

DR CONGO MANGROVE BLUECARBON PROJECT



Document Prepared by ClimeTrek Limited

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Project Proponent(s)	ClimeTrek Limited DK Balian dk.balian@climetrek.com / info@climetrek.com +447825-04785
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Project Lifetime	1 May 2020 – 31 December 2049; 30years
GHG Accounting Period	01-May-2020– 30-Apr- 2050; 30 years
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Gold Level Criteria	This project will meet the Gold Level criteria for climate change adaptation, community and biodiversity. Details will be provided in the document.
Expected Verification Schedule	To be confirmed

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1 SUMMARY OF PROJECT BENEFITS

Mangrove forests hold immeasurable value for coastal communities, serving as a crucial source of livelihood. Despite being officially classified as 'poor' in statistics, communities residing in thriving mangrove areas enjoy a wealth of diverse and plentiful food resources. Additionally, mangroves cater to various needs, complemented by other productive activities like agriculture, poultry farming, and beekeeping. The versatile use of mangrove wood further extends to crafting clotheslines, traps, paddles, yam logs, fences, sculptures, construction poles, fuel, and more (World Rainforest Movement, 2002).

In the Democratic Republic of Congo (DRC), the mangrove forest plays a pivotal role in the ecosystem, offering numerous benefits to local indigenous communities. These encompass critical functions such as shoreline protection and acting as breeding and feeding grounds for the lucrative local fishery industry. However, human-induced activities, particularly changes in land use and climate-induced sea level rise, pose substantial threats to mangrove forests, resulting in a rapid decline. The diminishing mangrove cover has sparked concern among local communities, key stakeholders, and the government. Agencies like the Institut Congolais pour la Conservation de la Nature (English; "Congolese Institute for Nature Conservation", ICCN) are actively engaged in devising innovative management approaches to prevent, halt, and reverse mangrove deforestation and degradation.

One proposed solution involves the implementation of a Payment for Ecosystem Services project, specifically a Carbon Offset Project covering the entire area of Zone A Marine Mangrove Park, totaling 23,683.88 hectares. This initiative aims to instigate behavioral change regarding the unsustainable use of the forest while simultaneously generating funds to support local livelihoods and conservation efforts.

The DR Congo Mangrove Carbon Project seeks to implement activities mitigating human impact on the mangrove forest. This includes preventing and minimizing the conversion of forested areas for settlements, crop production, or aquaculture. It also addresses issues such as illegal harvesting of wood for charcoal production and construction, promoting forest conservation and maintenance, as well as restoring degraded areas within the forest. The goal is to provide an alternative use for the forest, contributing to climate change mitigation through enhanced carbon dioxide (CO₂) emission removal.

Consequently, such projects generate financial benefits in the form of carbon credits, improving local livelihoods and providing essential goods and services to both the local communities and biodiversity. The project is situated in the Central Congo Province, specifically in the Muanda Territory at the Congo River Estuary.

Mangroves of DRC have been estimated to store carbon of 808 t C/ha¹ translating to total carbon stock of 19,136,575.04 tC. But the degradation which has been estimated to be 116ha/yr could have activated greenhouse emissions from the lost vegetation cover as well as from the top 1.0m of sediments. By ClimeTrek and partners implementing a mangrove REDD+ project in the area, the climate benefits are estimated to be 723,063.03 CO₂e/year with added benefits of shoreline protection and biodiversity conservation.

¹ Ajonina, G. N., Kairo, J., Grimsditch, G., Sembres, T., Chuyong, G., & Diyouke, E. (2014). Assessment of mangrove carbon stocks in Cameroon, Gabon, the Republic of Congo (RoC) and the Democratic Republic of Congo (DRC) including their potential for reducing emissions from deforestation and forest degradation (REDD+). The land/ocean interactions in the coastal zone of West and Central Africa, 177-189.

1.1 Unique Project Benefits

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) The project's target activities will improve the forest's capacity to offer ecosystem services and goods	4.2.3
2) Among the expected outcomes of the reforestation of the degraded areas and offering alternative livelihoods through employment and support of other fishing and agricultural activities are expected to empower the community.	4.2.3
3) Clime trek aims to introduce alternative livelihood methods targeting vulnerable community members, including oyster farming, apiculture, ecotourism, Marine waste recycling, and training of students in the area as part of the conservation groups	4.5.2
4) Special protection measures will be given to endangered species Given the danger that future generations face from these threatened and endangered species.	5.1.1
5)Improvement of Biodiversity within the project area	5

1.2 Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	Not Applicable	-
	Net estimated emission reductions in the project area, measured against the without-project scenario	17,613,813.51tCO ₂ e	2.1.17
Forest ² cover	For REDD ³ projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	To be determined during monitoring	-
	For ARR ⁴ projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not Applicable	N/A
Improved land management	Number of hectares of existing production forest land in which IFM ⁵ practices are expected to occur as a result of project activities, measured against the without-project scenario	Not Applicable	-
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	Not Applicable	-
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	300	4.2.3
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	120	4.2.3

² Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)

³ Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)

⁴ Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)

⁵ Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities, ⁶ expressed as number of full-time employees ⁷	510	4.2.3
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	153	4.2.3
Livelihoods	Total number of people expected to have improved livelihoods ⁸ or income generated as a result of project activities	12500	4.2.3
	Number of women expected to have improved livelihoods or income generated as a result of project activities	7700	4.2.3
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	To be determined during monitoring	-
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	To be determined during monitoring	-
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	To be determined during monitoring	-
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	To be determined during monitoring	-
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	To be determined during monitoring	-

⁶ Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

⁷ Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])

⁸ Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	To be determined during monitoring	-
Well-being	Total number of community members whose well-being ⁹ is expected to improve as a result of project activities	Not Applicable	-
	Number of women whose well-being is expected to improve as a result of project activities	Not Applicable	-
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation, ¹⁰ measured against the without-project scenario	Approximately 500 ha	5.1.3
	Expected number of globally Critically Endangered or Endangered species ¹¹ benefiting from reduced threats as a result of project activities, ¹² measured against the without-project scenario	3	5.1.1

⁹ Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

¹⁰ Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

¹¹ Per IUCN's Red List of Threatened Species

¹² In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

ClimeTrek Limited is developing a Mangrove Blue Carbon project in DRC within the Central Kongo Province, Muanda Territory. The project is being developed with the blessings of the Institut Congolais Pour la Conservation de la Nature (Congolese Institute for Nature Conservation, ICCN), which is the government partner responsible for the upkeep and conservation of the National parks and reserves in the country. The other major stakeholders are the local communities of Kinlau and Malela. The two communities live around the protected mangrove area (PMM), a resource they depend on for various ecosystem goods and services.

Mangrove forests are biodiversity hotspots that offer key ecosystem functioning roles including coastal protection, climate change adaptation, climate mitigation, biodiversity support and provision of forest products for the local communities¹³. Critical among the forest services and products drawn from the forest by the local communities, living adjacent to the forest, include wood for construction, firewood, fish, and honey. Additionally, mangroves sequester up to five times the amounts of carbon from the atmosphere compared to tropical upland forest, making it one of the most carbon-rich ecosystems of the world.¹⁴ Thus, making carbon storage by the mangroves crucial in counterbalancing anthropogenic CO₂ emissions and mitigating climate change.

Despite its uniqueness and diverse uses, degradation of mangrove forests continues to compromise the status of mangrove forests globally. In DRC, the country records indicate that, about 1161 hectares of mangrove forest cover has been lost in the last ten years; a statistic that translates to an annual loss of 116ha/year.¹⁵ The threats facing these mangroves include encroachment leading to the conversion of forest land to settlement and other land uses, especially agriculture and settlement. The change in land use is linked to population increase over the years, a condition that has prompted unsustainable harvesting of mangrove forests for construction wood and firewood for domestic use. The resulting consequences of the DR Congo mangrove deforestation and degradation threaten the livelihood of the local coastal people as they get exposed to coastal flooding along with its devastating environmental repercussions. Additionally, the loss of mangroves leads to carbon stored by the ecosystem being emitted back into the atmosphere causing accelerated climate changes.

The DR Congo mangrove project is located at the mouth of River Congo in the Province Bas-Congo, in Muanda territory where about 23,683 hectares of mangrove occur (05°45'-06°05'S, 12°45'-13°00'E map). Most of the mangroves fall within a park, (Parc Marin des Mangroves, established in 1996) [1] and also enjoy the status of the Ramsar site, but continue to be degraded.[2] Management of the Protected Areas falls to the Institut Congolais pour la Conservation de la Nature (the Congolese Institute for the Conservation of Nature, ICCN) following the order of law number 75-023 of July 22, 1975. There is currently low visitation to the Parc Marin des Mangroves (English; Mangroves Marine Park, or Muanda Marine Reserve) thus causing ICCN to shift its enforcement focus to more active parks. For any finances to manage park, ICCN relies on technical and financial aid from its non-governmental organizations and international partners.

¹³ Food and Agricultural Organization (2023). World Mangroves; 2000-2020.

¹⁴ 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.

¹⁵ <https://storage.googleapis.com/earthenginepartners-hansen/GFC-2021-v1.9/download.html>

The insufficiency of technical personnel and eco-guards assigned in the territory impedes the ICCN from playing its role in ensuring the necessary oversight to efficiently reduce the various anthropic pressures. Due to this inefficiency, mangrove still faces illegal logging.

The continued loss of mangroves has triggered the attention of local communities and government stakeholders who are now working to come up with different innovative management approaches which aim at preventing, halting, and reversing mangrove deforestation and degradation. Payments for ecosystem services (PES) schemes, such as Reduced Emissions from Deforestation and forest Degradation plus conservation, sustainable forest management and the increase in forest carbon stocks (or REDD+) is one approach being championed as market-based option for forest conservation and management.

This project is therefore designed to implement activities that reduce human activities in the mangrove forest including clearance of the land for tree harvesting for non-commercial purposes, settlements, crop production (agriculturalist) or ranching or aquaculture and unplanned deforestation firewood or fuelwood, thus allowing for conservation and maintenance of the forest cover as well as restoring the degraded area of the forest. The project uses a methodology certified under the VCS program VM0007, with applicability in Avoided Unplanned Deforestation and Degradation in tidal wetlands. This project fits under the different modules as has been identified in the methodology viz. M-REDD, M-ARR, M-TW, X-STR, X-UNC, BL-UP, BL-TW, LK-ASU, LK-ECO, CP-AB, and C-PD.

2.1.2 Project Scale

Project Scale	
Project	
Large project	✓

2.1.3 Project Proponent (G1.1)

Organization name	ClimeTrek Limited
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2.1.4 Other Entities Involved in the Project

Organization name	Groupement Kinlau
Contact person	Zinga Nkanu Monique

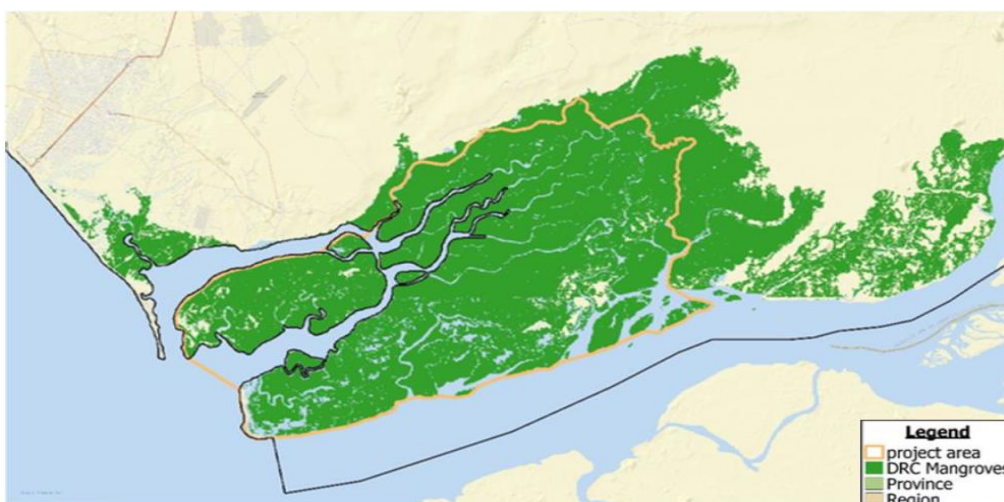
Title	Chef de Groupement (Kinlau)
Address	Territoire de Muanda, Central Congo Province, Democratic Republic of Congo
Telephone	
Email	Chiefkinlau@gmail.com

Organization name	Groupement Malela
Contact person	Kutshi Baka
Title	Chef de Groupement (Malela)
Address	Territoire de Muanda, Central Congo Province, DR Congo
Telephone	
Email	Chiefmalela@gmail.com

2.1.5 Physical Parameters (G1.3)

Project location

The DR Mangrove project is located on the North bank of the mouth of the Congo River, in the province Bas-Congo, in Muanda territory where about 23081hectares of mangrove occur (05°45'-06o05'S, 12°45'-13000'E map). Most of the mangroves fall within a park, (Parc Marin des Mangroves, established in 1996)¹² and also enjoy the status of the Ramsar site, but continue to be degraded.¹³ Management of the Protected Areas falls to the Institut Congolais pour la Conservation de la Nature (the Congolese Institute for the Conservation of Nature, ICCN) following the order of law number 75–023 of July 22, 1975.

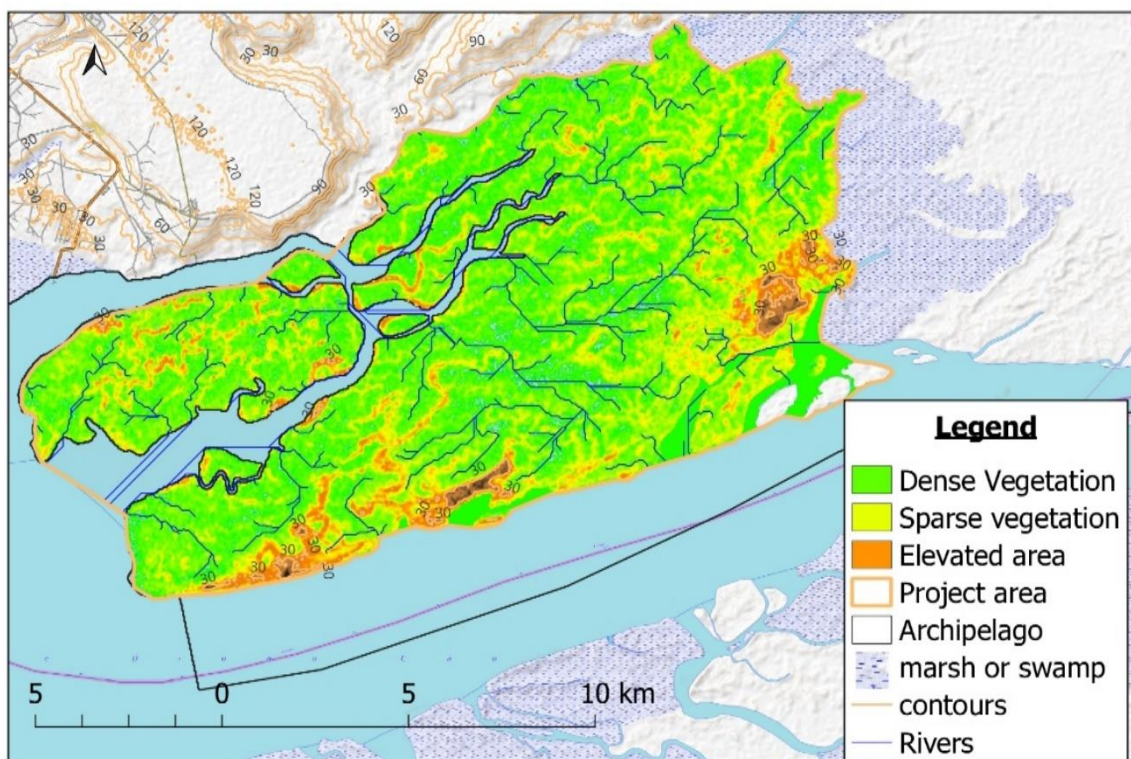


Mangrove area and project area of the DRC

Topography (slope, aspect, geological features, etc.).

