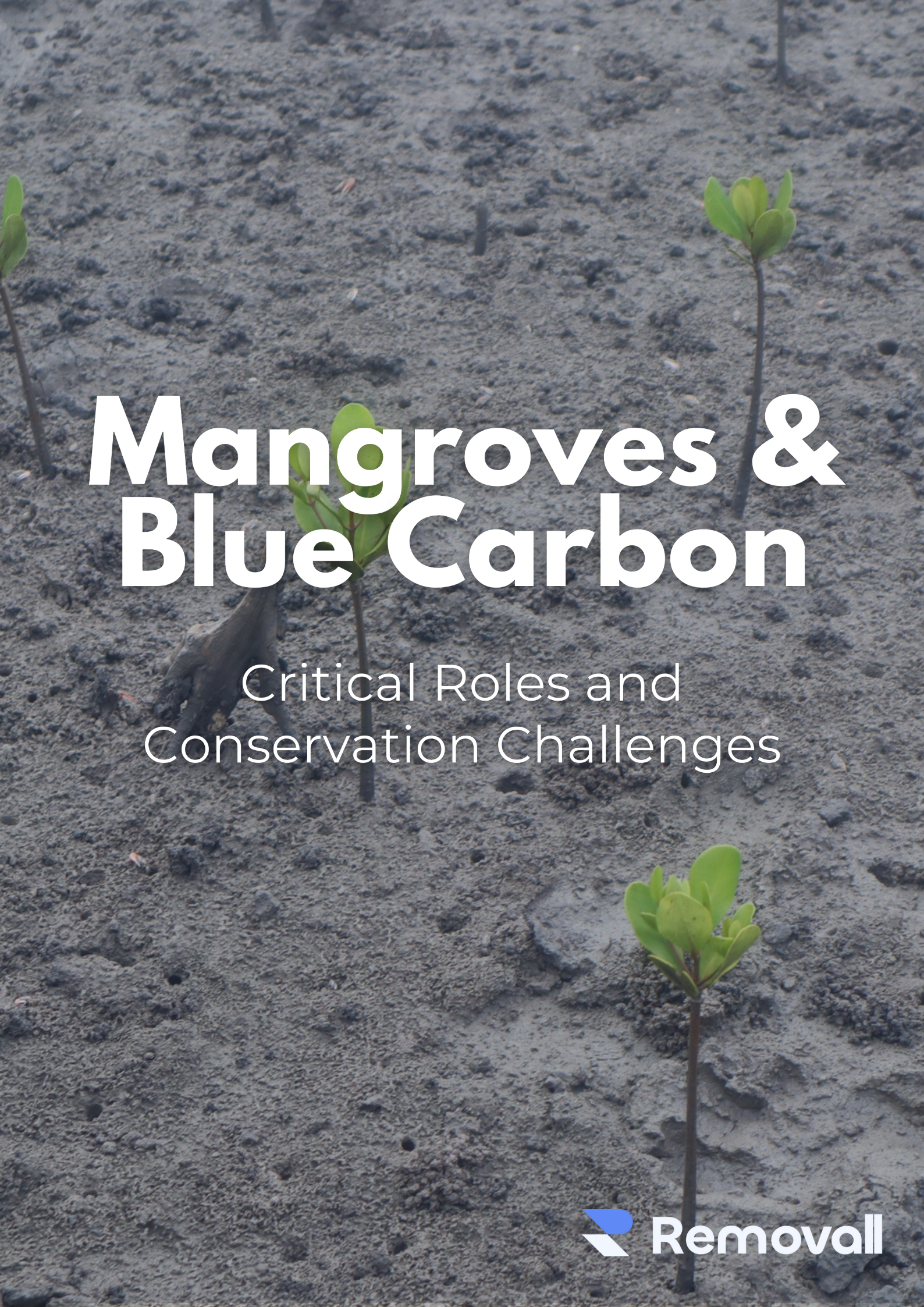


Mangroves & Blue Carbon

Critical Roles and Conservation Challenges

Removall

Mangroves, unique coastal forests, play a significant role in mitigating climate change. This ecosystem is highly efficient at sequestering carbon in its biomass and sediments, making it one of the most carbon-dense ecosystems globally.

What are Mangroves?

Mangroves are **coastal forests located in tropical and subtropical latitudes**, near the equator, because they cannot tolerate freezing temperatures. Mangroves are found in several regions, such as **Southeast Asia, the Caribbean, African coasts, and parts of Australia and South America** *(Rotich et al., 2016)*.

