

**International Atomic Energy Agency input on United Nations Secretary General report
on Oceans and the Law of the Sea,
within the thematic of “Marine Ecosystem Restoration”**

Blue carbon ecosystems are coastal vegetated ecosystems, including mangroves, seagrasses, and saltmarshes, found all around the world, with the exception of Antarctica. These are truly remarkable ecosystems, providing a wide range of ecological, social, and economic benefits.

From a societal and economic perspective, blue carbon ecosystems support indigenous communities and contribute significantly to national economies, particularly in Small Island Developing States (SIDS). They serve as breeding and nursery grounds for numerous commercially important species, acting as vital biodiversity hotspots that sustain fisheries and underpin coastal livelihoods.

From an environmental standpoint, these ecosystems are critical to achieving global conservation objectives, including Target 3 of the Kunming–Montreal Global Biodiversity Framework, which aims to protect 30% of the planet by 2030. Protecting and restoring blue carbon ecosystems is essential for halting biodiversity loss and strengthening the recovery and resilience of coastal ecosystem functions and services.

In the context of climate change and ocean acidification, blue carbon ecosystems play a critical role. Their high primary productivity, the substantial accumulation of organic matter in sediments, and the efficient preservation of organic matter under anoxic conditions for centuries to millennia result in exceptional carbon sequestration and burial rates. As a result, carbon burial rates per unit area in blue carbon systems are approximately an order of magnitude greater than in terrestrial forests, making them significant contributors to nature-based solutions for climate change mitigation and adaptation. Realizing their potential requires reversing the ongoing global loss of BCEs. While their contribution to global offsets is modest, it can be substantial for countries with extensive BCEs, low emissions, and high restoration potential, representing a significant fraction of national land-based emissions.

Restoration of blue carbon ecosystems is therefore central to climate mitigation efforts, but its contribution depends critically on the concept of *additionality*. *Additionality* refers to the extent to which carbon benefits (such as avoided emissions, increased sequestration, long-term storage) would not have occurred in the absence of a deliberate restoration intervention. Restored ecosystems must therefore generate carbon gains that exceed those expected under a business-as-usual scenario.

In blue carbon systems, restoration can generate additionality through several mechanisms. Re-establishing vegetation on degraded sites enhances carbon sequestration and resumes sediment accumulation. These ecological responses can lead to measurable increases in carbon stocks and accumulation rates that clearly surpass natural recovery trajectories. Moreover, restoration delivers crucial co-benefits, including enhanced biodiversity, improved fisheries productivity, and increased coastal protection, thereby strengthening the resilience of coastal communities.

Through its research and development activities to address knowledge gaps and its capacity building efforts, the IAEA Marine Environment Laboratories work closely with Member States to strengthen their ability to use blue carbon ecosystems as nature-based solutions for climate change and ocean acidification mitigation, coastline protection from extreme events such as hurricanes, and biodiversity restoration and conservation. The IAEA efforts emphasize the generation of quality-assured data to support evidence-based policymaking and the development of national regulations.

The Agency also assists countries in building national carbon inventories, a critical step in preparing their Nationally Determined Contributions (NDCs) under the Paris Agreement, and in accessing climate finance mechanisms.

The IAEA Marine Environment Laboratories blue carbon activities are closely aligned with the goals of the UN Decade of Ocean Science for Sustainable Development. Through participation in initiatives such as the Global Ocean Blue Carbon (GO-BC) Programme and the Ocean Acidification International Coordination Centre (OA-ICC), the Agency contributes actively to advancing ocean-based climate and biodiversity solutions. Working together with Member States, partner agencies and institutions, the IAEA helps to generate and share high-quality data and strengthen scientific understanding of the ocean–climate–biodiversity nexus. These collective efforts support the development of effective solutions to enhance climate adaptation and mitigation worldwide while promoting biodiversity in marine ecosystems.