The lower Congo landscape is diverse due to different types of rocks and erosion cycles over time. Many erosion cycles, dating back to the Cretaceous period, have shaped the region into lateralized plateaus area averaging from 10 to 130 m above sea level.

Streams and rivers, the major one being the Congo River, transverse the district draining their water into the Atlantic Ocean. The current landforms are closely linked to the geological structure, and the durability of rocks influences the landscape. Typically, more durable rocks are found at higher elevations, while less durable rocks are found at lower elevations.



The Topography of Muanda region. Source: NASA

Soil (mineral, organic, arable, upland, etc.).

The soils of the mangrove areas are predominantly sandy unconsolidated coralline, with poor water holding capacity and extreme alkalinity (Branam, 1978). The Congo River floods bring in sediments from the hinterlands which contribute to better growth of the mangrove.

Climate (including temperature, rainfall and seasonality).

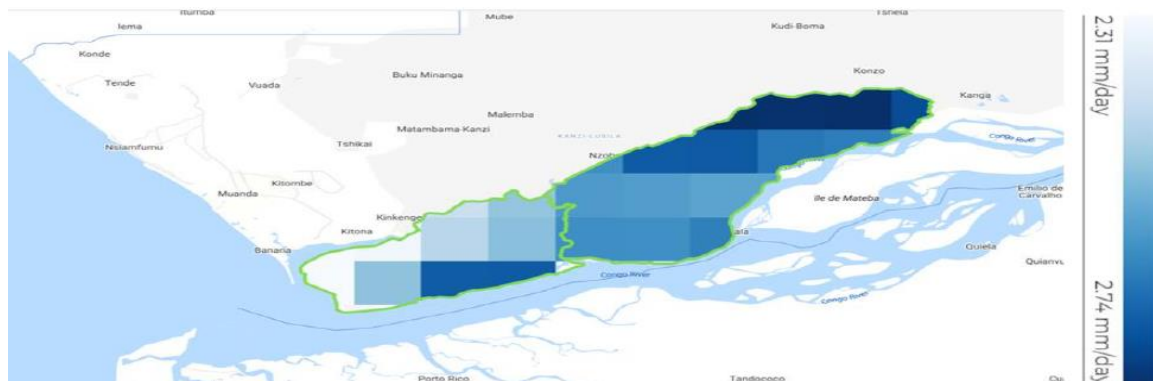
The Democratic Republic of Congo's coastline is characterized by a tropical climate with high humidity throughout the years ranging between 77 and 81%. Has two seasons; the rainy season

starts from October to May and the dry season from June to September (MINAFENV,2001). The average annual rainfall is between 1750 and 2100mm (Evrard, 1986) and this has led it to be classified as tropical wet and dry (Aw) under the Köppen-Geiger climate classification system.¹⁴

The Köppen-Geiger climate classification designates Muanda's climate as tropical wet and dry (Aw), with a marginal level of humidity that prevents it from being categorized as a hot semi-arid climate (BSH). The region has had an average of 25.40C in temperature moving up to 28.3°C/82.94°F, Wind SW at 1.99 km/h, 68% Humidity change to today in the past 10+ years.

In 2013, Muanda had warm tropical weather with a Max Average Temperature of 30.15°C (86.27°F) and a Min Average Temperature of 22.87°C (73.17°F). The overall Average Temperature was 27.32°C (81.18°F). Precipitation was low at 2.4mm (0.09in), and there was no snow. The wind averaged 5.91km/h (3.67mph), gusting up to 8.8km/h (5.47mph). Sea level pressure was 2.4mb, suggesting a warm tropical climate with moderate rainfall.

Compared to 2020, Muanda experienced warm weather with a Max Average Temperature of 28.68°C (83.62°F), Min Average Temperature of 22.77°C (72.99°F), and an overall Average Temperature of 26.26°C (79.27°F). Precipitation was moderate at 5.32mm (0.21in), and there was no snow. The wind averaged 5.48km/h (3.41mph), with gusts at the same speed. The sea level pressure in 2020 was 5.32mb. In summary, Muanda had warm and moderately humid weather with gentle winds in both years. (Data, 2020)



Precipitation in Muanda region. Source: CHIRPS¹⁶

Climate data for Moanda (altitude: 31 metres or 102 feet)													[⬆]
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	31.3 (88.3)	31.3 (88.3)	32.1 (89.8)	31.9 (89.4)	30.8 (87.4)	28.1 (82.6)	26.3 (79.3)	26.3 (79.3)	28.1 (82.6)	30.2 (86.4)	30.3 (86.5)	31.1 (88.0)	29.8 (85.7)
Daily mean °C (°F)	26.8 (80.2)	26.8 (80.2)	27.4 (81.3)	27.2 (81.0)	26.3 (79.3)	23.4 (74.1)	21.7 (71.1)	21.8 (71.2)	23.8 (74.8)	26.2 (79.2)	26.3 (79.3)	26.8 (80.2)	25.4 (77.7)
Average low °C (°F)	22.4 (72.3)	22.4 (72.3)	22.7 (72.9)	22.6 (72.7)	21.8 (71.2)	18.7 (65.7)	17.2 (63.0)	17.4 (63.3)	19.5 (67.1)	22.2 (72.0)	22.4 (72.3)	22.5 (72.5)	21.0 (69.8)
Average rainfall mm (inches)	81 (3.2)	132 (5.2)	145 (5.7)	166 (6.5)	59 (2.3)	0 (0)	0 (0)	1 (0.0)	6 (0.2)	29 (1.1)	127 (5.0)	87 (3.4)	833 (32.6)

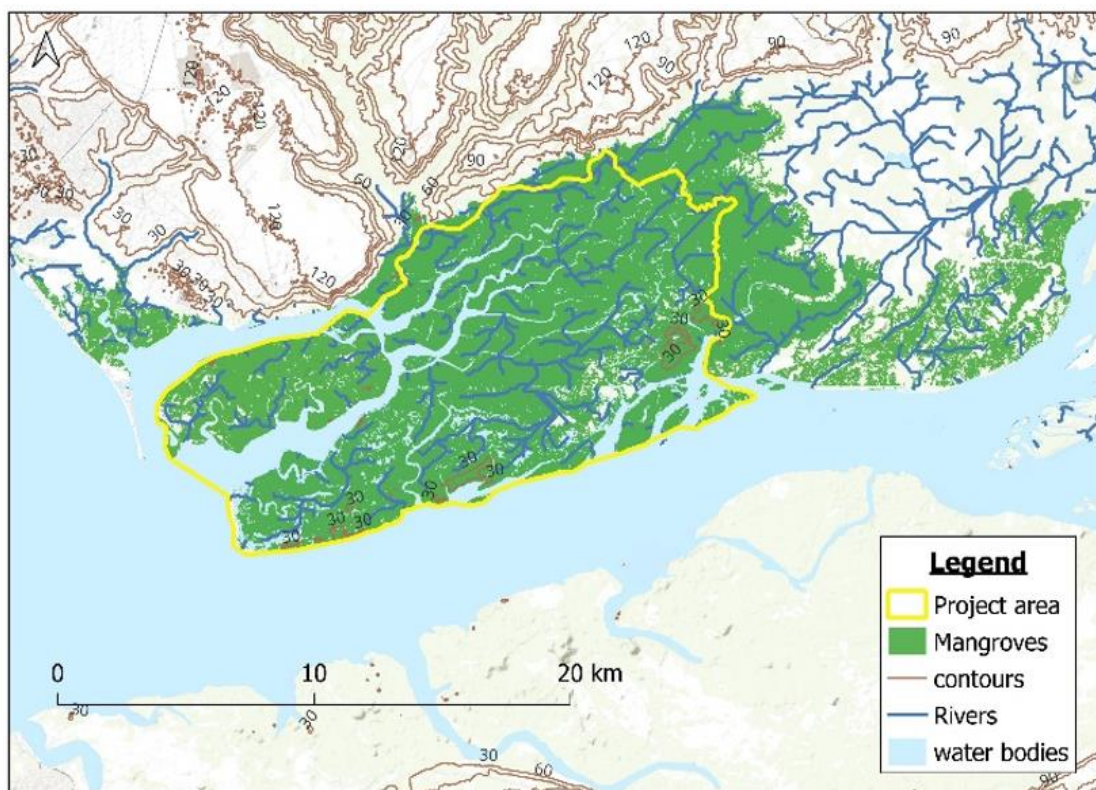
¹⁶ <https://chc.ucsb.edu/data/chirps>

Climate of Muanda Region, DRC. Source: Climate-Data.org¹⁷

Hydrology

DR Congo's coastline is about a 23-mile strip characterized by beaches, savanna permanent streams and rivers, creeks, and mangroves. The Congo River, the second biggest river in Africa, with its monstrous dimensions, drains its water into the Atlantic Ocean through Muanda territory as an estuary. The river transports annually 86 million tonnes of suspended sediment to the ocean.¹⁸ The freshwater from River Congo influences the growth of the mangrove by supplying sediment as well as nutrients. In turn, the mangrove act to sieve the sediment or pollutants that come from the hinterland before the water flow into the Ocean. There however observation of the coastland retreating by about 2300 meters since 1980 in some coastal areas through shoreline erosion caused by the harvesting of coastal mangroves and other ocean dynamics. It has however been reported elsewhere that the presence of mangroves acts as coastal defense.

Climate change in DRC, especially in Muanda (DRC), affects freshwater distribution, posing security challenges over the years. Water and biodiversity status in DRC, highlighting the economic potential of freshwater resources. However, overfishing and decreasing water depths in parts of the Congo River raise concerns. Transboundary management plans are lacking, and growing populations worsen the situation. The idea of exporting Congo's freshwaters to refill Lake Chad is cautioned against due to potential ecological risks. Managing Congo's freshwater is crucial for regional security and requires careful consideration¹⁹



Hydrology in Muanda region. Source: CHIRPS

¹⁷ https://www.wikiwand.com/en/Moanda%2C_Democratic_Republic_of_the_Congo#Climate

¹⁸ https://en.wikipedia.org/wiki/Congo_River

¹⁹ https://wires.onlinelibrary.wiley.com/doi/abs/10.1002/wat2.1410?elq_cid=23054883&elq_mid=43714

Type of Vegetation

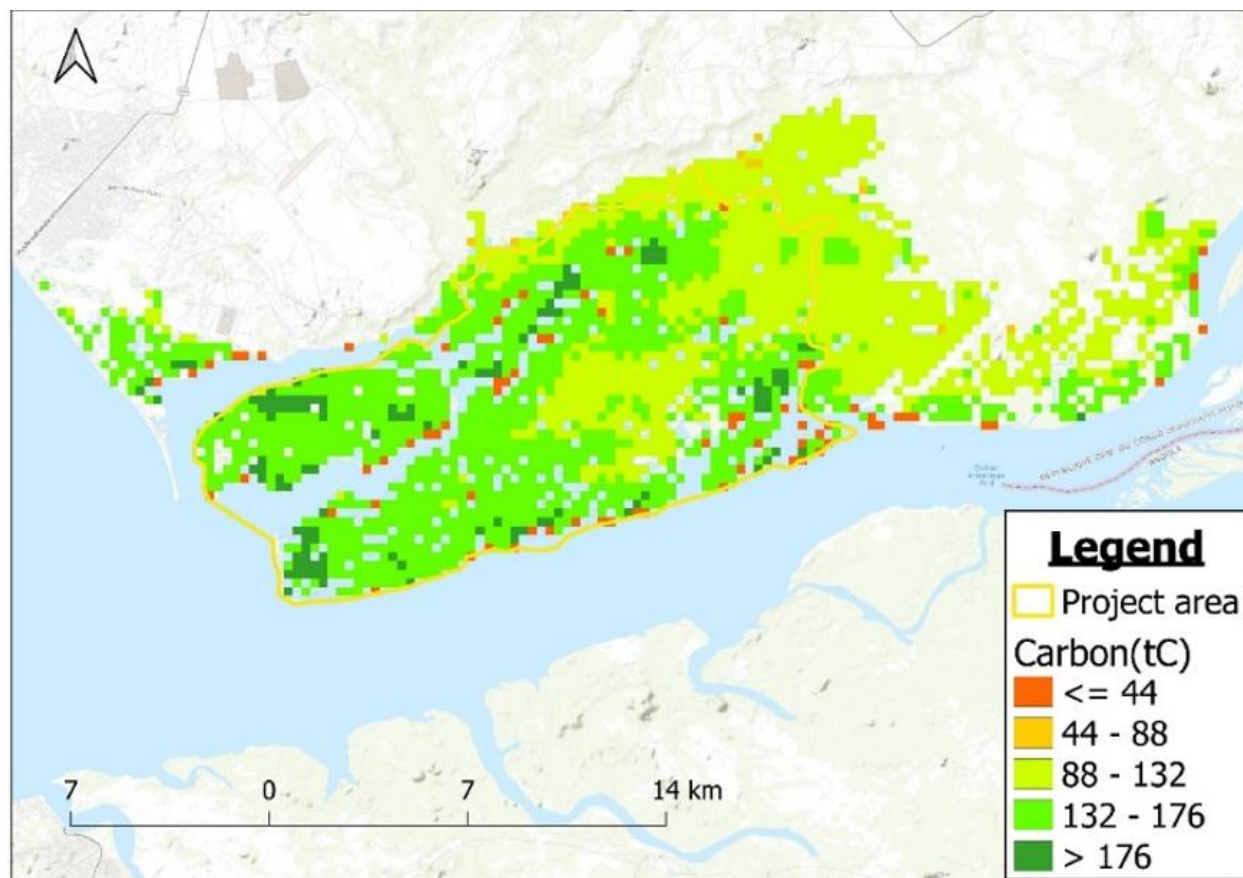
The Mangrove is a forest formation typical of the Marine Park. It is characterized by impenetrable mangrove forests which fix their roots in the soil of calm waters where mud and silt are deposited. It belongs to the western type and in two distinct categories: the small Mangrove in the characteristic zone of mud soil and the high Mangrove on more sandy soil at the foot of the Kindofula and Muanda plateaus, on the edge of the Rosa Island, Bulambemba Point and Fisherman's Island.

- **The pioneer vegetation of coastal sands;** It is a low vegetation which settles on the sandy outcrops of the Atlantic coast. It is made up of a typically herbaceous floristic procession including *Alternanthera maritima* (Mart.) A. St-Hil. *Canavalia rosea* (Sw.) DC., *Cyperus dives* Del., *Ipomoea pes-caprae* L., *Remirea maritima*, *Sporobolus virginianus* L.
- **The Mangrove:** The Tonde River mangrove is a halophilic shrub formation found on the alluvium at the mouth of this small river. It is made up of *Rhizophora racemosa* GFW.Meyer and *Avicennia germinans* (L.) L. whose size rarely exceeds 6 m. Hence the name “small mangrove” reserved for this formation. On the lower banks, the small mangrove is sometimes delimited by a floral procession made up of *Phoenix reclinata* Jacq., *Dalbergia ecastaphyllum* (L.) Taub. and *Drepanocarpus lunatus* (L.f) C.F.Mey. In the mangrove–swamp forest or mangrove–savannah transition zones, this procession is enriched with the installation of *Antidesma rufescens* Tul., *Ormocarpum verrucosum* P.Beauv. *Annona glabra* L., *Ximenia americana* L., *Oncocalamus* sp., *Alchornea cordifolia* (Schumach. & Thonn.) Müll.Arg., *Dracaena mannii* Baker, *Bridelia ripicola* J.Léonard, *Jacquemontia* sp. and *Terminalia catappa* L.