Mangroves are characterized by their ability to **grow in saline environments with low oxygen levels**, making them unique among trees *(UNESCO, 2023)*. Mangrove forests are also known for their high productivity, abundant biodiversity, and ability to thrive in the challenging and ever-changing boundary between land and sea.

A total of **73 mangrove species and hybrids are classified as true mangroves** (ITTO, 2012). Differences in mangrove forest structure and species composition are significant across continents (FAO, 2007).

Mangroves in Mozambique

This ecosystem also plays a critical role in multiple ways within coastal landscapes, particularly where communities depend on the richness of the aquatic resources their habitat supports (Rotich et al., 2016).

What is Blue Carbon?

Blue carbon refers to the **carbon captured by the world's oceanic and coastal ecosystems, primarily mangroves, seagrasses, and salt marshes.**

Mangroves play a crucial role in this process by sequestering carbon dioxide from the atmosphere through photosynthesis and storing it in their biomass and sediments *(Akram et al., 2023; UNESCO, 2023)*. This makes them a vital component in the fight against climate change.

Mangroves in the Sundurbans in India

Mangroves in the Sundurbans in India

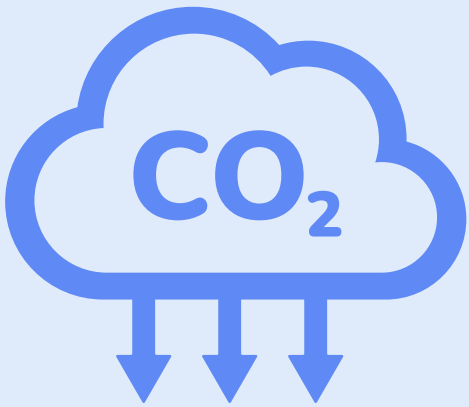
The Role of Mangroves in Blue Carbon Sequestration

Mangroves are incredibly efficient at **capturing and storing carbon**. **They sequester CO2 from the atmosphere through photosynthesis and store it in their roots, trunks, and leaves, as well as in the sediment.**

Research indicates that the **carbon accumulation in mangrove sediments increases with the age of the trees**, attributed to the progressive buildup of organic matter (OM) from plant debris and other sources, which becomes trapped in the sediment and is protected from decomposition due to anaerobic conditions *(Ray et al., 2023; Zeng et al., 2021)*.

The spatial variation in organic carbon sources within mangrove ecosystems further enhances their carbon storage capacity. For instance, the interior mangrove sites, are mainly, composed of plant-derived OM, whereas the proximal tidal flats contain more algal OM.

This spatial diversity ensures a robust and sustained carbon sink across different parts of the mangrove ecosystem *(Ray et al., 2023)*. Additionally, the stability provided by mangrove root systems helps trap sediments rich in organic carbon, further contributing to carbon sequestration *(Ray et al., 2023)*.



Potential for Climate Change Mitigation

Mangroves hold immense potential for climate change mitigation through blue carbon initiatives. **Protecting and restoring mangrove forests could significantly contribute to reducing atmospheric CO2 levels.** A study highlighted that **blue carbon credits could protect approximately 20% of global mangrove forests from deforestation.** These credits offer financial incentives for conserving these ecosystems, which can be particularly beneficial for tropical coastal countries striving to meet climate change goals *(Zeng et al., 2021)*.

Furthermore, mangroves' ability to act as natural barriers against coastal erosion and storm surges adds another layer of climate resilience. **By stabilizing shorelines and reducing the impact of extreme weather events, mangroves protect both biodiversity and human communities**, enhancing overall ecosystem resilience *(TNC, 2021)*.

Coastal habitats are important for capturing carbon, but their destruction poses a great risk. **When these habitats are damaged or destroyed**, it is not only their carbon sequestration capacity that is lost. **Carbon stored in the habitats can also be released, contributing to increased levels of greenhouse gases in the atmosphere.**

They also provide critical habitats for various marine species, contributing to biodiversity and supporting fisheries that many coastal communities depend on for their livelihoods *(Zeng et al., 2021)*.

Conservation Challenges and Strategies

Despite their importance, **mangroves face several significant threats** primarily **due to human activities** and **climate change impacts** such as sea-level rise.

