLU sector can make a separate and robust contribution to climate mitigation, complementing the deep and rapid cuts needed in fossil fuel emissions.

THE EDUCATION CHALLENGE

The discussion at COP 15 on target 8 illustrated that the periodic exchanges between the UNFCCC and CBD SBSTAs have failed to result in the practical changes needed to foster integrated and synergistic climate and biodiversity action.

Because the ecosystem provisions of the UNFCCC (Article 4.1 (d)) and the Paris Agreement (Article 5) have never been fully 'operationalised' it is difficult, if not impossible, to prioritize and implement Nature-based (climate) solutions (pers. Com. Christina Voight Chair, IUCN Commission on Environmental Law, WWF hosted side event at COP 27). Current UNFCCC LULUCF rules are unfit for operationalising NbS (Keith et al 2021) and it is arguable that all the rhetoric around ending deforestation (first by 2020 and now by 2030) fails because of this oversight.

The gulf between the UNFCCC and CBD must be bridged. It is now urgent to better explain the nature of the two-way linkages between the biodiversity and climate crises. The CBD and UNFCCC SBSTA's should:

- increase understanding of the functional role of biodiversity in underpinning ecosystem integrity and stability and thus the longevity of carbon storage in ecosystems, noting in particular the vital importance of retaining primary forests and other primary ecosystems (IPCC AR 6 WG 111);
- explain the central importance of longevity of carbon storage for climate mitigation and of maintaining and where necessary restoring ecosystem integrity for reducing risks to ecosystem stability, longevity of carbon storage, tipping points, and improving adaptive capacity to environmental change;
- provide guidance on the mutual benefits and priorities for integrating climate and biodiversity action to achieve strong synergistic outcomes;
- elaborate the risks for longevity of carbon storage from climate action in land, forests and other ecosystems that is not based upon protecting and restoring natural patterns of biodiversity to ensure ecosystem integrity;
- educate climate decision makers on the pitfalls and scientific fallacies from utilising nature/ecosystem-based climate action to offset ongoing fossil fuel emissions; and
- reflect on how best to fill information gaps in current LULUCF accounting rules and appropriately value ecosystem carbon stocks relative to ecosystem integrity (as per the UNSEEA-EA, see below).

THE NEED FOR ECOSYSTEM BASED ACCOUNTING

It is important to have an ecosystem accounting/information system capable of:

- registering the risk of carbon stock loss and how these risks differ with the level of ecosystem integrity;
- reflecting the linkages between the biodiversity and climate crises; and
- revealing the benefits of synergistic biodiversity and climate action.

The current carbon accounting system cannot satisfy these needs. It fails to facilitate synergistic action and fails to differentiate between carbon stored in high, medium and low integrity ecosystems at corresponding low, medium and high risk of loss. All carbon stocks are in effect assumed to have the same stability, longevity and resilience, and therefore that they are fungible (Ajani et al., 2013).

Carbon lost from primary forests is not offset by planting new trees. Assuming the loss of primary forests can be offset through new plantings, ignores the nature and scale of the carbon debt - reducing the carbon stored in the landscape and increasing the stock in the atmosphere, at least until planted trees reach the same size after decades, centuries or millennia. Moreover, new plantings have lower ecological integrity and thus a higher risk of loss.

Carbon accounting rules used to report national GHG inventories and develop the current pledges for NDCs (IPCC, 2006, 2019b) assume that only annual flows need to be estimated. This assumption is appropriate for fossil fuel emissions, which are one-way flows but inadequate to account for the two-way flows (emissions and removals) between the land and

atmosphere (Mackey et al., 2013). Reporting net emissions in the land sector, and using this to assess progress towards the goal of 'net zero' emissions (Allen et al., 2022), is misconceived because it conflates removals by natural forest growth with emissions from human activities (Keith et al. 2021). This net accounting also obscures the emissions from logging and masks the mitigation benefits of protecting and restoring natural forests (Mackey et al., 2022a).

