Connecting the Dots

Achieving synergistic action for global biodiversity and climate goals utilising the Kunming-Montreal Global Biodiversity Framework

Technical Brief | UNFCCC COP 28
November 2023

Prepared by the World Commission on Protected Areas (WCPA) and the Climate Crisis Commission (CCC) of the International Union for the Conservation of Nature (IUCN)

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Introduction

Calls to integrate climate and biodiversity action have been mounting in the UNFCCC, culminating in key decisions at COP 27 (Decision 1/CP.27 para 1 and Decision 1/CMA. 4 para. 1) that underlined **"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...".** These decisions followed several relevant and important conclusions by IPCC AR 6 WGIII, notably that protection and restoration of natural ecosystems offers high mitigation potential with 'protection offering the highest mitigation value of any action in the AFOLU (Agriculture, Forestry and Other Land Use) sector and that **'high synergies with biodiversity exist in carbon dense ecosystems such as primary forests.'** (1)

The joint IPBES/IPCC workshop in 2021 (2), which revealed where synergies between biodiversity protection and climate mitigation lie, has yet to be built on, pointing to the need for either a joint IPBES/IPCC or joint CBD/UNFCCC SBSTA work programme (3). However, **the Kunming-Montreal Global Biodiversity Framework (K-M GBF) also provides a new opportunity to integrate climate and biodiversity action, support the rights and livelihoods of Indigenous peoples, and underpin climate resilient sustainable development.** Importantly, the UNFCCC can also embrace the GBF adopted by the CoP of the CBD in line with the mandates of the UNFCCC and the Paris Agreement.

This is feasible because an important area of overlap between the CBD, UNFCCC, and SDGs is their dependence on retaining and recovering the ecological integrity of ecosystems, or ecosystem integrity, which is in turn dependent on retaining and recovering biodiversity.

The UNFCCC/Paris Agreement Mandate on Ecosystem Integrity

During formulation of the Paris Agreement there were calls by many Parties to embrace holistic land sector climate solutions4 and ensure the Agreement's operational provisions support rights and protect biodiversity and ecosystem integrity. Ultimately the preamble to the Agreement reflected these calls and thus they are still applicable to all climate actions. Recent IPCC conclusions and UNFCCC COP decisions (5) make it an appropriate time to build on the language in the preamble and fully operationalize Article 5 of the Agreement.

We are at an important inflexion point for increased understanding that biodiversity is the foundation on which successful climate mitigation action in land, forests, and other ecosystems must be built in order to minimize the risk of losing ecosystem carbon to the atmosphere (6). This understanding has brought into sharp focus the relevance of biodiversity and ecosystem integrity for the conservation and enhancement of sinks and reservoirs of all terrestrial, coastal, and marine ecosystems (as per the preamble and in Article 5 of the Paris Agreement, which cross-references Article 4.1(d) of the UNFCCC)

Moreover, retaining and improving the adaptive capacity of ecosystems, including forests, in the face of climate and other anthropogenic pressures depends on maintaining their biodiversity to enable continuation of the foundational ecological and evolutionary processes (7).

Article 2 of the UNFCCC explicitly calls for retaining the adaptive capacity of natural ecosystems, stating that we must *"… achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."* Article 7 of the Paris Agreement reinforces this adaptation objective.

IPCC AR6 WGII provided important insights into the potential role of the K-M GBF in helping to retain and improve the adaptive capacity of ecosystems, notably concluding:

"Safeguarding biodiversity and ecosystems is fundamental to climate resilient development, in light of the threats climate changes poses to them and their roles in adaptation and mitigation (very high confidence). Recent analyses, 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% -50% of Earth's land, freshwater, and ocean areas, including currently near-natural ecosystems. (SPM.D.4)" 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 (SPM.D.4.2).*"

Maintaining biodiversity and associated natural processes is therefore key to on-going ecosystem integrity and provides the foundation for effective climate mitigation and adaptation in the biosphere and the provision of all ecosystem services, including carbon retention, on which humanity depends. (8)

The CBD Mandate on Ecological Integrity

The protection and recovery of biodiversity and ecological integrity are pillars of the K-M GBF and of central importance to the Convention on Biological Diversity as they underpin every ecosystem service on which humanity relies. (9)

While the entire K-M GBF framework would make a strong contribution to protecting and recovering ecological integrity and thus help protect and recover biosphere carbon reservoirs and maximize the resilience and adaptive capacity of ecosystems (10), several of the K-M GBF goals and targets are critically important for climate mitigation and adaptation and should be reflected in both Nationally Determined Contributions (NDCs) and National Biodiversity Strategy and Action Plans (NBSAPs). Goals A & B and Targets 1,2,3,4 & 8 are particularly relevant and outlined in Attachment A.