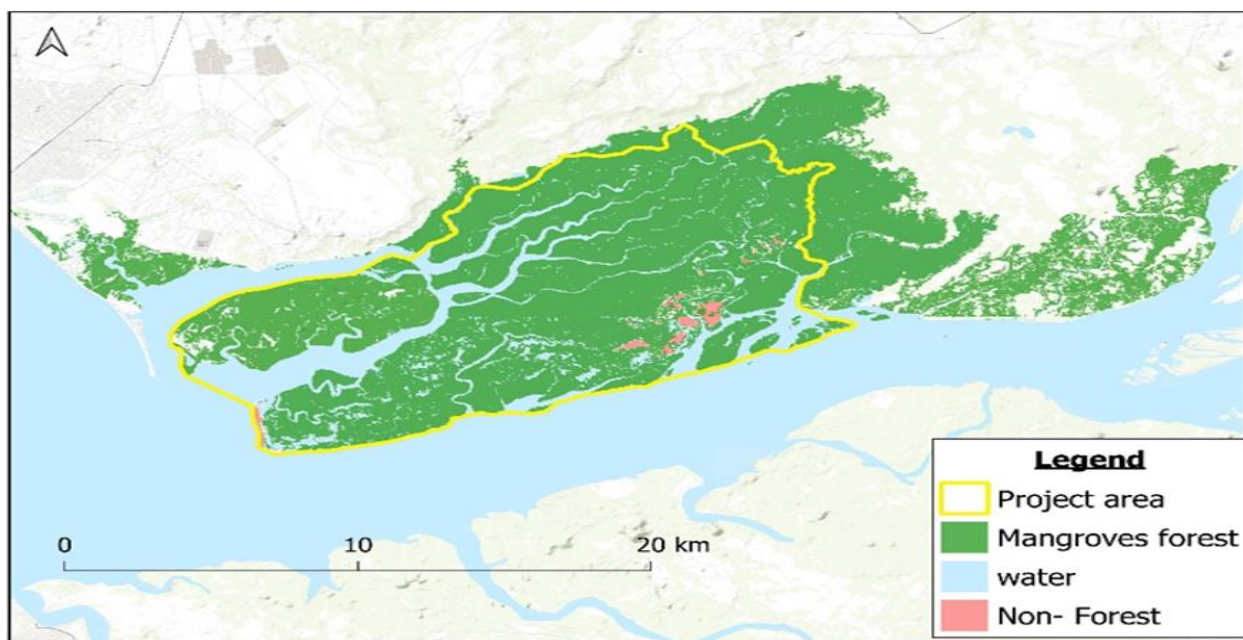
Ecosystem type

DRC mangroves are estuarine wetlands found at the mouth of the Congo River, where the river's freshwater input influences the growth of mangrove trees. Presently, these mangroves are reported to decline at a rate of 116ha/yr. Noting that this Marine Forest is the smallest in comparison to the country's terrestrial forest, it is facing unmatched degradation rates. Owing to the many goods and services that it provides, both to communities and biodiversity, the degradation compromises their provision, regulating, supporting, and cultural functions to the ecosystem and the local communities.

The DRC mangrove are classified as a rare habit in the country and the region. According to FAO (2001) the region has six species of mangroves including *Acrostichum aureum*, *Avicennia germinans*, *Conocarpus erectus*, *Laguncularia racemosa*, *Rhizophora mangle*, and *Rhizophora racemosa*. However, only two species are found in abundance within the DRC's mangrove ecosystems; *Rhizophora racemosa* and *Avicennia germinans*. Other vegetation surrounding the mangrove includes the grassland savanna (*Annona Arenaria*) and swamp vegetation (*Canavalia maritima*). Further, the forest harbors biodiverse species that are listed as endangered including the African manatee (Sea cow) and turtles. Unfortunately, years of unchecked degradation of critical ecosystems along the coastline of DRC threaten the survival rates of these species. Additionally, the ecosystem acts as habitat for some endemic fish species including *Tylochromis praecox*, *Micralestes halargyreus*, and *Oreochromis lepidurus*. Other aquatic fauna including sharks, barracuda, sole, capitaine, snakes, , crustaceans (shrimp, crab), and oysters also rely on the mangrove ecosystem as a key staging, feeding, and breeding area for migratory waterbirds (Ramsar, 1994).



Carbon density of Muanda region.



Forest and Non-Forest Classification. Source: ALOS Research and Application Project²⁰

²⁰ https://www.eorc.jaxa.jp/ALOS/en/url_change_info_e.htm

2.1.6 Social Parameters (G1.3)

Main Settlements

Coastal areas offer suitable settlement conditions for human populations. The DRC coastal area supports a cosmopolitan population that comprises both local Congolese citizens and foreign nationalities working in the different service and resource extraction such as mining and logistics. The Mangrove Marine Park (PMM) is located near the towns of Muanda and Banana (Muanda territory), in the Kongo Central Province (Southwest of the DRC), on the north bank of the Congo River estuary. It extends along the Congolese coastline for 40 km, with 20% of its area in the Atlantic Ocean. Administratively, the PMM is divided into 2 administrative sectors: the Sea and Assolongo. The Sea sector has 3 groupings: Kimbanza (Zone A), Manzali (Zone B), and Muanda village. Kimbanza grouping (Zone A): with 4 villages - Kimbanza, Tshimbundu, Nzobuta, and Tombe. Manzali grouping: Kisadi, Luzngu Nzambi, and Kotala. Muanda village grouping with the town of Muanda and its various neighborhoods. The Assolongo sector has 2 groupings: Malela (with 12 villages) and Kinlau (with 9 villages). Malela grouping (12 villages): Kimongowolo, Kimpozia, Luangu, Nsenge, Kiabi, Kimuabi, Nteva, Mbanza, Kongo, Kabmvo, Miema, and Kinsati. Kinlau grouping (9 villages): Kitombe, Kinimi, Kifuku, Kitona, Mbondo, Kindofula, Kikhenge, Kingalasa, and Kinsongo. The villages of kimuabi and Nteva are within the PMM's boundary, while other villages are located on the outskirts of the park.

Land Use and Economic Activities

The coastal zone of the DRC spans 40 km. Since 1980, coastal erosion, particularly in the Banana-Muanda segment, has accelerated, resulting in an estimated retreat of up to 2,300 meters. The second national communication on climate change (2010) attributes this erosion to the combined effects of topography, sandy soil, and ocean dynamics. The report predicted a complete loss of the Banana-Muanda Road by 2050-2100, with a doubling of land lost to the sea around Nsiamfumu and between Muanda and Banana. Overall, the coastal zone is expected to shrink by 50-100 meters per year by the year 2100, totalling up-to 4500 meters coastal retreat.

The main driver of deforestation of the mangrove in the region are attributed to economic development and habitat modification. The DRC mangrove ecosystem occurs at the mouth of the Congo River, exposing the ecosystem to continued human population encroachment since the area is a preferable settlement area because of its rich agricultural soil and access to the seaport for industrial logistical purposes. For example, towns like Muanda have witnessed population surge to the current 90,812²¹ rising from a small rural centre to a town status in a few years. Despite the growth in population, the planning of development in such townships have been lacking and they continue to reflect the negative socioeconomic aspects of the country. Majority of the populace remains poor, there is a lack of planned physical infrastructure, exploitation of natural resources remains the main source of livelihood for most households, and unemployment among most sections of the demography remain high. For example, communities living around the mangrove forest carry out fishing, and subsistence farming, harvest wood from the forest, and collect firewood from the forest to sell to the urban townships in exchange for money. It is this trade on natural resources that remains the only reliable source of income among many households living around

²¹ https://www.wikiwand.com/en/Muanda,_Democratic_Republic_of_the_Congo

the PMM. The continued exploitation of natural resources around the region, especially ecological resources such as forests, fisheries, and groundwater that have led to an ecological imbalance currently witnessed in the form of degraded ecosystems. Further, urban and maritime development in the region is also converting some of the critical ecosystems like mangrove forest areas to seaways. The oil exploration and refining plants also have occasion spilled oil in the area compromising ecosystem functionalities, especially of mangroves as vital biodiversity habitats to endangered Marine life.²² Finally, poaching of marine life, especially sea turtles and African manatees compromised the biodiversity abundance of mangrove ecosystems for some of these animals play key ecological roles within the marine food web and ecosystem to attain the right species balance.. The land tenure is characterized as agricultural and forest concessions.

Urbanization; Infrastructure development in Muanda and Banana Towns

The past decades have seen the population along the DRC coastal area grow exponentially. The towns of Muanda and Banana have registered population influx with majority of residents having migrated into the towns from the DRC hinterland and Angola. The current population growth (Insert percentage increments from census data) has seen more land area around Muanda and Banana expropriated into settlement areas.

Housing and transport infrastructure have been initiated in the areas both by private developers and governments to meet the demand currently witnessed in these two towns. For example, there are ongoing urban road development projects taking place around the PMM including the link road between Muanda and Banana under government funded programs (List the Project Codes and sources of funds). Additionally, there are urban roads being constructed within Muanda town, upgrading the roads from dirt roads to bitumen/concrete roads i.e., all-weather roads. [info from Placcide, have Naomi do the Census review]

Agriculture

Agriculture is practiced in a small-scale or household-level in Muanda territory. Crops cultivated in the area (lowland sandy soils) are largely for family consumption. The crops are largely vegetables which do not need so much rain and can equally do well in the region's poor soils. Livestock farming remains largely non-existent except for poultry and small ruminants such as goats done at household.

Fishing Industry

The DRC coastal strip is the smallest livelihood zone in the country covering a 30 km coastal stretch from the town of Banana to Kumbi beach bordering Angola's Cabinda province. The main ecological features of the area as a livelihood zone include the Atlantic Ocean and the great Congo River estuary. Mangrove forests remains a unique ecosystem of the region offering various ecological goods and services to the local populations. Coastal area is largely influenced by the Congo River outflow that influences both the estuarine and Marine environment of the area.

Fishing remains a key livelihood activity for any coastal area. The DRC coastal strip is no different and with Congo River's great outflow, the estuarine area that includes the mangrove forest and the

²² Mangroves of western and central Africa. No. 26. UNEP/Earthprint, 2007.

lower Congo basin offer local communities ideal fishing opportunities. Fishing takes place throughout the year despite the drier months of between May to September being the peak fishing season considering the low outflow from the Congo River allowing the plankton-rich upwelling effects of the Benguela Current from the South to reach the coast of DRC.

Despite the existing potential of Marine fisheries in the area, most fisher villages remain confined to near-coast/artisanal fishing around the mangrove forests and in the Congo basin. The modes of fishing, restrained to small boats, lines and nets, as well as motorboats discourage the exploitation of deep-sea fishing. Fish markets, mainly in Boma, Nsiamfumu, Banana, and Muanda towns provide a key uptake channel for the small artisanal fishery that supports most local communities, especially the communities domiciled in the mangrove area.

The high commercial fisheries caught in the mangrove are crustaceans including shrimps *Caridina* sp., *Palaemon* sp. (Fam. Palinuridae), *Nephropsis atlantica* (langoustine, Fam. Nephropidae), *Lysiosquilla hoevenii* (Stomatopodes), *Panulirus argus* (Latreille) and crabs: *Callinectes amnicolor*, *Cronius ruber*. The latter are very abundant in the undergrowth of the Mangroves and in the sands of the beaches.

Bivalve molluscs or oysters of the genus *Egeria* (*Egeria congica* and *E. Bernardii*, Fam. Donacidae) found in the estuary near the village of Malela. Catching oysters is the main activity of women in “Dilondo” and “Mbanza Malela”. It is done individually or in pairs using a canoe weighed down with lead while the fisherman dives into the bottom of the river to bring back the oysters. Oyster fishing in the mangroves of the DRC is most successful in the rainy season. It is practiced by diving without appropriate equipment, and this is viewed as one of the challenges in mangrove fisheries which limits the fishers from fully exploiting the urban demand market of the mangrove fish.



fish specimens from the PMM, Malela village



Oyster shell hills, Malela Village

Energy and Mineral Prospecting

The DRC is presently regarded as one of the leading oil and gas producing nations in Sub-Saharan Africa. The coastal area, Muanda territory, has seen increased exploratory and drilling of both oil and gas by Perenco. Under its current concessions, Perenco's activities in Muanda are to continue until 2030 making the petroleum and energy sector a key driver of land use change in the region since 2002.

Perenco engages in both onshore and offshore drilling of both crude and gas. Presently, the company controls between 250 and 800 active wells in the region alone making it one of the biggest investors in Muanda territory. However, activities from offshore drilling and onshore exploration have been a cause of environmental concern from various stakeholders including the local communities, environmental activist groups, conservators, and the media. [propose safeguards as mitigation efforts]; have this documented and share as part of our mitigation proposals/strategies. Have a strong community involvement component to the same]

Marine Transport

Muanda town acts as the gateway to DRC through the Port of Banana. The port is situated in Banana Creek; 8km South-East from Muanda town centre and connected by a dirt road running along the coast. The Port is separated from the ocean by a spit of land 3km long and 100 to 400m wide. The creek shelters the port from the ocean's direct action making it a suitable area for harbour dredging. Presently, the government is actively mobilizing resources to expand the port infrastructure establishing the country's first seaport. When operationalized, the Port of Banana shall contribute to DRC's and the global network through offering a viable transit corridor to Central Africa's developing markets. Feasibility studies on viability of DRC's first seaport point to the potential positive impacts such infrastructural investment may have on the country's trade. Importantly, the significant cost and time savings associated with operating an efficient seaport to a country, attracting more direct calls from larger global vessels especially from the Americas and Europe, ultimately acting as a catalyst for the growth of the country. Currently, the country relies on inland ports of Boma and Matadi where shipping activities are handled. Among the vessels that make the journey inland to the ports of Boma and Matadi are general cargo ships, containers, general cargo, and bulk. At the moment, small engine motorboats remain the preferred mode of transport transporting cargo and people along the Congo River and across the DRC-Angola border towns creating employment to the youthful coastal population around the PMM.

Hospitality and Tourism

The PMM lies next to the vibrant city of Muanda and the Port of Banana. The ongoing infrastructure projects around these two areas are strategically aligning to tap on the influx of people in both towns. Investors in property, especially real estate, are positioning to leverage on the existing gaps along the hospitality and tourism spaces. For example, the need for conference facilities, tourist hotels, and recreational facilities has seen targeted investments along this sector. Notably, the tourism potential of Muanda town remains viably vibrant. Investors targeting the sector remain guaranteed of a dynamic and commercially appealing kind of contemporary tourism that encompasses various tourist-targeted offers including leisure and recreational orientated

infrastructure, conferencing facilities, culture and research-based ecotourism, and sport tourism for both local and international markets.

Presently, the tourism and hospitality sector remain underwhelming despite the underlying potential as a high-revenue opportunity sector considering that coastal town of Muanda has tourist-linking infrastructure like an airport, adequate security installations, and a road network. The DRC's coastal sociocultural aspects that include a rich colonial heritage, indigenous communities, ecological tourism, and water sports potential are all tourism ventures of interest that remain unexplored around the PMM as alternative livelihood sources.

Transport and Service sectors.

The transport and service sectors form an important facet of the community living around the PMM. Majority of the population living in Muanda town as well as the local indigenous communities around the PMM are employed in the transport and service sectors. Youthful men are largely engaged as porters, taxi drivers, motorcycle riders, or small business operators. However, the underdeveloped road network, Muanda Town road network is largely made of dirt roads, remains an impediment to the transport sector as most operators blame the state of infrastructure as a contributor to high costs of operating a transport service venture.