The primary threats include **deforestation** for agriculture, charcoal production, aquaculture, and the creation of salt ponds, as well as **urban development** and infrastructure expansion. These activities result in habitat loss and fragmentation, severely impacting the biodiversity that relies on mangrove ecosystems. **Additionally, industrial and agricultural runoff pollution contaminates mangrove habitats**, further degrading these vital areas *(Akram et al., 2023)*.

To counteract these threats, effective conservation strategies are essential to safeguard these vital ecosystems. For instance, **community-based management initiatives play a vital role**, as they engage local populations in sustainable practices and education about the importance of mangroves. **Restoration projects**, which involve replanting and rehabilitating degraded mangrove areas, **are another essential strategy to recover lost ecosystems** and enhance their resilience against climate change. This helps in carbon sequestration and supports local livelihoods by sustaining fisheries and other mangrove-related economic activities *(TNC, 2021)*.

In addition, **the development of blue carbon projects also offers a promising opportunity for mangrove conservation.** These projects benefit from the significant carbon sequestration capacity of this ecosystem. Thus, by managing mangroves for their blue carbon potential and obtaining carbon credits, projects can secure funding for mangrove protection and restoration. This economic incentive encourages both governments and private entities to invest in maintaining and expanding mangrove forests, thereby promoting long-term conservation and the mitigation of climate change impacts *(Donato et al., 2011; Zeng et al., 2021)*.

Current Status of Blue Carbon Projects and Future Prospects

Despite their importance and potential, there are still relatively few certified blue carbon mangrove projects worldwide that generate carbon credits. This imbalance between low supply and high demand presents both a challenge and an opportunity in the carbon market.

Removall, committed to advancing the blue carbon initiative, has been developing blue carbon projects for over three years. These projects are set to be certified and are expected to start generating carbon credits by 2025. By contributing to the emergence of blue carbon, Removall aims to enhance the availability of carbon credits and support the global effort to mitigate climate change through the preservation and restoration of mangrove ecosystems.

Conclusion

Mangroves are indispensable for their blue carbon sequestration capabilities, offering a natural solution to climate change mitigation. Protecting and restoring these ecosystems is vital for maximizing their carbon storage potential and enhancing coastal resilience. However, addressing the challenges they face requires a collaborative approach involving local communities, policymakers, and scientific advancements. By leveraging blue carbon credits and community-based management, we can ensure the sustainable conservation of mangroves for future generations.

Want to know more about Blue Carbon projects?

Contact us

FOLLOW US ON

www.removall-carbon.com

contact@removall-carbon.com

https://www.linkedin.com/company/removall-carbon

References

- *Akram, H., Hussain, S., Mazumdar, P., Chua, K. O., Butt, T. E., & Harikrishna, J. A. (2023). Mangrove health: A review of functions, threats, and challenges associated with mangrove management practices. Forests, 14(9), 1698.*

- *Donato, D. C., Kauffman, J. B., Murdiyarso, D., Kurnianto, S., Stidham, M., & Kanninen, M. (2011). Mangroves among the most carbon-rich forests in the tropics. Nature geoscience, 4(5), 293-297.*

- *Food and Agriculture Organization of the United Nations (FAO) (2007). The world's mangroves 1980–2005: A thematic study prepared in the framework of the global forest resources assessment 2005. FAO Forestry Paper 153. Rome, Italy: FAO.*

- *International Tropical Timber Organization (ITTO) (2012). Mapping mangroves. Tropical Forest Update, 21(2). Yokohama, Japan: International Tropical Timber Organization.*

- *Ray, R., Suwa, R., Miyajima, T., Munar, J., Yoshikai, M., & Nadaoka, K. (2023). Sedimentary blue carbon dynamics based on chronosequential observations in a tropical restored mangrove forest. Biogeosciences, 20(4), 911-928.*

- *Rotich, B., Mwangi, E., & Lawry, S. (2016). Where Land Meets the Sea: A Global Review of the Governance and Tenure Dimensions of Coastal Mangrove Forests-Report Brief.*

- *The Nature Conservancy (TNC) (2021). State of the World's Mangroves. Retrieved from https://www.nature.org/content/dam/tnc/nature/en/documents/state_of_word_mangroves.pdf*

- *UNESCO. (2023). An Inside Look at the Beauty and Benefits of Mangroves. Retrieved from https://www.unesco.org/en/articles/inside-look-beauty-and-benefits-mangroves*

- *Zeng, Y., Friess, D. A., Sarira, T. V., Siman, K., & Koh, L. P. (2021). Global potential and limits of mangrove blue carbon for climate change mitigation. Current Biology, 31(8), 1737-1743.*