The effectiveness of climate mitigation and adaptation action in land, forests, and other ecosystems would be enhanced if, as a minimum, they were guided by and contributed to the K-M GBF goals and targets. With 30% of terrestrial and marine ecosystems needing to be protected through high quality conservation measures (Target 3) and a further 30% needing to be restored by 2030 (Target 2) in order to recover biodiversity and ecological integrity, it makes sense for these targets to inform climate action in land, forests, and other ecosystems.

Utilizing spatial planning (Target 1) to retain and recover areas of high ecological integrity, buffer and reconnect protected areas, and using new conservation tools such other effective area-based conservation measures (OECMs) (11) and connectivity conservation approaches (12) would deliver high synergies and lower-risk climate mitigation and adaption outcomes. The success of these approaches is closely linked to working with Indigenous and local communities to support and enhance climate resilient sustainable development, their rights, and cultural aspirations.

The importance of ecosystem integrity for carbon retention

Understanding the importance of biodiversity and ecosystem integrity for climate mitigation requires a deeper appreciation of the functional role of biodiversity in underpinning ecological processes and the provision of all ecosystem services including the ecosystem service of carbon retention. Ecosystem integrity affects the ability of all ecosystems to store carbon over long periods of time. (13)

The definition of ecosystem integrity adopted by the UN Statistical Commission in its System of Economic and Environmental Ecosystem Accounts is useful:

"The system's capacity to maintain composition, structure and function over time using processes and elements characteristic for its eco-region 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."

Notably, the IPCC defined ecosystem integrity as "the ability of ecosystems to maintain key ecological processes, recover from disturbance, and adapt to new conditions" (IPCC AR6 WG11, SPM footnote 50). (14)

Actions that help retain and recover ecosystem integrity, including the protection and recovery of the natural composition, abundance, and structure of biodiversity, contribute to ecosystem integrity and underpin the critically important ecosystem service of carbon retention, reduce the risk of GHG release to the atmosphere, and improve the longevity of carbon storage. Improving ecosystem resilience and resistance to threats that are increasing with climate change will help to conserve and recover carbon reservoirs in the Biosphere and improve their adaptive capacity (15) — both key goals of the UNFCCC and Paris Agreement. Attachment B reveals how to reflect ecological integrity and its relevance for carbon retention in forests.

Conclusion

The ecosystem service of carbon retention, together with every other ecosystem service, is dependent on the protection and restoration of biodiversity. Given the functional roles of biodiversity in ecosystem processes, its protection and restoration is essential for conserving carbon reservoirs in the biosphere and achieving the mitigation goals of Article 4.1(d) of the UNFCCC and Article 5 of the Paris Agreement.

Implementing the GBF goals and targets will also improve the natural adaptive capacity of ecosystems and the services they provide, and are thus key to delivering the adaptation goals of Article 2 of the UNFCCC and Article 7 of the Paris Agreement.

Recommendations

1. **Recognize that ensuring the integrity of all ecosystems including forests and oceans, through improved protection, restoration, and conservation management is essential for achieving the goals of the CBD, UNFCCC, and the Paris Agreement**—providing immediate and cost-effective benefits for biodiversity, climate mitigation, adaptation, and the SDGs.

2. **Prioritise protection and conservation management of high integrity carbon dense ecosystem**s like primary forests because their carbon stocks and biodiversity are irrecoverable by 2050, followed and supported by, restoration action that improves ecological integrity at a landscape scale.

3. **Utilise the K-M GBF to increase connections between key instruments and mechanisms** such as the NBSAPs of the CBD and the NDCs of the Paris Agreement.

4. **Adopt spatial planning approaches as called for in Target 1 of the K-M GBF**, in which to nest all of the GBF targets aimed at reducing biodiversity loss and improving ecological integrity.

5. **Recognise that the K-M GBF provides important tools for facilitating climate mitigation and adaptation.** Ensuring ecological "connectivity" at a landscape scale (Target 3 of the K-M GBF) will facilitate adaptation and improve ecological integrity and by buffering and reconnecting existing natural areas play an important role in enhancing and/or retaining ecological functions and services, including carbon retention.