Ventures in the service sector are predominantly small and medium level businesses in retail, financial services, telecommunication, beauty, and recreation. The residents of the coastal towns of Muanda, Port of Banana, and Nsiamfumu are largely engaged in these lines of employment. Retail services are predominantly self-proprietorship businesses selling household goods. The financial services are offered by banks and telecommunication merchants who offer money transfer and banking services to the populace. The beauty and recreation services include cosmetic shops, hair salons, bars, and restaurants. All these ventures, largely small proprietorships, have evolved into critical economic drivers in a region that is underdeveloped, underprioritized, and with disenfranchised youthful population.

2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

Provide a map of the project zone including:

Boundaries of the project zone, which is defined as the area encompassing the project area(s) in which project activities that directly affect land and associated resources, including activities such as those related to provision of alternate livelihoods and community development, are implemented.

Location of communities (identified in Section 2.1.9).

Boundaries of the project area(s), which is defined as the area(s) where project activities aim to generate net climate benefits.

Any high conservation value (HCV) areas (identified in Sections 4.1.3 and 5.1.2).

Areas where offsite climate impacts are predicted.

Areas where other stakeholders will be impacted (Section 4.3).

Areas where offsite biodiversity impacts are predicted (Section 5.3).

For grouped projects, specify potential project areas and communities that may be included in the project at a future verification.

Geodetic coordinates must be provided to allow an unambiguous identification of boundaries of the project area(s), which may be submitted separately as a KML file.

2.1.8 Stakeholder Identification (G1.5)

The PMM extends across two administrative sectors: the Assolongo Sector and the De la Mer Sector; administered at different levels, both by local Community Chiefs and Community Elders, with the country's provincial administrative guideline that forms the formal administrative and political governance structures at provincial levels. Equally, communities living within the mangrove area are categorized based on the Administrative Sectors within which they reside.

The Sectors are further subdivided into Groupments housing different villages. While the villages are spread across the two zones of the mangrove area, Zone A is exclusively inhabited by the Assolongo community who form a major part of the native cultural group. The population of the Assolongo has exponentially increased over the years. They have been seen spreading and occupying territories beyond the Assolongo Sector in Zone A, which had for years been perceived as the Assolongo territory. Hence, apart from the 19 Assolongo villages confined to the Malela and Kinlau Groupments; there are other Assolongo villages in De la Mer Sector living in Kimbanza Groupment. The Kimbanza Groupment comprises of 4 villages living in the project Area (Zone A). Cumulatively, the Project Area (Zone A) is occupied by 23 villages of the Assolongo peoples spreading across two administrative sectors.

The mangrove ecosystem remains central to the Assolongo culture. As a fisher-tribe, the Assolongo have for generations relied on this unique ecosystem for the goods and services it provides. The mangrove fisheries offer the residence tribes with settlement areas, as most fishing camps are established deep in the mangrove forest. Additionally, the communities continue to draw their livelihood from products such as fish and wood extracted from the mangrove forest for both energy and construction purposes.

In addition to the local communities, there are other stakeholders with direct and indirect influence on the project area. These are government agencies and institutes namely The Congolese Institute of Nature Conservation, The Congolese Center for Nature Conservation, Marine Studies Institute, mining companies (PERENCO), Tourism and hospitality sector, NGOs (Recoplast, CICOBIO, RASTOMA) and foreign cooperation ULB-Cooperation all actively working within the project area.

2.1.9 Stakeholder Descriptions (G1.6, G1.13)

The DRC Blue carbon project identified stakeholders both from at community level and experts as well as others group with influence in the resource use and conservation in the project area. The identification was based on an understating of the resources, the goods and services it provides, the resource users, government, academics and research institutions and NGOs as well as private sectors.

- a. The Resource Users are those community members who directly depend on mangrove resources or whose actions directly impact mangrove resource use.

- b. Government institutions are mainly those with the mandate and authority to make policy and regulatory decisions about the protection, management, and use of the mangrove as well as those tasked with implementation, oversight, and reporting on the status of mangroves in the country.
- c. The academic and research entities provide science-based evidence of mangroves' goods and services and threats for decision-making and adaptive management.
- d. The NGO and private sector are important as key partners and service providers especially when financial, organizational, or capacity resource is limited.

Following this, ClimeTrek established main stakeholders including Agencies and institutions, of which the lead agencies and institutions operating in Muanda and by extension, the project area (Zone A) comprise of:

- ICCN- Congolese Institute of Nature Conservation; agency in-charge of the management of the Muanda Mangrove Marine park.
- Maritime Navigation and Fisheries Institute (Marine Studies Institute)
- Perenco oil and petroleum company (Onshore Oil and gas exploration and extraction)
- Tourism and hospitality sector (Leading hotels in Muanda operating tourist adventure expeditions in the protected area).
- Recoplast (Marine debris and plastic recycling start-up company involved in plastic wastes in the Muanda town and the surrounding environs including the Park area)
- CCPN Muanda (Le Centre Congolais pour la Conservation de la Nature)
- CICOBIO partnering RASTOMA in Sea turtle conservation.

For the community level stakeholders, Local Communities (Villages): the local communities residing in the project impacting areas are largely from the Assolongo tribes, an indigenous community, who claim communal rights to the mangrove forest area (Fig.2).

For the description of how each stakeholder was identified and their relevance to the project activities see [Appendix 1](#) (The Stakeholder Identification Table).

2.1.10 Sectoral Scope and Project Type

Sectoral scope	14
AFOLU Project Activity	Reduced Emission from Deforestation and Forest Degradation

Project activity type	Avoided Unplanned Deforestation and Degradation (AUDD)
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2.1.11 Project Activities and Theory of Change (G1.8)

The DRC mangrove project primary objective is to enhance mangrove conservation in the region and generate income to uplift local livelihoods. This initiative stems from a thorough threat analysis faced by the forest, including ongoing conversion to settlement areas (due to Muanda town expansion and informal settlement by Angola refugees). Furthermore, local communities engage in the illegal harvesting of mangroves for charcoal production, supplying Muanda town residents. Although there exist laws and institution bestowed with power to prevent deforestation and degradation of the resource, through analysis of satellite maps, it shows a continued decline in mangrove forest cover. Therefore, our theory of change is that, with enhanced conservation of the forest through improved governance and sustainable management, the forest condition will improve and will return to being a closed forest like 10years ago unlike today where it is highly classified as open forest. This will be achieved through training on sustainable forest management and introducing alternative livelihood that supplements the illegal activities that cause the degradation of the forest. It has been observed that the mangroves are illegally harvested to produce *Makala*(charcoal). To reduce the huge consumption of Makala, there is a proposal to use fuel efficient stoves that require small amount of Makala for cooking. By use of this, the rate of the trees being felled for Makala production will reduce allowing the forest to stay intact.

On the part of governance, like most countries, the laws pertaining forest conservation are drafted by elites with general view of how the resource should be managed without taking to consideration area specific needs. Also, in most cases, these laws and policies are not transcribed to the locals for deep understanding of what they entail. From interaction with the local communities, most have heard of there being law preventing mangrove from being cut but it does not give alternative to the indigenous people who have used the resource their entire life. For this, better training on the laws governing the use and management of the forest will be conducted to foster better adherence and where possible revision to give rights to sustainable utilisation of the resource. This result to wells conserved forest with minimal illegal degradation and hence reduced carbon emission.

The ICCN, the agency in charge of manging the Mangrove Marine Park, has few people operating from a central office with limited interaction with the locals only visiting the park area when signalled of illegal activities. This creates a rift between the locals, and they feel they are left out on decisions pertaining to the resource management. Our theory of change is that, holding regular consultation meetings and having representatives from the communities being part of the ICCN board making decision on the mangrove resource use will foster better relationship between the communities and the government on best ways to conserve and benefit from the resource.

The status of mangrove is under protection, Mangrove Marine Park, but is not sufficiently funded. This is evidenced with the few numbers of expert working in the office and by the limited number of trained forest guards thus no regular surveillance and monitoring in the mangrove and this exacerbating the degradation of the mangrove. Our theory of change under this is, if sufficient finances are allocated for surveillance and monitoring, involving and incentivising the local

communities in the process, and developing monitoring strategies, the integrity of the park will be maintained.

Population growth is a significant driver of mangrove degradation, coupled with weak resource governance highlighted by a limited number of trained forest guards and insufficient finances to support regular surveillance and monitoring in the mangrove. Our theory of change is that by educating the communities on the goods and services provided by the forest and the introducing alternative livelihood to alleviate the mangrove degradation pressure, the forest can be sustained, and the livelihood can be improved.

ClimeTrek Ltd, the project proponent, is working closely with the regional and central government agencies, forest services (Service Permanent d'Inventaire et d'Aménagement Forestiers), Marine Park authorities (ICCN), and the indigenous Abassolongo people to develop and design strategies that best minimize the degradation and deforestation of the local mangrove forest. Local youth selected from the villages surrounding the mangrove area will be trained in resource protection, monitoring, and surveillance. They will supplement the park guards in deterring illegal mangrove harvesters.

Another activity will involve the local fishermen using the mangrove area. Currently they are using traditional methods to fish and their catch is small and therefore supplement their low catch with harvesting mangrove for charcoal making. The project will actively develop a training program on better fishing methods that will reduce the degradation of the mangrove forest. The local communities and Muanda town dwellers depend on the forest for fuelwood, either in the form of charcoal or firewood. To reduce the pressure of mangrove harvesting and to continue providing fuelwood, the carbon project will establish Acacia woodlot in the adjacent terrestrial areas (Zone B) to serve as alternatives to mangrove wood for fuel and construction. Further, the project shall undertake measures to reduce demand for fuelwood by the extension of the usage of improved cookstoves to all the villages and nearby urban households (especially in Muanda town) where charcoal is the main source of household cooking energy. Where the mangrove degradation has happened, the project shall be conducting reforestation programs aimed at increasing carbon sinks mostly along the periphery of Zone A.

Under the restoration goal of this carbon project, training (both the indigenous community and partnering agency-ICCN) on the best ways to restore the degraded areas will be conducted by ClimeTrek expert teams as a measure for creating a sustainable forest management strategy. The teams shall ensure that the restoration programs adequately identify and map the drivers of mangrove degradation, degraded areas identification, restoration species matching, preparing nurseries where necessary, and the actual out-planting followed by monitoring; all done with the help of trained community and ICCN groups. Apiculture (beekeeping) is a low-cost investment with high returns in mangrove areas elsewhere. The project will offer proper training in apiculture as a livelihood activity diversifying the community's source of income. Additionally, bees provide a certain level of protection status for the forest against anthropogenic interventions, as people usually defer from disturbing the forest areas where there are thriving beehives.

Finally, the carbon project shall initiate programs aimed at improving the productivity of subsistence agriculture through quality seeds and training the community on sustainable agriculture practices as part of the alternative livelihoods the project seeks to establish during the project implementation

phase. Additionally, the level of aquaculture is low at present, as most fishermen depend on the wild catch. Therefore, science-based aquaculture practices will be introduced with the help of the local Fishery training institute to supplement the wild catch. Alongside, a female dominated oyster culture system which is presently underdeveloped, despite its notable contribution to the community livelihood, is also one of the foci for this carbon project. ClimeTrek Ltd aims to provide efficient training and necessary equipment to enable the fisherwomen to ameliorate the oyster fishing, which will translate into enhanced income, resulting in better living.

The unified output of these activities will lead to reduced deforestation and degradation of the mangroves, thus contributing to carbon emission avoidance and removal along with community livelihood enhancement. The resulting avoided carbon emission and active carbon removal will be then traded to generate finances that will be ploughed back to the communities' projects to continue conservation of the mangrove. To achieve the forementioned project programs and their underlying objectives, ClimeTrek Ltd. intends to activate all the plausible carbon emission mitigation and sequestration options at acceptable costs. These will be guided by the AFOLU Plan, articulated around initiating behavioural change through the launch of the carbon offset project in the Mangrove forests to control activities thereby resulting in either reduction of carbon emissions or enhancement of carbon sequestration. The project hopes to establish a robust institutional, logistical, technical and a strategic foundation, that will enable development of a carbon project.

2.1.12 Sustainable Development

The DRC Mangrove Carbon project is designed to have multiple benefits beyond carbon removal or emission reduction. Mangrove forests have both biodiversity benefits in addition to other services and their continued existence contributes to international commitment such as those outlined in the SDGs under the United Nations Framework Convention on Climate Change. These include:

No poverty (SDG 1). The revenue share from the sale of carbon through the project to the communities will guarantee livelihood improvement through community projects such as better water systems and improved mangrove tourism.

No hunger (SDG 2). A healthy functioning mangrove forest provides food in terms of high fish catch, and mangrove honey. The revenue from the sale of carbon credits can start a feeding program among the communities. Additionally, training on better farming methods that are sustainable would see food security in the project area.

Good health and Well-being (SDG 3). Mangrove acts as a defence to the coastal community from Tsunami and other ocean-related incidents. In this case, they cushion the communities from the flooding of the river Congo and the effects of sea level rise.

Quality education (SDG 4). Projects aim to train the locals on better conservation methods of the forest. As a key environmental component, students from DR Congo schools will use the forest as training ground as well as a Research centre to learn and teach about Marine ecosystems. Additionally, the project will create material that will be shared in all the learning institutions. Where applicable the project will support scholarship through field-based activities.

Gender Equality (SDG 5). For effective implementation, the project will deliberately share the opportunities among all gender: women, men, and youth from leadership, and business

opportunities to training. This will create an all-round environment that will foster better project implementation as well as achieve the project objective of improving the mangrove cover and health status.

Climate Action (SDG 13). By reducing carbon emissions from forest deforestation and degradation, the project will be mitigating the effect of climate change.

Life on land (SDG 15). The conservation of the mangrove under the project will ensure continues survival of aquatic biodiversity; the manatee, turtle, fish, and birds some of which are endangered, and others endemic to this area.

Clean water and sanitation (SDG 6). It has been demonstrated that effective mangrove preservation will ensure purification of coastal waters due to the mangrove roots' exceptional capability to filter out phosphates, nitrates, and other pollutants harmful for human consumption, thereby raising the standard of the water that flows from the inland environment to the estuarine environment.

Decent work and economic growth (SDG 8) . Decent work and economic growth will be met via mangrove conservation efforts that create jobs for the residents of the region, both men and women, who will contribute to the protection of mangrove ecosystem. Furthermore, mangrove restoration and conservation training will provide individuals with long-term job stability through effective talent acquisition.

Life below water (SDG 14). As a result of the numerous ecosystem benefits created by the protected mangroves, such as – food, cooler water, safety around roots, majority of the underwater species (such as fishes, crustaceans, aquatic cows etc.,) will be protected and enriched through the DRC mangrove protection project by ensuring a creation of safe places for them to thrive in.

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
Jan 2020	Project Idea Note
Feb 2020	Sustainable Forest Management Plan
Mar 2020	Project Start date, on which protective measures to prevent further mangrove degradation were implemented.
Oct 2022	Introductory meeting with community leaders and ClimeTrek representatives
14 Nov 2022	Agreement for Carbon Project Development signed with the Communities
Oct 2023- Jan 2024	PD development
11Jan-2024-12Jan 2024	Local Stakeholder Meeting
9 Dec 2023-28 Feb 2024	Forest structure inventory and Carbon assessment
2Jan 2024-31March 2024	Carbon Emission Calculation

TBC	Community Project Committee Establishment
TBC	PDD development
TBC	Validation and Verification
01-05-2020 to 30-04-2050	GHG Accounting Period

2.1.14 Project Start Date

Project Start Date	1 st May 2020	The date on which the measures listed in the forest management plan began
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2.1.15 Benefits Assessment and Crediting Period (G1.9)

Project Start Date	1 st May 2020
Project End Date	31 st December 2049
Total Number of years	30 years

2.1.16 Differences in Assessment/Project Crediting Periods (G1.9)

Explain and justify any differences between the GHG emissions accounting, climate adaptive capacity and resilience, community, and/or biodiversity assessment and periods.