Burning wood for bioenergy is similarly misrepresented. Forest biomass is not clean energy because burning it releases CO_2 emissions which are instantaneous, but their subsequent removal from the atmosphere takes a long time, thereby creating a significant time lag (Mackey et al., 2022b; Booth 2018, 2022). This is not a mitigation action for achieving net zero and competes with real clean energy sources, such as solar photovoltaic and wind (Brack, 2017; Booth, 2018, 2022; Law et al., 2018; Sterman et al., 2018; Keith et al., 2022). Again, carbon accounting rules are at fault. Emissions from combustion to produce bioenergy are not counted in the energy sector or facility where they occur. Emissions are not reflected in country level GHG accounts at all if forest biomass is imported, leaving it to the exporting country to appropriately reflect emissions from logging in their GHG accounts. By failing to report emissions in the facility or country where it is consumed, emissions from burning biomass cannot be compared with emissions from other energy sources (Pulles et al., 2022). Moreover logging emissions are netted out by ongoing natural growth in the rest of the forest estate creating a false sense that logging is carbon neutral or even carbon positive.

Current UNFCCC accounting rules and market approaches encourage offsetting and 'commodification' of carbon and nature in ways that obscure and delay the now urgent action needed to reduce emissions from all sectors.

Accounting rules need to be appropriate to ensure that the mitigation outcomes of different land use management strategies are reported transparently, and ensure decision makers can understand which policies and actions should be prioritised in order to be confident of achieving the desired mitigation outcomes while supporting the full range of ecosystem services, including carbon retention.

AN IMPORTANT ROLE FOR THE UNSEEA-EA

The UN System of Environmental Economic Accounting - Ecosystem Accounting (UNSEEA-EA) adopted in 2021 (UN et al. 2021) provides an important tool for bridging the UN Rio Conventions and filling critical information gaps on the integrity of ecosystems and the climate and biodiversity value of retaining and restoring high integrity, carbon-dense natural ecosystems.

This new accounting and information system enables State Parties to appropriately reflect the economic value of a country's ecosystem assets by encouraging and enabling them to progressively bring into the balance sheet of their National Accounts, the value of every ecosystem asset and all ecosystem services, based on their level of integrity.

The UNSEEA-EA helps reveal that high integrity ecosystems provide higher quality, more reliable, more stable and lower risk of loss ecosystem services, including the crucially important ecosystem service of carbon retention. It facilitates considering climate and biodiversity synergistically and acting holistically on mitigation, adaptation and climate resilient sustainable development.

Utilising the UNSEEA-EA in both the CBD and UNFCCC would provide the critical information needed to inform low risk climate, biodiversity and climate resilient development outcomes.

The UNSEEA-EA can provide this information because it has adopted a reference level of 'ecosystem integrity', which is defined as:

> ***"...the system's capacity to maintain composition, structure and function over time using processes and elements characteristic for its ecoregion and within a natural range of variability. The system has the capacity for self organisation, regeneration and adaptation by maintaining a diversity of organisms and their interrelationships to allow evolutionary processes for the ecosystem to persist over time at the landscape level. Ecosystem integrity encompasses the continuity and full character of a complex system"***

This reference level helps Parties track ecosystem condition over time and reveals the carbon carrying capacity of ecosystems in their natural state (under natural disturbance regimes) (Keith et al. 2020). Changes from this reference level can be assessed to reveal the true loss of carbon due to human activities and the potential gain through restoration and can incorporate long time horizons that reflect the full extent of carbon dynamics at landscape scales (Keith et al. 2019).

The additional information provided by the UNSEEA-EA includes 'comprehensiveness' in terms of all pools, ecosystem types and land areas, a missing element in GHG accounts. The UNSEEA-EA can encompass all ecosystems without necessarily incurring a penalty or bonus in a country's GHG accounts, and still reveal the mitigation benefits of and provide an incentive for improved conservation management.

The policy briefing note by Keith et al. (2021) describes how to utilize the UNSEEA-EA to reflect the carbon and biodiversity value of forest protection and restoration in three broad categories of forest condition (primary, secondary natural & monoculture plantation) in country level National Accounts.

CONCLUSION AND RECOMMENDATIONS

The fact that we are facing a biodiversity crisis that is just as destabilizing to future life on Earth as the climate crisis (IPBES 2018/19) makes it imperative to understand why improved conservation management of all natural ecosystems and particularly carbon-dense ecosystems, should be encouraged by both the CBD and UNFCCC and be at the centre of all climate action in land, forests and other ecosystems.