6. **Reflect key principles of the K-M GBF** that encourage holistic action, support the rights and livelihoods of indigenous and local communities, and work with communities to deliver protection and restoration objectives essential for achieving long-term climate and biodiversity outcomes and climate resilient sustainable development.

The views expressed in this publication do not necessarily reflect those of IUCN or other participating organisations.

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Attachment A

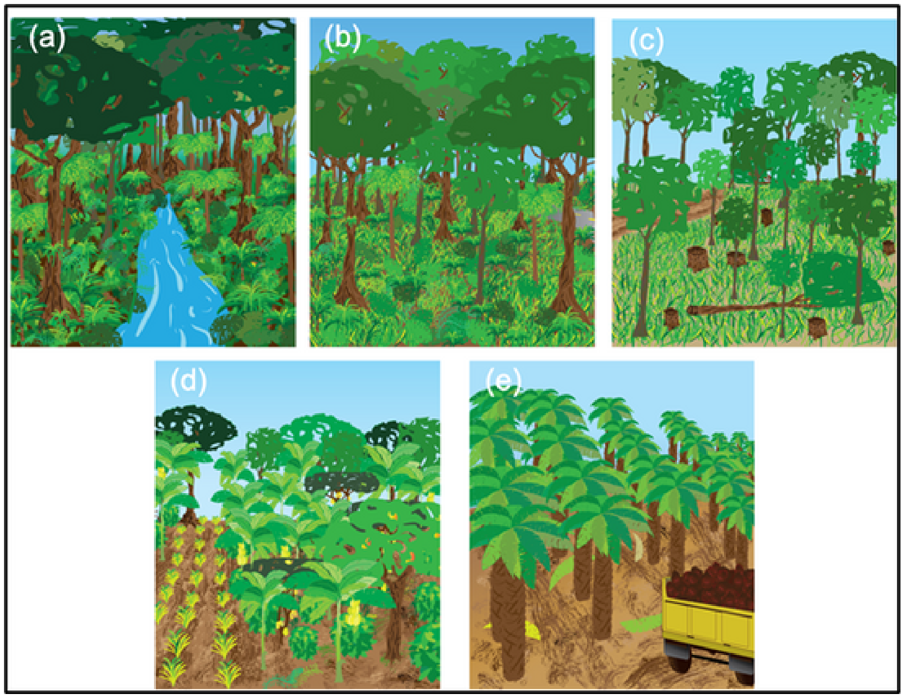
Strong and focused implementation of the Kunming-Montreal Global Biodiversity Framework is the best way to strengthen nature's contribution to the coupled climate and biodiversity crises. Goals and targets of particular importance for climate mitigation and adaption include:

- **Goal A** – "The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050…The genetic diversity within populations of wild and domesticated species is maintained, safeguarding their adaptive potential."
- **Goal B** – "Biodiversity is sustainably used and managed and nature's contribution to people, including ecosystem functions and services are valued, maintained and enhanced, with those currently in decline being restored, supporting the achievement of sustainable development for the benefit of present and future generations by 2050."
- **Target 1** – "Ensure that all areas are under participatory integrated biodiversity inclusive spatial planning and/or effective management processes addressing land and sea use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities."
- **Target 2** – "Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity."
- **Target 3** – "Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories."
- **Target 4** – "Ensure urgent management actions to halt human induced extinction…to maintain genetic diversity (and) adaptive potential…"
- **Target 8** – "Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation and disaster risk reduction including through nature based solutions and/or ecosystem based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity."

Attachment B

The significance of ecosystem integrity for carbon storage in Forests

Not all forests are equal in terms of their level of ecosystem integrity, carbon storage value, and how they are impacted by climate and other risks. **The figure illustrates these differences for five categories of forests:** *(a) primary forest; (b) secondary forest; (c) production forest; (d) agro-forestry; and (e) commercial plantation.* Higher integrity results in forests having more dense carbon stocks and greater stability, resilience and adaptive capacity in the face of escalating external pressures. The first table provides an overview of how these forest types differ in terms of their ecosystem integrity and the second table provides further details on the three key factors (structure, processes, stability).