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
01-May to 31 December 2020	349335.1
01-January to December 2021	595,326.8416
01-January to December 2022	595,326.8416
01-January to December 2023	595,326.8416
01-January to December 2024	595,326.8416
01-January to December 2025	595,326.8416
01-January to December 2026	595,326.8416

01-January to December 2027	595,326.8416
01-January to December 2028	595,326.8416
01-January to December 2029	595,326.8416
01-January to December 2030	595,326.8416
01-January to December 2031	595,326.8416
01-January to December 2032	595,326.8416
01-January to December 2033	595,326.8416
01-January to December 2034	595,326.8416
01-January to December 2035	595,326.8416
01-January to December 2036	595,326.8416
01-January to December 2037	595,326.8416
01-January to December 2038	595,326.8416
01-January to December 2039	595,326.8416
01-January to December 2040	595,326.8416
01-January to December 2041	595,326.8416
01-January to December 2042	595,326.8416
01-January to December 2043	595,326.8416
01-January to December 2044	595,326.8416
01-January to December 2045	595,326.8416
01-January to December 2046	595,326.8416
01-January to December 2047	595,326.8416
01-January to December 2048	595,326.8416
01-January to December 2049	595,326.8416
Total estimated ERs	17,613,813.51
Total number of crediting years	30
Average annual ERs	587,125.1

Risks to the Project (G1.10)

The DRC average governance score across the six indicators of governance listed by world bank in 2022 stood at -1.4. The underlying governance inefficiencies are a result of the sociopolitical situation in the country which has curtailed any form of political or institutional transformation for decades. Socially, the current situation has jeopardized critical sociopolitical systems including education, local administration, physical infrastructure, and bilateral relationships with neighbouring countries, especially Rwanda and Uganda.

The PMM lies on the boundary between DRC and Angola. Therefore, there exist management challenges that include jurisdictional surveillance along the border areas of the PMM that are immediately adjacent to the border with Angola.

The local indigenous community, the Bassolongo, continue to rely on the mangrove forest for several forest goods including fishery grounds for oyster, fuelwood, timber for building, and the surrounding lands for settlement and agriculture. It is from this continued reliance that human activities around the forest especially conversion of land from forest land to farmlands and settlements that been the leading drivers of degradation. Additionally, the increased demand for cooking energy arising from the surging urban population in Muanda has led to increased rate of mangrove tree felling for charcoal production.

The coast of DRC faces an increased threat from sea level rise resulting from climate change. Presently, the coast experience increased instances of tidal flooding around low lying areas around Banana leading to population resettlement around the area. Additionally, the absence of natural buffers such as mangroves around Nsiamfumu, Kumbi, and Muanda has exposed the coastline to high wave action eroding away the beaches and shorelines around the PMM.

The mangrove disappearance is attributed to both natural and human-induced factors. For natural factors it difficult to mitigate unlike human induced that why any carbon or conservation project is aimed at reducing the human impacts. In our efforts to reduce the human impacts the project target to change human behaviour toward the utilisation of the forest resource. Failure of a carbon project to take up would be most likely to be due to reversal to old human habits such as illegal harvesting of tree for Makala, fuelwood, construction wood, conversion to settlement or other human development along or in mangrove area. Failure of the project developers to continually consult with the communities could trigger them defaulting from agreed standard operating procedure for project established during the project development phase.

The political volatility of DRC could also be a risk that would affect the performance of the project where civil war led to immigrations leaving the forest prone to encroachment and illegal harvesting. Expansion of the hydrocarbon drilling could also put the project at risk with the spills of the oil contaminating the water leading the death of the forest and the biodiversity therein.

The rising sea levels, Congo River flooding bringing sedimentation, ocean cyclone and effects of climate change (increased carbon dioxide in the atmosphere, rising temperatures, precipitation and extreme weather conditions) ²³ are some of the natural factors that could pose risk to the project. In-depth analysis on the frequency and intensity of these factors would help stay ahead of such disaster. Further developing early warning system could help prepare in advance or after such disasters thus limiting impacts to the project.

2.1.18 Benefit Permanence (G1.11)

Sustainability of carbon project is based on proper structure both at project level and community level. Communities being the beneficiaries and key implementers need to align with all the project parts. At the start of the project the challenges identified include low level skills on conservation

²³ <https://www.environews-rdc.org/en/articles/2023/07/26/foret-inverser-la-tendance-a-la-deforestation-des-mangroves>

and lack of alternatives to livelihood. Investing in training the communities on the better conservation approaches is a way to enhance conservation beyond the project crediting period. Alternatively

- i. Promoting nature-based enterprises and networking for livelihood improvement
- ii. Strengthening community participation in formulation and implementation of relevant policy and legislative processes
- iii. Developing conflict resolution mechanisms to address emerging disputes even beyond the project timeline.
- iv. Promoting adoption of silvo-aquaculture in mangrove areas
- v. Improving and diversifying tourism products including culture and ecotourism.
- vi. Enhancing community capacity in tourism entrepreneurship

2.1.19 Financial Sustainability (G1.12)

Demonstrate that financial mechanisms adopted provide an adequate actual and projected flow of funds for project implementation and to achieve the project's climate, community and biodiversity benefits. Provide evidence of actual and/or projected revenues from GHG emissions reductions and/or removals and/or other sources.

2.1.20 Grouped Projects

The project is not a grouped project.

1) Eligibility Criteria for Grouped Projects (G1.14)

The project is not a group project.

2) Scalability Limits for the Grouped Projects (G1.15)

The project is not a grouped project.

3) Risk Mitigation Approach for Grouped Projects (G1.15)

The project is not a grouped project.

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Land Use Scenarios without the Project (G2.1)

Without the REDD+ project, the mangrove forest of DR Congo is expected to continue being deforested and degraded through human activities at the rate of 116 hectares per year.²⁴ The human threats that have been identified causing the degradation include firewood harvesting, extraction of construction wood, charcoal production, small-scale farming, and clearing for settlement. Subsequently, the lack of sensitization among the communities living adjacent to the forest on sustainable resources will continue to face low levels of awareness about REDD+ thus forcing unsustainably exploiting the mangrove resource (Berk and Lungungu, 2020). The project, therefore, aims to reduce emissions from these activities by implementing a strategy of Avoided Unplanned Deforestation and forest Degradation (AUDD) within the AFOLU classification. Initiating a REDD+ project within this forest will help reduce these threats to a level that is not detrimental and at the same time earn revenue that will be used to support alternative activities that do not reduce the mangrove forest cover of DRC.

Muanda territory land use/cover comprises of farming area, shrub land, Open grassland, Swamp, water body, mangroves, settlement, terrestrial forest, and Degraded Forest area. All forests are subject to some kind of visible human interactions, plantations mixed with indigenous species. Cultivated land of diverse characteristics highly divided land with trees and bushes along plot boundaries, mainly subsistence agriculture, high percentage of bare ground. Settlement spaces are covered by road (tarmac or dirt track) rocks, village, town. The shrubland adjacent has vegetation dominated by shrubs often also includes grasses, herbs, and geophytes which occur because of human activity.

Although the mangroves are under protection as a park, they still face degradation from human activities which has attributed to low forest Law enforcement.

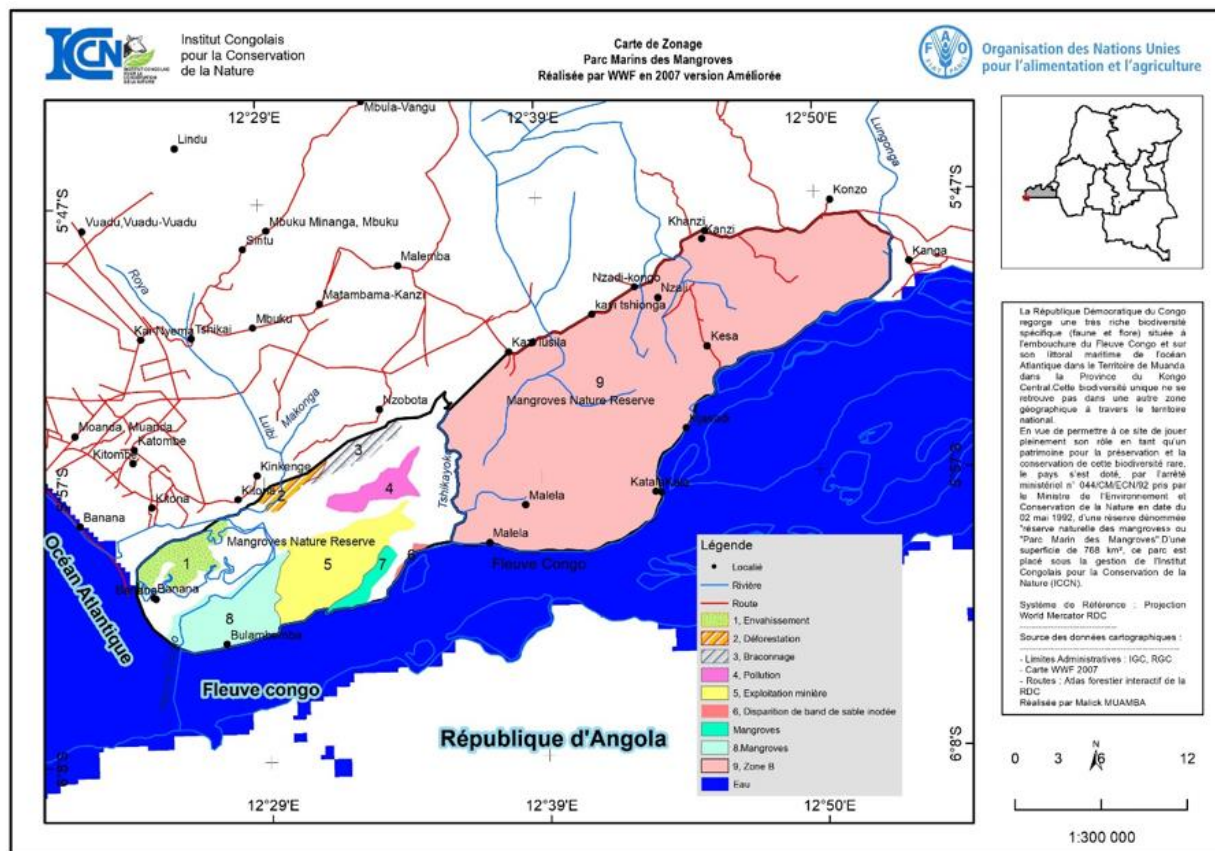
2.2.2 Most-Likely Scenario Justification (G2.1)

An assessment shows the forest has been zoned for different land uses (Fig. 3). Further studies have concluded the mangrove area is faced by both anthropogenic and human factors²⁵

²⁴

[https://www.globalmangroveswatch.org/country/COD?activeLayers=mangrove_extent&zoom=2&bounds=\[\[-219.13531149729465,-42.41236389429227\],\[230.86468850270336,83.18973289668429\]\]](https://www.globalmangroveswatch.org/country/COD?activeLayers=mangrove_extent&zoom=2&bounds=[[-219.13531149729465,-42.41236389429227],[230.86468850270336,83.18973289668429]])

²⁵ Characterization of the socio-economic and environmental contexts of five villages in the Mangrove Marine Park and its periphery in the Democratic Republic of Congo. PDF



DRC Mangrove Marine Park zoned for different land uses

2.2.3 Community and Biodiversity Additionality (G2.2)

The main economic activities around PMM engage are agriculture, livestock, fishing, hunting, crafts, and gathering. The main crops grown are cassava, corn, plantain, beans, peanuts, rice and sweet potatoes. Cassava is the main food. The farmers are found adjacent to the mangrove. The degradation of the mangrove is allowing for salinity introduction in the farmed thus poses a threat the agriculture production in Muanda area. Fishing is a major activity among the local's thought being practiced at artisanal level due to lack of technical means for industrial type fishing. Degradation of mangrove continues to destroy fisheries habitat leading to low fish catch. This has further led to extinction of some fish species: beaked whale (*Hyperodon ampullatus*); sand shark (*Sypharma sp.*); and the bull shark (*Carcharias taurus*). To restore such species, to increase the fish catch and to prevent further salt intrusion in the adjacent cassava farmer, deliberate effort should be imposed in the conservation and restoration of the mangrove in the PMM.

As of now, the PMM does not have a management plan but there is an annual work plan developed in 2008 based on the national biodiversity conservation strategy. Management activities are not carried out due to insufficient human resources and lack of financial means. The budget allocated by the State only makes it possible to cover the payment of salaries, but does not allow for the basic operating activities of the PA.

The conservation project activities to be implemented will generate biodiversity and community benefits from the sale of GHG credits the funds will address barriers illustrated in section 3.1.5 without the funding from sale of credits, it is unlikely that the project activities would be able to be implemented or continue in the future. The implementation of the proposed project activities will require a joint effort between local communities, to guarantee effective conservation and local sustainable development.

Thus, in the absence of the project, the deforestation and degradation of natural ecosystems as a result of conversion to agricultural land, illegal logging, charcoal burning and unsustainable fishing practises in the project Area will increase, this coupled with high population growth will lead to high demand for new agricultural land in the Project Area, leading to loss of habitat for local fauna.

2.2.4 Benefits to be used as Offsets (G2.2)

The project does not have any distinct community and biodiversity benefits that can be used as an offset.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

Climetrek Ltd, as the project's proponent, manages a centralized digital database that acts as the information repository from where all project documentation are stored as consolidated material. The access of project documents is possible to stakeholders through email correspondence or website information shared publicly by Climetrek. Other channels for accessing project documents shall include public petitions, grievances, submitting suggestions, reclamations, and denunciations. Additionally, the proponent shall arrange meetings in the forms of workshops, informative talks, or community visit conversations where need arises to inform the public of project activities and engagements.

2.3.2 Dissemination of Summary Project Documents (G3.1)

Project documents shall be shared and made accessible through different communication channels. Therefore, the project proponent shall design such channels of communication exchange from an audience-appropriate structure where different methods of communication shall be made available for targeted audiences on a need-basis. In this case, ClimeTrek Ltd. shall categorize the different active parties in the project and assign communication channels on how they access information. Key among the groups active in the project include collaborating entities, government institutions and policy makers, academia factions, and civil society.

2.3.3 Informational Meetings with Stakeholders (G3.1)

Stakeholder consultation forums were arranged in forms of meetings. Communication posters were put up a few days in advance in the different locations to indicate the dates and places of meetings, including a press release in the most widely read local newspaper in the region.

A total of 83 people actively participated in these meetings, stakeholders present included, community groups, local NGOs, the government officials, and community heads (chiefs of Malela and Kinlau).

2.3.4 Community Costs, Risks, and Benefits (G3.2)

Consulting with local stakeholder communities living adjacent to mangrove for the project began before the start date of the project. The project proponent designed the process to be consultative with all information sharing exercises conducted in organized community meetings. The meetings were conducted in local dialect where the ClimeTrek Ltd engaged the communities in their native Lingala dialect with the help of local translators. An open village meeting was held where the village chiefs had contacted the villagers. It was expected that the attending persons from different villages, present during the meeting would convey the message to the rest of the community members. The chiefs also briefed their communities on the carbon project and the indulgence of the communities in the same. ClimeTrek experts had the opportunity during this meeting to explain the concept of the carbon offset project. During the consultation meetings, the concerns of the communities were noted down, discussed with them and experts on the ground for possible solutions.

Proponent and stakeholders Meetings/Correspondence

Formal stakeholder consultation and sensitization meetings within the project zone were held. An email address was provided for the stakeholders where any concerns regarding the project will be channelled. Regular session with stakeholders will be held to evaluate every step of the project development and implementation. ClimeTrek experts held several meetings with the following stakeholders and consultations have continued ever since. The stakeholders include.