The natural dynamics of ecosystems – and the factors that affect their stability and resilience – determine carbon residence time and the ability of ecosystems to resist threats that are increasing with global warming (Keith et al 2021). Given the globally significant carbon reservoirs in ecosystems (Mackey et al. 2013), it is critically important to retain ecosystems that are in good condition and improve the integrity of fragmented and otherwise damaged or degraded ecosystems to increase the stability of current and future ecosystem carbon storage.

Retaining carbon through ensuring high integrity/ high carbon ecosystems are protected is a necessary mitigation action along with keeping fossil carbon in the ground for limiting warming to 1.5 or even 2 degrees – we cannot achieve our climate goals unless we do everything possible to keep carbon out of the atmosphere by dramatically reducing emissions from both sources: ecosystems and fossil fuels (IPCC SYR SPM, **https://doi.org/10.1016.oneear.2022.06.02**; **https://doi.org/10.1126/Science.aaw2741**)

Prioritising forest protection and ensuring forest restoration is linked to connectivity conservation management is essential. However, these priorities are not fostered by any of the current UNFCCC carbon accounting rules. The same is true for achieving the post 2020 goals and targets of the CBD where new indicators must be capable of reflecting basic differences in ecosystem integrity. For example, in forests where there are critical differences for biodiversity and climate mitigation in retaining high integrity primary forests, or allowing secondary natural forests to recover their biological potential, compared with plantation forests.

Maintaining and enhancing the services provided by healthy ecosystems is absolutely dependent upon retaining and restoring natural patterns of biodiversity across the natural (and shifting) ranges of ecosystems.

The new ecosystem accounting framework developed and adopted in 2021 by the UN Statistical Commission (the UNSEEA-EA) could help fill crucial information gaps in UNFCCC accounting and CBD targets and indicators, enabling the integrity of ecosystems to be assessed against a natural reference level and countries to include and value the ecosystem service of carbon retention, relative to the condition and ecosystem integrity of different kinds of forests (e.g., primary, secondary natural and monoculture plantation) in the balance sheets of their National Accounts.

Maintaining and restoring ecosystem integrity is important for achieving the goals of all the Rio Conventions and all of the SDGs but in particular SDG 15 (Life on Land). Increased focus on integrating climate and biodiversity action provides an opportunity to deliver multiple societal goals through ensuring the integrity of ecosystems

Achieving the goals and targets of the CBD and UNFCCC will not be possible unless carbon-dense and species-rich ecosystems are protected and restored. Significant progress towards recognising the crucial importance of protecting and restoring ecosystems has been achieved in the last five years but the principle of ecosystem integrity must now be fully implemented in monitoring frameworks and reporting and accounting rules of both Conventions; and at national scales in NBSAP's and NDC's. These concepts also need to be fully integrated across the entire UN architecture.

In addition to operationalizing Article 5 of the Paris Agreement a joint CBD/UNFCCC SBSTA work programme should:

- Explore and articulate the ways in which the biodiversity and climate crises (and solutions) amplify each other;
- Explain why protection is the priority and restoration is secondary;
- Explain the functional dependencies and linkages between biological diversity, ecosystem integrity and effective climate mitigation and adaptation; and
- Promote actions that buffer and reconnect existing biodiverse and carbon dense natural ecosystems – such as support for conservation management of Indigenous Territories and Connectivity Conservation.

We also recommend that the CBD:

- Share its knowledge and expertise with the UNFCCC and promote the benefits for climate mitigation of encouraging the protection, improved conservation management and regeneration of Earth's high integrity, carbon dense ecosystems like primary forests in both NBSAPs and NDC's; and
- Acknowledge its responsibility to guide low risk, long lived and synergistic climate and biodiversity action in natural ecosystems.

Failure to do so will result in failure to limit warming to 1.5 or even 2 degrees above pre-industrial levels, and lead to much of the climate action taken in land, forests and other ecosystems being low integrity, high risk and short term. Worse, removals in the AFOLU sector will be used to offset fossil fuel emissions in national GHG Inventories. which will serve to enable ongoing fossil fuel emissions and neutralise the mitigation good from natural forest growth.

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