Forest Type	Definition	Relative level of ecosystem integrity
(a) Primary Forest	Naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed	High levels for all three factors
(b) Secondary Forest	Natural forests recovering from prior human land use impacts. Canopies dominated by pioneer and secondary growth tree species	Moderate depending on time since disturbance
(c) Production Forest	The consequence of conventional forest management for commodity production (e.g., timber, pulp). Forest predominantly composed of trees established through natural regeneration, but management favours commercially valuable canopy tree species	Low to moderate depending on intensity of logging regimes and biodiversity loss
(d) Agro-forestry	Some level of natural tree species is maintained with subsistence food or commercial crops grown (e.g., shade coffee). Swidden subsistence farming commonly used by traditional communities. Utilizes a mix of natural and assisted regeneration	Low to moderate given sufficient management inputs
(e) Commercial Plantations	Forest predominantly composed of trees established through planting and/or seeding and intensely managed for commodity production (timber, pulp, plant oil)	Low

Primary forest

- Naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed
- Likely to have never been commercially logged or intensely managed
- At a landscape level, can comprise early successional (seral) stage following natural disturbances
- More likely to contain full complement of evolved natural biodiversity
- Often the customary territories of Indigenous Peoples

Dissipative structures	• *Ecosystem processes*	• *Stability and risk profiles*	• *Ecosystem integrity level*
• Canopy trees dominated by large, old trees • In wet tropics, closed canopies • Dense soil organic stocks • Typically significant quantities of dead biomass	• Fully self-generating (autopoiesis) • In temperate and boreal forests, includes seral stages following natural disturbances • Tight nutrient cycling with minimal leakage and/or erosion • Clean water supply	• Highly resistant and/or resilient to extreme weather events • In boreal and temperate biomes, fire-adapted plant species • Rich biodiversity provides functional and phenotypic adaptive capacity	• High levels for all three factors

Secondary forest

- Natural forests recovering from prior human land use impacts
- Canopies dominated by pioneer and secondary growth tree species
- If not subsequently disturbed by human land use, can continue to develop additional primary forest attributes over time

• *Dissipative structures*	• *Ecosystem processes*	• *Stability and risk profiles*	*Ecosystem integrity level*
• In wet tropics, canopy closure can occur within 1–2 decades • Aboveground living significantly less than primary forests • Some dead biomass may remain	• Fully self-regenerating so long as primary propagules/seed stock are available • Soil carbon and nutrients stocks can be depleted due to past erosion and biomass removal	• In temperate and boreal forests, increased exposure to wildfire and drought impacts due to more open canopy and drier forest interior • Reduced biodiversity impairs some key processes (e.g., pollination, top-down tropic control)	• Moderate depending on time since disturbance

Production forest

- The consequence of conventional forest management for commodity production (e.g., timber, pulp)
- Forest predominantly composed of trees established through natural regeneration, but management favors commercially valuable canopy tree species

• *Dissipative structures*	• *Ecosystem processes*	• *Stability and risk profiles*	*Ecosystem integrity level*
• Logging regimes maintain a predominantly even-aged, younger age structure (~20–60 years) • Simplified vertical vegetation structure	• Canopy tree species natural regenerated but some level of assisted regeneration common • Ongoing soil loss	• More flammable forest conditions • Greater exposure to invasive species	• Low to moderate depending on intensity of logging regimes and biodiversity loss

Agro-forestry (commercial, subsistence)

- Some level of natural tree species is maintained with subsistence food or commercial crops grown (e.g., shade coffee).
- Swidden subsistence farming commonly used by traditional communities
- Utilizes a mix of natural and assisted regeneration

Dissipative structures	*Ecosystem processes*	*Stability and risk profiles*	*Ecosystem integrity level*
• A curated canopy of trees, often remnant from primary forest or planted from local stock • Little if any understory • Ground cover are food crops	• In tradition swidden system, closed nutrient cycle through use of natural regeneration • Canopy trees buffer food crops from extreme weather and help maintain soil moisture	• Intensive small-scale management and modest level of biodiversity provides assisted resilience and adaptive capacity	• Low to moderate given sufficient management inputs

Source:

Rogers B.M., Mackey B., Shestakova T.A., Keith H., Young V., Kormos C.F., DellaSala D.A., Dean J., Birdsey R., Bush G., Houghton R.A. and Moomaw W.R. (2022) Using ecosystem integrity to maximize climate mitigation and minimize risk in international forest policy. Front. For. Glob. Change, Sec. Forest Management. https://doi.org/10.3389/ffgc.2022.929281