- i. ICCN- Congolese Institute of Nature Conservation; agency in-charge of the management of the Muanda mangrove Marine park.
- ii. Maritime Navigation and Fisheries Institute (Marine Studies Institute)
- iii. Perenco oil and petroleum company (Onshore Oil and gas exploration and extraction)
- iv. Tourism and hospitality sector (Leading hotels in Muanda operating tourist adventure expeditions in the protected area).
- v. Recoplast (Marine debris and plastic recycling start-up company involved in plastic wastes in the Muanda town and the surrounding environs including the Park area)
- vi. CCPN Moanda (Le Centre Congolais pour la Conservation de la Nature)
- vii. CICOBIO partnering RASTOMA in Sea turtle conservation.

Stakeholders and the community

The stakeholders were identified based on their level of influence on the project. Sensitization meetings were held for stakeholders' consultation. Posters were put a few days to the meeting

indicating the dates, places, and the venue. There was also a press release in the most widely read local newspaper in the region. 83 people attended the meetings, including community groups, local NGOs, government officials and community heads.

2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

Measures taken.

Communication methods used. The Projects communication shall be shared through different communication channels designed from an audience-appropriate structure. These channels include email address, Telephone number, WhatsApp group, local committees, online webinar (in different platforms), publishing in local newspaper, radio as well as face to face meeting with the project proponent team. To further streamline the project communication, Clime Trek shall categorize the different active parties in the project and assign communication channels on how they access information.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The intent to validate and verify the Project documentation by recognised DOEs through an onsite visit was discussed during the Local stakeholders' meetings. It was communicated to them that during the audit, interviews will be held for the stakeholders and members of the local communities who will be impacted directly or indirectly by the project. The project proponent will be responsible for facilitating the meetings and interviews and any other direct and independent communication required by the CCB standard. Once the audit dates are finalised the communities and other stakeholders will be informed by the following means:

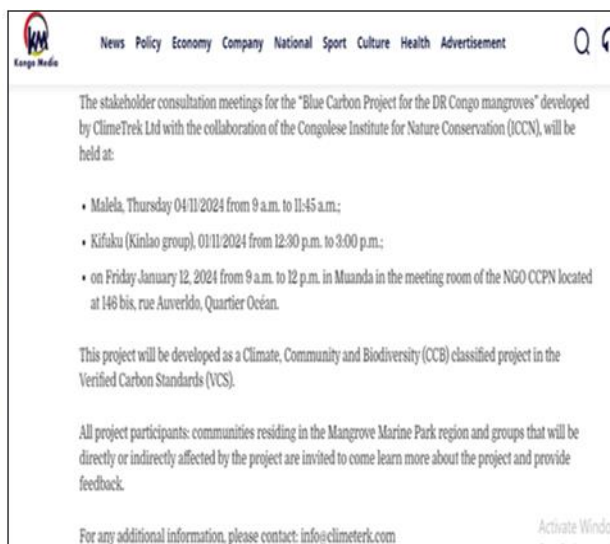
- The communities will be notified through their representatives who work closely with the project proponent.

- Other stakeholders will be notified through emails/text messages and/or through telephone calls.

2.3.7 Stakeholder Consultations (G3.4)

Stakeholder consultation forums were arranged in forms of meetings. Communication posters were put up a few days in advance in the different locations to indicate the dates and places of meetings, including a press release in the most widely read local newspaper in the region.

A total of 83 people actively participated in these meetings; stakeholders present included community. The minutes for the meeting written pictures & video for the meeting collected groups, local NGOs, the government officials, and community heads (chiefs of Malela and Kinlau



The participants want to see this project bring local jobs in order to stop the rural exodus towards Angola and raise the standard of living in their community. They insist on training in good environmental governance, especially with regard to fishing techniques for fishery resources. They think that the rarity of aquatic fauna is a source of a return to the manufacture of embers.

The communities would like the project to consider discussing with the authorities of the Congolese Seaways Company (CVM) so that dredging can be done without depositing too much sand in the spawning grounds.

After explaining the objectives of the project to the various stakeholders, the questions and good wishes showed increased interest in the project. Among the most asked questions is that of the distribution of the benefits of project activities in terms of project financing.

The project proponent shared registers with the local chiefs of Kinlao and Malewa, where any comments or communication regarding the project will be entered. The project supervisors will be going on the ground every month and liaise with the chiefs on matters requiring urgent attention. For the stakeholders in Muanda an email address was provided where any concerns regarding the project would be collated and passed on to the responsible persons for resolution.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

To ensure adaptive project management, ClimeTrek have developed ongoing communication mechanisms that go beyond the grievance mechanism. Communication and consultation have taken place and will continue to take place on an ongoing basis between ClimeTrek and local communities and other stakeholders surrounding the project area. The project proponent through the project will employ additional staff for various roles to enhance the conservation of the project area, such roles will include local forest guards, plantation workers during the reforestation of the degraded areas and monitoring stuff. These employees will be hired from the forest fringe community's further information on employment sect (2.3.15).

These community staff, after receiving the required project training, will be main point of contact with local communities and the project proponent to notify on any grievances, potential conflicts, or

negative impacts the project may have on the communities. This ongoing consultation feedback and adaptive management in combination with other grievance redress procedures developed for the project will allow the project to continuously improve by incorporating the comments or adapting to the changing circumstances within the project area.

To other stakeholders surrounding the project area, all their grievances are channelled to the company mail provided and also use of other channels i.e. WhatsApp call/teams call has been incorporated in the project to ensure quick communication and continuous consultation with stakeholders involved.

2.3.9 Stakeholder Consultation Channels (G3.5)

ClimeTrek management team holds periodical meetings internally to update on the implementation status of the project and plan on future project activities to ensure that employees concerns are addressed, and their inputs and suggestions considered.

Regarding the local communities working for the project, Clime trek community contact persons engage with the community members on regular basis throughout the year, this ensures effective communications as there is constant engagement and information is easily conveyed and required action taken.

Additionally, Clime Trek is actively holding meetings through social media platforms i.e. WhatsApp/teams and direct calls with relevant stakeholders to address any concerns arising from the project.

2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

Stakeholder consultation and participation process on project design and implementation were carried out during the pre-feasibility and feasibility assessments where possible project impacts were identified by the participants. Joint participation was encouraged for all the participants, where they able to freely express their opinions without judgement.

2.3.11 Anti-Discrimination Assurance (G3.7)

The project proponent, Climetrek Ltd, remains committed to ensuring that all engagements with the communities and all project parties are publicly executed in a participatory manner that ensures all engagements are not discriminatory. Additionally, Climetrek shall ensure that all project partners and actors remain committed to the non-discriminatory laws of DRC and the International Charter on Human Rights. Finally, the Project proponent has an established equal opportunity and anti-discrimination policy that guides all its employment and engagements during project act. ClimeTrek has developed framework for equal treatment in employment occupation to all genders seen with the diverse staff members that is contained by both male and female. The nursery establishment are mainly done by women and youth but planting is an all community activity.

Stakeholder consultation and participation process on project design and implementation were carried out during the pre-feasibility and feasibility assessments where possible project impacts were identified by the participants. Joint participation was encouraged for all the participants, where they able to freely express their opinions without judgement.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

Development process	As the proponent, ClimeTrek has established a robust grievance mechanism aimed at addressing emerging concerns, disagreements, or complaints from various parties and stakeholders. The grievance mechanism is operated at three different levels to ensure efficient handling of matters and their prompt resolution. These levels include the Project Design Team, the Grievance Committee, and the Judicial Process.
Grievance redress procedure	The Project Design Team is responsible for receiving and registering all grievances or complaints as they arise. The team then acknowledge receipt of the grievances, conduct an internal review, and propose possible resolutions to the complaint. Subsequently, the team share the internal review proposals with the aggrieved party who submitted the complaint. In response, the aggrieved party communicate their satisfaction, thereby closing the grievance, or expressing displeasure with the proposed resolutions from the Project Design Team. If the aggrieved party indicates displeasure with the Project Design Team's resolutions, the matter is escalated, and the parties seek mediation through the Grievance Committee. Upon receiving the displeasure outcome from the Project Design Team, the Grievance Committee reviews the outcomes and proposals, seeks a resolution before responding to the complainant. The committee's response is communicated to the complainant, who either accepts the resolution or registers further displeasure. If the Committee's resolutions are acceptable, the complainant agrees to the outcomes, and the matter is considered closed, allowing the Project Team to implement the agreed solutions. However, if the complainant registers displeasure with the Committee's resolutions, the matter escalated to the Judicial Process, with all parties agreeing to follow the jurisdictional due process.

2.3.13 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

The feedback and grievance redress procedures have been shared and made available to the communities and the stakeholders. The grievance procedure was explained to the locals verbally during the local stakeholder consultation meetings and other engagement sessions. The relevant communities are also aware of the grievance register book made available in their local community where they can raise any concerns and comments regarding the project or communicate directly with the representative of the proponent who will interact with them on a regular basis. This representative will communicate to the proponents, and issues/concerns raised will be addressed using the structures developed for these projects. All the grievances raised, and the proponents' responses will be documents and made publicly available for all the stakeholders involved. There will be regular updates to the communities on the progress of the project.

2.3.14 Worker Training (G3.9)

ClimeTrek experts shall identify and designate various community members and collaborating entities roles within the project. For effective operationalization of the project and project activities,

identified members shall join ClimeTrek expert teams after undergoing different training sessions. Additionally, the proponent shall use the training sessions as informative meetings for further outlining the objectives of the project to the collaborating parties and community members.

2.3.15 Community Employment Opportunities (G3.10)

The conservation project ensures no discrimination of any form to all individuals from the communities and thus are given equal opportunities to fill any employment positions when they fit into the Job requirements advertised. This benefits women and mostly those that are marginalized or vulnerable.

The Redd+ Project implemented have several planned activities throughout the project phase that will provide employment opportunities to community members. Demonstrate that people from the communities will be given an equal opportunity to fill all work positions (including management) if the job requirements are met.

The project activities shall target creating employment opportunities both temporary and long term for the local population. Other employment opportunities shall exist in the form of provision of technical, professional, and operation services both from the local and external teams that will be working on the project.

2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

ClimeTrek Ltd. and the implementing partners together with the local communities has taken strong steps to create a culture of inclusivity and respect for all. This is achieved through a clear and comprehensive non-discrimination and anti-harassment policy in line with Labour policies and practises of DRC. In the policy, it outlines how the employees are to conduct themselves in the workspace to ensure creation of an effective, productive, and healthy working environment for all. Those who interact with the workplace clearly know that sexual harassment is unacceptable behaviour and carries capital punishment for anyone found to have committed the offense. The project regularly supports training of employees on the policy and the procedures of reporting sexual harassment cases to the relevant authorities.

Additionally, ClimeTrek Ltd. has gone ahead to communicate sexual harassment policy to the employee through conducting an official launch of a sexual harassment policy at a full staff meeting and conducting regular updates and email copies of the policy forwarded to all the staffs. The organization has requested all the employees, fixed-term contractors, and sub-contracted workers to sign a copy of the policy acknowledging they have received and understood it before they are being inducted to work.

Further ClimeTrek Ltd. has developed framework for equal treatment in employment occupation to all genders seen with the diverse staff members that is contained by both male and female. The nursery establishment is mostly women and youth dominated contracts while planting is an all-community members activity.

The organization has put a policy that controls all staffs to use language with a high degree of precision and avoid word choices that are often carry unconscious assumptions about gender roles while at workplace and should adopt gender sensitive language in their communication (Anti-

stereotyping). ClimeTrek Ltd. has a well-structured leave program for all its staffs like 28 days annual leave is given to all its employee, sick leave, three months of maternity leave and flexible work schedules which allows sometimes the staffs to work from home.

ClimeTrek Ltd. will conduct due diligence of the implementing partners to ensure they have strong anti-trafficking and labor policies in place according to the DRC's prevention of trafficking in person law No 22/067.²⁶ which provide for the prohibition of trafficking in persons, creation of offences, prosecution and punishment of offenders, prevention of the vice of trafficking in persons, protection of victims of trafficking in persons, and other related matters.

2.3.17 Occupational Safety Assessment (G3.12)

	Risks identified.	Mitigation or preventative measure taken
Working Conditions	Occupational hazards	Workers are provided with the necessary PPE and its use is enforced. Workers (technical team and community field workers) are given adequate training in health and safety, as well as on the job training, and ensure adherence to health and safety procedures to minimize accidents.
Sanitation Issues	Water and Vector-borne diseases	The project provides toilet facilities at the site to discourage free-range defecation among workers and field workers will be encouraged to use the facilities available at nearby communities. Workers are encouraged to sleep in tents to avoid disease vectors such as mosquitos.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

ClimeTrek is the project proponent thus will assume all the responsibilities of running the projects. ClimeTrek comprise different department which assume different project roles including. Project Development department is in-charge of developing project workplan and activities, Field Technical Department is in-charge of field data collection and analysis, Business Development team is in-charge of sourcing project finances and project logistic planning, and Sales and Marketing team deal with project advertisement to outside partners and also matters dealing with credit sales and retirement. The Human resource department hires external consultants to fill in specific roles for the project.

²⁶ <https://www.state.gov/reports/2023-trafficking-in-persons-report/the-democratic-republic-of-the-congo/>

2.4.2 Required Technical Skills (G4.2)

Project lead

The project team lead has a postgraduate degree in mangrove ecology and doubles up as taxonomist, biodiversity, and carbon expert. The lead has over 7 years of experience conducting mangrove inventory surveys and/or soil sampling and/or biodiversity assessments and developing blue carbon project in Africa. The team lead is responsible for general team coordination, logistics planning, data collection, data entry, and data quality assurance, analysis and developing carbon project document and reports. The team lead also ensures field equipment are available to team members and are well maintained and stored. The team lead also is responsible for handling transport and temporary field storage of samples while out in the field.

Biodiversity expert

The biodiversity expert is a professor in DRC university with a wealth knowledge in biology, Marine science, ecology and/or related sciences. The expert has huge experience conducting coastal biodiversity surveys and/or research. He is responsible for training participating members on inventory protocols and procedures. He is also responsible for biodiversity data collection, data entry, and data quality assurance. The expert also takes part in report writing and review of report drafts before submission.

Taxonomist

The taxonomist has graduate degrees with extensive knowledge of coastal biodiversity in DRC and with experience conducting coastal biodiversity surveys and/or research. The taxonomists are responsible for training participating members on inventory protocols and procedures. They are responsible for data collection, data entry, and data quality assurance. The expert will also take part in report writing and review of report drafts before submission. The taxonomist will also help identify any unknown species encountered in the field and assist in any other tasks when called upon to do so.

GIS expert

The GIS expert has a postgraduate degree in remote sensing, mapping, and field surveys. He is responsible for developing project maps, developing trends and forest cover forecast maps, generating sampling points. He is also responsible for GPS data collection, data entry, and data quality assurance.

Field Assistants (Forest assistant, soil assistant, biodiversity assistant, translator)

These are local community members who are young, strong, and able to perform the duties of in the mangrove such as soil coring and sample transport. They at least have a secondary school qualification. They possess basic knowledge of mangrove tree species growing in their area, animal and plant species present in their area. They assist in mangrove vegetation measurement, biodiversity assessment, soil coring, sample packing and transport to laboratory for analysis. Translators are young and energetic individuals proficient in English, French and the local language of the area of sampling. They at least have a secondary school qualification and are responsible

for all translation services. Community guides & porters are members of the local communities with extensive knowledge of the mangrove forest. They are responsible for carrying field equipment and guiding the field teams through the forest.

2.4.3 Management Team Experience (G4.2)

ClimeTrek limited has gone ahead to employ project manager and field officer who are all graduates with background in environment and conservation related courses and are responsible for all technical project activities required. Training for field staff has been done on how they can conduct field data collection using the required field equipment. Plans are under way to train the plantation farm managers to work as the bystanders on how to safely intervene and support those experiencing sexual harassment related issues while implementing project activities.

2.4.4 Project Management Partnerships/Team Development (G4.2)

ClimeTrek has technical and project management expertise (see section G4.1) with 50+ years' cumulative experience and technical knowledge in carbon project development. Occasionally, partners with local institutions to guide on specific ground matters. In this project, the communities are ClimeTrek collaborators and helping to monitor the activities in the forest.

2.4.5 Financial Health of Implementing Organization(s) (G4.3)

ClimeTrek has secured project funding to develop this project. The funds cover all the project cost from project registration fees, project employees' salaries, covering consultation meeting fee, to purchase of field equipment's as well as to facilitate validation and verification team.(possible proof of project finances)

2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

To avoid be implicated in any corruption, ClimeTrek has made it public its intentions to develop carbon offset project in the DRC mangrove. Further, has held public consultations with both community and expert stakeholders who are directly or indirectly impacted by the development of the project. Additionally, the project is being developed following the prescriptions in DRC Forest Code of 2002 and country Constitution of 2006.

Additionally, all transaction concerning the project development are well documents and are available upon request and justification for the disclosure.

Any employment related to the project is publicly advertised for qualified people to apply. Once application are received are screened by ClimeTrek HR team and 3round of interviews are conducted to determine the best qualified applicant fill a position.

2.4.7 Commercially Sensitive Information (Rules 3.5.13 – 3.5.14)

There is commercially sensitive information included in this project description.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

Access to land by ecological zone:

Home gardens are individualized by households. They are shared in inheritance, that is, the heir to the parents' house inherits the entire home garden and the resource (trees and fruit trees, livestock).

The Savannah zone is considered collective with right access for non-native for limited time and only after prior agreement with chief of a village. The low exploitation of land far from the village and the collective status is, however, used today by city dwellers who exploit the area quite freely. Conflicts are beginning to emerge, particularly with the increase in pressure on savannah in recent years. It seems that in certain villages, the area has been subdivided by lineage but this division remains flexible in the event of prior request. In general, the land rules in the savannah remain to be clarified.

The periphery forest zone is collective, exploited for cooking wood by the villages. The cultivated areas are probably individualized.

Lowland zone is divided between household and transmitted by paternal inheritance.

The fishing zone area accessible to everyone without restriction. The presence of very large camps of non-natives on the islands attests to this. There do not appear to be any restricted areas.

The exploitation of non-timber forest products is open to all, particularly for baobab fruits.

Hunting can also be practiced by everyone. Theoretically, non-native hunters must first obtain permission from the village head.

2.5.2 Recognition of Property Rights (G5.1)

Climetrek Ltd, as the project proponent, duly recognizes the communities of Kinlau and Malela as the holders of land and property rights within the project area. Thus, such rights as accorded by the existing laws of DRC and the Carbon rights agreements signed with the communities in respect to develop a Mangrove Carbon Project shall remain respected. The communities shall retain access to the project area during the project period.

2.5.3 Free, Prior and Informed Consent (G5.2)

Obtaining consent

The community engagement and consultations formed part of information gathering and sharing during the project. The project proponent designed the process to be consultative with all information sharing exercises conducted in organized community meetings. The meetings were conducted in local dialect where the ClimeTrek Ltd teams relied on Prof. Raoul, Mr. Placide Mananga, and Malik to engage the communities in their native Lingala dialect. The intention

	for organizing the village meetings and conducting them in local language was to guarantee that all information, pertaining to the projects mission, goals, and objectives were effectively captured and that, the local community were granted an opportunity to share their aspirations, expectations, and concerns on the project. For a transparent carbon project, consultation with directly and indirectly affected stakeholders is paramount. Thus, for this project, ClimeTrek held three consultation meetings with communities living around the mangrove. Following the governance hierarchy of the communities, the first meeting was with the 20 chiefs of the villages. This was held in a conference room (appendix I) it was the first time ClimeTrek contacted the communities. In the meeting, ClimeTrek outlined the idea of conserving the forest through carbon finance. Being a new idea, the ClimeTrek expert detailed the process of how the conservation should be to warrant receiving carbon finance. Subsequent meetings were organized by the chiefs within the villages (Appendix II). The chiefs took the center stage to brief their communities on the carbon project and the role the communities would play. The meetings were attended by men, women, and youths. A minimum of thirty community members participated in each meeting.
Outcome of FPIC	While the community remains agreeable to the project and are looking forward to being fully engaged; they raised concerns about the alternative livelihoods that the project plans to implement. To this, the community leaders suggested various initiatives that, if successfully integrated as part of the project's programs, could help minimize their dependence on mangrove forest and encourage them to engage in conservation. The community, through their leadership refer to a local adage stating that, "...When you remove the machete from the child's hands; then find him a stick to replace it..." Through their inference, the community leaders champion the need for robust alternative livelihoods, products, and services supported under the project period to cushion them and their needs retrieved from the forest. Mitigation Measures No modifications have yet been made to the project as it is still being developed. During the consultation meetings, the concerns for the communities were noted down, discussed among the communities and experts on the ground for possible solutions. Where the solution was not immediately reached, the concerns were forward to ClimeTrek management team for comments and way forward. This same approach was agreed to be used throughout the project implementation where regular feedback session with

	stakeholders will be held to evaluate every step of the project development and implementation. Consent to develop the project. After careful consideration by the chiefs, who are the main custodians of the resource on behalf of the local communities, they consented to the project to be developed in their mangrove, evidenced by them signing an agreement to that effect. Also, the bigger communities consented to having the project in their jurisdiction after detailed explanation of the project objectives and the benefits it brings once it is implemented.²⁷
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2.5.4 Property Rights Protection (G5.3)

During the project active phase, ClimeTrek Ltd is committed to upholding the communal land and property rights as accorded to the communities of Malela and Kinlau. As such, no relocation of land or any property shall be conducted during and after the project.

Rights to territories and resources	All land and natural resources thereof in DR Congo are under State ownership. However, individuals, groups, or entities can acquire concession rights from the government to utilise the land and the resources in it. In certain areas occupied by indigenous communities, the government recognizes their rights to the land and resources and provides customary rights to the chieftains of such communities to utilize the land and the resources of such areas.
Respect for property rights	For the mangrove forests of DR Congo, the government extended customary land rights to the chieftains from the communities of Malela and Kinlau. The extension of such rights by the Government indicated that the community through their generations will continue to possess customary land rights over these mangrove areas. To reinforce the prevalence and provision of the customary rights of the Malela and Kinlau communities, the mangrove areas are considered as nature reserves bifurcated into two zones namely Parc Marin des Mangroves (Zone A) and Parc Marin des Mangroves (Zone B). Consequently, through such official paperwork and customary rights accorded to the chieftains Malela and Kinlau, the communities have signed a carbon rights agreement with ClimeTrek; to utilise the mangrove areas for a carbon project. The agreement allows ClimeTrek to carry out conservation activities that reduce the continued degradation of the

²⁷ FPIC report will be attached

mangroves in Marine Park and restore the already degraded areas under the legal statutes provided in both state and conservation laws.

If any relocation of habitation or activities is undertaken within the terms of an agreement, demonstrate that the agreement was made with the free, prior, and informed consent of those concerned and includes provisions for just and fair compensation.

2.5.5 Illegal Activity Identification (G5.4)

The project feasibility study identified various illegal activities currently ongoing in the PMM compromising the structure, integrity, and capacity of the ecosystem to sustain its providence role for various ecosystem goods and services. Example of illegal activities in the PMM include uncontrolled illegal fishing around the PMM, illegal logging of mangrove for charcoal (Makala) production, game hunting in the project boundary areas.

2.5.6 Ongoing Disputes (G5.5)

There are no ongoing disputes or unresolved conflicts over rights to land, territories, and resources.

2.5.7 National and Local Laws (G5.6)

There is no text specifically regulating the Protected Area (PA). Regulatory mechanisms to control inappropriate land use and illegal activities in the PA are described in texts applicable at the national level. These include:

- Law No. 69-041 of August 22, 1969, on the conservation of nature in the DRC.
- Law No. 82 of May 28, regulating hunting.
- Law No. 011 of August 29, 2002, on the forest code in the DRC.

Law No. 69-041 of August 22, 1969, on the conservation of nature in the DRC calls for national measures to reduce emissions from deforestation and forest degradation and recognises co-benefits of protecting natural forests that is resilience of ecosystems and maintaining the stock of carbon forest. The project aims to reduce forest degradation in the region and implement REDD+ activities that will increase forest carbon stock, prevent social conflicts related to land use, and conserve ecosystems.

Law No. 82 of May 28, regulating hunting. set out offences, punishable by imprisonment for up to five years or a fine, to possess a protected animal and to engage in hunting without a permit. This project will perform regular monitoring, proper management, enforcement of regulations, clear demarcation of forest boundary and discontinuation of the non-resident cultivation to ensure sustainable natural resources management.

Law No. 011 of August 29, 2002, on the forest code in the DRC acts as the main legislation regulating the forest sector in DRC. One of the major focuses is to restore State control over a sector profoundly undermined by corruption and illegality, it calls for better forest control and oversight, implementation of sound forest plans and improved preservation of local people's rights. In this regard, the project proponent, following the legal channel conducted Free Prior and informed consent. In short-term project, the community wants to have financial benefits from the forest while their long-term goal is to have a healthy forest that continuously provides for their livelihood for the current and future generations. By ClimeTrek developing a conservation and carbon sequestration project in the mangrove of DR Congo, it will be abiding by the Forest Law.

Law No. 14/003 on Protection of the Nature, aims to adapt the DRC legal order of protection of nature to modern principles on biological and genetic resources management and to requirements of international conventions, including among others the Treaty on protection and sustainable management of forestry ecosystems in Central Africa. The law mandates the government to consider the potential value of forest carbon sequestration services for climate change mitigation while elaborating the National Strategy on Protection of Nature and the National Forestry Programme. The law further calls on the central and regional governments to adopt and implement policies, plans and programmes promoting the contribution of natural and biological resources and ecosystems to the economic growth, rural development, fight against poverty and regulation of the climate. The project aims to achieve sustainable management developing a science based on the priorities of local people, and creating a technical base that includes both traditional and modern approaches to problem which will result to sustainability of the mangrove resources and rural livelihood in Democratic Republic of Congo.

Law .no 11/009 of July 2011 general environmental outlines the principles for environmental protection and governance. This law calls for the inclusion of environmental and social considerations in decision making and promotes sustainable development and public participation. This project will be promoting better living conditions for the population through the revenues from the carbon credits and the maintenance of the forest enables continued provisions of the mangrove goods and services.

2.5.8 Approvals (G5.7)

ClimeTrek has signed MOU with communities of Malela and Kinlau as well as ICCN to develop carbon offset project in the DRC mangrove.

2.5.9 Project Ownership (G5.8)

The DRC Constitution on land tenure accords the state all ownership of land. While there is a process of obtaining concessions over land areas in DR Congo by an individual, group, or entity to utilize the land or the resource by getting such permission from the government, for certain areas, the government recognizes the rights of the communities residing in the area or have historically presided over the areas and provides customary rights to the chieftains of such communities to utilise the land and the resources of such areas.

The DRC Mangrove Marine Park (PMM) was created by Ministerial Order No 044/CM/ECN/92 of May 2, 1992, of the Ministry of the Environment. Its surface area is approximately 76,000 ha (760

km²). The Congolese State is the landowner of the PMM. But its management is entrusted to the Congolese Institute of Nature Conservation (ICCN).

The chieftains from the communities of Malela and Kinlau have been provided such customary rights by the Government which also indicates that their sons will continue to have the customary rights over these mangrove areas. To reinforce the prevalence and provision of the customary rights of the Malela and Kinlau communities, the mangrove areas are considered as nature reserves bifurcated into two zones namely Parc Marin des Mangroves (Zone A) and Parc Marin des Mangroves (Zone B). This identification happened back in 1992, and the areas were designated as Ramsar sites on January 18, 1996²⁸. Thus, through such official paperwork, customary rights were provided to the chieftains of the two communities. These communities of Malela and Kinlau living adjacent to the mangrove site have signed a carbon rights agreement with ClimeTrek to utilise the mangrove areas for a carbon project by carrying out conservation activities that reduce the continued degradation of the mangroves in Marine Park and restore the already degraded areas.

Under the carbon rights agreement, the signing parties i.e., the chieftains of Malela and Kinlau are free to confer the carbon rights to ClimeTrek Ltd., in developing the carbon project after the agreement of benefit-sharing mechanism in which the communities will receive financial benefits and capacity building support through the implementation of the project. Under this agreement, parties design a mechanism through which the project and its activities are undertaken, even further preparing a benefit-sharing scheme accruing from the monetization of the carbon credits in the carbon market, thereby unlocking important climate finance for the conservation and restoration of the mangrove zones.

2.5.10 Management of Double Counting Risk (G5.9)

The project has not generated or received any other form of environmental or social credit not has not registered any other programs to receive credits apart from the ones described in this temple PD.

2.5.11 Emissions Trading Programs and Other Binding Limits

The project is not trading neither does it have binding agreements with other emissions trading scheme.

2.5.12 Other Forms of Environmental Credit

The project is not seeking neither has it received any other environmental credit.

2.5.13 Participation under Other GHG Programs

The project is not registered neither is it seeking registration under any other GHG program.

²⁸ <https://www.afrik21.africa/rdc-le-parc-Marin-des-mangroves-menace-par-le-port-en-eau-profonde-de-banana/>

2.5.14 Projects Rejected by Other GHG Programs

The project is a new project and has never been rejected by any other GHG programs.

2.5.15 Double Counting (G5.9)

The project reductions & removals and project activities are not included in any other emissions trading program or binding emission limit. Additionally, DRC has signed consent indicating the credits accrued from this project will not be used by the country to report in her NDC commitments.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

The project employs VM0007 REDD+ Methodology Framework (REDD+MF), v1.6²⁹. The modules and tools used for estimation reduction under this methodology in this project include:

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0007	VM0007 REDD+ Methodology Framework (REDD+MF),	6.0
Module	VMD0001	Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB) version	1.1
Module	VMD0002	Estimation of carbon stocks in the dead-wood pool (CP-D)	1.0
Module	VMD0007	Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation and unplanned wetland degradation (BL-UP),	3
Module	VMD0050	Estimation of baseline soil carbon stock changes and greenhouse gas emissions in tidal wetland restoration and conservation project activities (BL-TW)	1.0
Module	VMD0015	Methods for monitoring of greenhouse gas emissions and removals (M-REDD)	2.2
Module	VMD0051	Methods for monitoring carbon stock changes and greenhouse gas emissions	1.0

²⁹ [VM0007 REDD+ Methodology Framework \(REDD+MF\), v1.6 - Verra](#)

		and removals in tidal wetland restoration and conservation project activities (M-TW),	
Module	VMD0010	Estimation of emissions from activity shifting for avoiding unplanned deforestation and avoiding unplanned wetland degradation (LK-ASU)	1.2
Module	VMD0044	Estimation of emissions from ecological leakage (LK-ECO),	1.1
Module	VMD0017	Estimation of uncertainty for REDD+ project activities (X-UNC),	2.2
Module	VMD0052	Demonstration of Additionality of Tidal Wetland Restoration and Conservation Project Activities (ADD-AM)	1.0

3.1.2 Applicability of Methodology

The VM007 version 1.6 methodology is a revised version meant to accommodate tidal wetland restoration and conservation activities. In its broad application, the methodology is applicable in forest lands, forested wetlands, and forested peatlands susceptible to deforestation or degradation in the absence of project activities.

Considering this project's sectoral scope (section 1.2) the applicability of this methodology is evaluated by the reduction of emissions from unplanned deforestation and unplanned degradation of intact or partially drained wetlands³⁰.

Methodology ID	Applicability condition	Justification of compliance
VM0007	All land areas registered under the CDM or under any other GHG program (both voluntary and compliance-oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program must be monitored over time and reported in the monitoring reports.	To date, there are no other GHG emission reduction programs registered for the area.
	Land in the project area has qualified as forest (following the definition used by VCS) at least 10 years before the project start date.	As the project is mangrove-based, the height requirement is excluded but the forest

³⁰ These are part of REDD+ activities under the AFOLU and the categories of Partially Drained wetlands under Wetland Restoration and Conserve (WRC)

Mangrove forests are excluded from any tree height requirement in a forest definition, as they consist of (close to) 100% mangrove species, which often do not reach the same height as other tree species and occupy contiguous areas, and their functioning as a forest is independent of tree height.

definition for DR Congo is applied. The project area has been a forest for more than 10 years.

If land within the project area is peatland or tidal wetlands and emissions from the soil carbon pool are deemed significant, the relevant WRC modules must be applied alongside other relevant modules.

As the project is developed in coastal wetlands, the relevant WRC modules are applied, according to the methodology, for the estimation of emission reductions.

Baseline deforestation and forest degradation in the project area fall within one or more of the following categories:

- Unplanned deforestation (VCS category AUDD);
- Planned deforestation/degradation (VCS category APD);
- Degradation through the extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD).

The processes active in the project area correspond to unplanned deforestation and degradation (AUDD).

Leakage avoidance activities must not include:

- Agricultural lands that are flooded to increase production (e.g., paddy rice)
- Encouraging livestock production using feedlots and/or manure lagoons

These options are not included as leakage management activities.

Baseline agents of deforestation must: (i) clear the land for settlements, crop production

The agents of deforestation and degradation in the project

(agriculturalist), or ranching, where such clearing for crop production or ranching does not amount to large-scale industrial agriculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) be both residents in the Reference.

Region for Deforestation or immigrants. Under any other condition, this methodology must not be used

Land in the project area has qualified as forest (following the definition used by VCS) at least 10 years before the project start date. Mangrove forests are excluded from any tree height requirement in a forest definition, as they consist of (close to) 100% mangrove species, which often do not reach the same height as other tree species and occupy contiguous areas, and their functioning as a forest is independent of tree height.

If land within the project area is peatland or tidal wetlands and emissions from the soil carbon pool are deemed significant, the relevant WRC modules must be applied alongside other relevant modules.

Baseline deforestation and forest degradation in the project area fall within one or more of the following categories:

- Unplanned deforestation (VCS category AUDD);
- Planned deforestation/degradation (VCS category APD);

idea have been identified as small-scale farming and fuel wood harvesting³¹

There are no previous concession rights for the mangrove of DR Congo, therefore no deforestation activity should be happening in the forest

As the project is mangrove-based, the height requirement is excluded but the forest definition for DR Congo is applied. The project area has been a forest for more than 10 years.

As the project is developed in coastal wetlands, the relevant WRC modules are applied, according to the methodology, for the estimation of emission reductions.

The processes active in the project area correspond to unplanned deforestation and degradation (AUDD).

³¹ Falasi, P. B. (2011). *Characterization of Land use Information for Mangrove Forests Conservation and Rural Farming in Democratic Republic of Congo* (Doctoral dissertation, Egerton University).

- Degradation through the extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD).

Leakage avoidance activities must not include: These options are not included as leakage management activities.

- Agricultural lands that are flooded to increase production (e.g., paddy rice)
- Intensifying livestock production using feedlots and/or manure lagoons

3.1.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Above ground	CO ₂	Yes	Major carbon pool
		CH ₄	No	Not included
		N ₂ O	No	Not Included
		Other	n/a	n/a
	Below ground	CO ₂	Yes	Major Carbon pool
		CH ₄	No	Not included
		N ₂ O	No	Not included
		Other	n/a	n/a
Project	Above ground	CO ₂	Yes	Major carbon pool
		CH ₄	No	Not included
		N ₂ O	No	Not included
		Other	n/a	n/a
	Below Ground	CO ₂	Yes	Major carbon pool
		CH ₄	No	Not included
		N ₂ O	No	Not included
		Other	n/a	n/a

3.1.4 Baseline Scenario

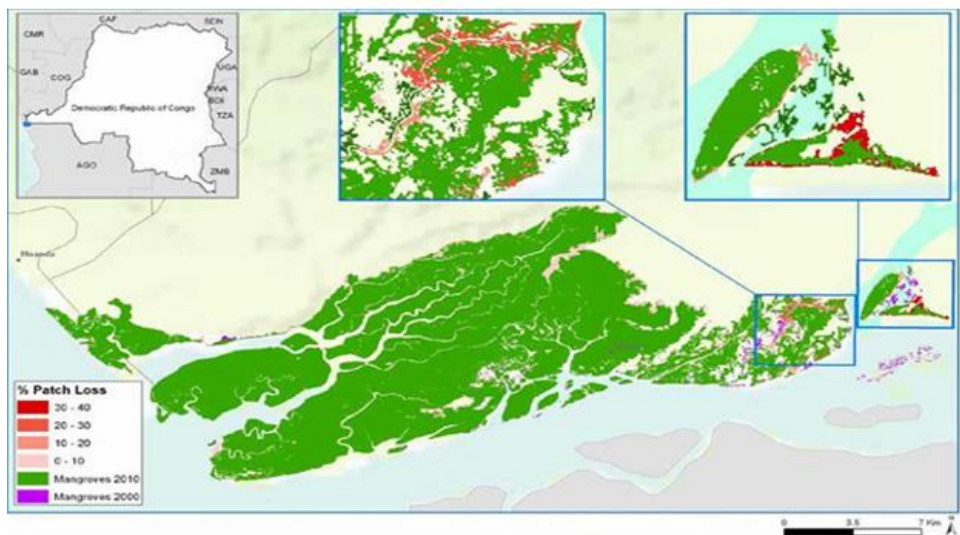
The Mangrove Marine Park, in central Kongo, in the Democratic Republic of Congo, is made up of important coastal (marine and fluvial) and island (fluvial) areas of mangroves, sheltering a rich biodiversity. However, several threats weigh on the park including certain activities of local populations such as: agriculture, fishing or the exploitation of mangrove wood for the production of charcoal.

In addition, mangroves provide many of them with their needs, generally supplemented by other productive activities such as agriculture, poultry farming, beekeeping, etc. Mangrove wood is a multi-use resource used in making clotheslines, traps, paddles, yam logs, fences, sculptures, construction poles, fuel and many other uses (World Rainforest Movement, 2002).



Causes of forest deforestation and degradation A) Unsustainable fishing and B) Oil pollution

Without the REDD+ project, the mangrove forest of DR Congo is expected to continue being deforested and degraded through human wood harvesting, firewood harvesting, small-scale farming, and clearing for seaway. Subsequently, the lack of sensitization among the communities living adjacent to the forest on sustainable resources will continue to face low levels of awareness about REDD+ thus leading to an unsustainable exploitation of the mangrove resource (Berk and Lungungu, 2020).



Thus, the project aims to reduce emissions from these activities through implementing strategies that promote Avoided Unplanned Deforestation and forest Degradation (AUDD) within the AFOLU classification. Additionally, initiating a REDD project within this forest will help reduce these threats to a level that is not detrimental and at the same time earn revenue that will be used to support alternative activities that do not reduce the mangrove forest cover of DRC.

3.1.5 Additionality

The DR-Congo Mangrove Blue Carbon Project meets applicability condition Protecting at-risk wetlands (e.g., establishing conservation easements, establishing community supported management agreements, establishing protective government regulations) of the VMD0052 Demonstration of Additionality of Tidal Wetland Restoration and Conservation Project Activities (ADD-AM), version 1.0) in the following ways.

The project area is susceptible to human encroachment for agricultural activities and unsustainable use of the natural resources of the marine park. (Illegal logging, charcoal production, overfishing and plastic pollution). This activities without the carbon project will continue to exist and the deforestation and degradation of this mangroves will increase contributing to further emissions.

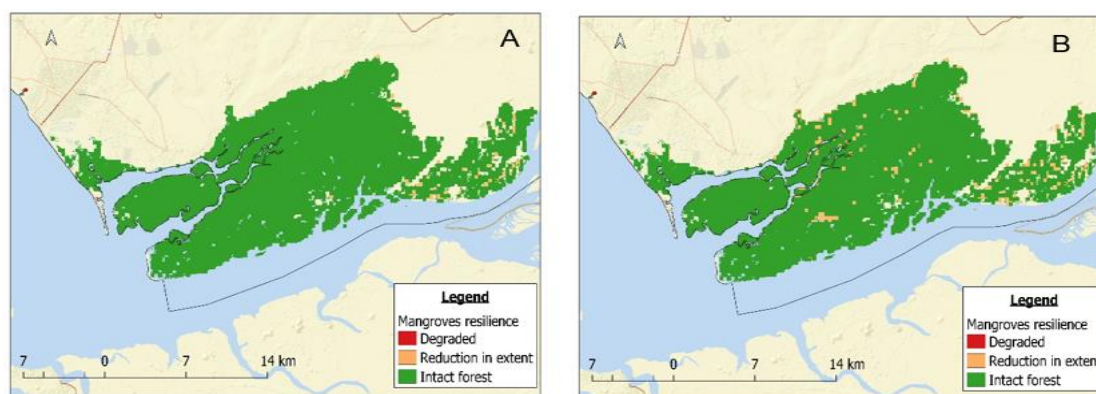


Figure above showing mangrove reduction extent between (A) 2013 (B)2018

The above figures show that the extent of reduction has increased in 2018 compared to 2013 as a result of underlying anthropogenic factors mentioned above.

Without enhanced restoration, the mangrove areas will remain vulnerable to further degradation. Therefore, it is paramount to have a restoration program to recover the degraded areas of mangroves. Detailed ground truthing of the degraded areas and plans for its restoration is integral to the carbon project. This exercise will be community-focused where the communities get proper training using the approved protocol for mangrove conservation and restoration.

No methodological deviations.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Estimation of annual areas of unplanned baseline deforestation in the project area

$$A_{BSL,RR,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{RRL}$$

Where;

$A_{BSL,RR,unplanned,t}$ Projected area of unplanned baseline deforestation in the reference region for location (RRL) in year t; ha

$A_{BSL,RRD,unplanned,t}$ Projected area of unplanned baseline deforestation in RRD in year t; ha

P_{RRL} Ratio of forest area in the RRL at the start of the baseline period to the total area of the RRD; dimensionless

t 1, 2, 3, ... t * years elapsed since the projected start of the project.

activity

The annual area of unplanned baseline deforestation in the leakage belt is estimated as follows (only used where spatial modelling is not applied):

$$A_{BSL,LB,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{LK}$$

Where:

$A_{BSL,LB,unplanned,t}$ Projected area of unplanned baseline deforestation in the leakage belt area in year t; ha

ABSL,RRD,unplanned,t	Projected area of unplanned baseline deforestation in RRD in year t ; ha
P_{LK}	Ratio of the area of the leakage belt to the total area of RRD; dimensionless
t	1, 2, 3, ... t^* years elapsed since the projected start of the project activity.

3.2.2 Project Emissions

Calculate the mean carbon stock in aboveground biomass for each stratum, converted.

to carbon dioxide equivalents:

$$C_{AB_tree,i} = \sum_{sp=1}^{P_i} \frac{C_{ABtree,sp,i}}{A_{sp,i}} * \frac{44}{12}$$

Where:

$C_{AB_tree,i}$	Mean aboveground biomass carbon stock in stratum i ; t CO ₂ -e ha ⁻¹
$C_{ABtree,sp,i}$	Aboveground biomass carbon stock of trees in sample plot sp of stratum i ; t C
$A_{sp,i}$	Area of sample plot sp in stratum i ; ha
sp	1, 2, 3 ... P_i sample plots in stratum i
i	1, 2, 3, ... M strata
$\frac{44}{12}$	Ratio of molecular weight of CO ₂ to carbon, t CO ₂ -e t C ⁻¹

The mean carbon stock in belowground tree biomass per unit area is estimated based on field measurements of aboveground parameters in sample plots. Root to shoot ratios are coupled with the Allometric Equations method to calculate belowground from aboveground biomass.

Step 1: Calculate the belowground tree biomass carbon stock for each plot:

$$C_{BB_tree, sp,i} = R * C_{AB_tree,sp,i}$$

Where:

$C_{BB_tree,sp,i}$	Belowground tree biomass carbon stock of trees in plot sp , in stratum i ; t C
$C_{AB_tree, sp, i}$	Aboveground tree biomass carbon stock of trees in plot sp in stratum i ; t C
R	Root to shoot ratio; t root d.m. t ⁻¹ shoot d.m.
i	1, 2, 3, ... M strata

Step 2: Calculate the mean belowground tree biomass carbon stock for each stratum, converted to carbon dioxide equivalents:

$$C_{BB_tree,i} = \sum_{sp=1}^{P_i} \frac{C_{BB_tree,sp,i}}{A_{sp,i}} * \frac{44}{12}$$

$C_{AB_tree,i}$	Mean belowground biomass carbon stock in stratum i ; t CO ₂ -e ha ⁻¹
$C_{ABtree,sp,i}$	below ground biomass carbon stock of trees in sample plot sp of stratum i , t C
$A_{sp,i}$	Area of sample plot sp in stratum i ; ha
sp	1, 2, 3 ... P_i sample plots in stratum i
i	1, 2, 3, ...M strata
$\frac{44}{12}$	Ratio of molecular weight of CO ₂ to carbon, t CO ₂ -e t C ⁻¹

3.2.3 Leakage

$$\Delta C_{LK-ASU-LB} = \Delta C_{P, LB} - \Delta C_{BSL, LK, unplanned}$$

Where:

$\Delta C_{LK-ASU-LB}$ Net CO₂ emissions due to unplanned deforestation displaced from the project area to the leakage belt up to year t^* (t CO₂e)

$\Delta C_{BSL, LK,}$ unplanned Net CO₂ emissions in the baseline from unplanned

deforestation in the leakage belt up to year t^* (t CO₂e)

$\Delta C_{P, LB}$ Net greenhouse gas emissions within the leakage belt in the project case up to year t^* (t CO₂e)

If $\Delta C_{LK-ASU-LB}$ as calculated is <0 then $\Delta C_{LK-ASU-LB}$ must be set equal to 0 (to prevent positive leakage).

3.2.4 Net GHG Emission Reductions and Removals

This information will be available during monitoring.

For data and parameters monitored, use estimates. Document how each equation is applied, in a manner that enables the reader to reproduce the calculation. Provide example calculations for all

key equations, to allow the reader to reproduce the calculation of estimated net GHG emission reductions or removals.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year A				
Year B				
Year C				
Year...				
Total				

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Complete the table below for all data and parameters that are determined or available at validation and remain fixed throughout the project crediting period (copy the table as necessary for each data/parameter). Data and parameters monitored during the operation of the project are included in Section 3.3.2 below.

Data / Parameter	CO ₂ Conversion factor
Data unit	tCO ₂
Description	The factor is applied to convert the tree carbon sequestered to tree CO ₂ e sequestered.
Source of data	https://www.epa.gov/energy/greenhouse-gas-equivalencies
Value applied	3.667
Justification of choice of data or description of measurement methods and procedures applied	The ratio of the mass of carbon to that of carbon dioxide
Purpose of data	
Comments	Estimation of belowground biomass

Data / Parameter	Root /shoot ratio (R)
Data unit	Dimensionless

Description	Converts the aboveground biomass to the above and below ground biomass
Source of data	IPCC "Good Practice Guidance for LULUCF". 2006.Table 4.4
Value applied	24%
Justification of choice of data or description of measurement methods and procedures applied	The ration is multiplied by the aboveground biomass to get the below ground biomass.
Purpose of data	Calculation of project emissions
Comments	N/A

3.3.2 Data and Parameters Monitored

Complete the table below for all data and parameters that will be monitored during the project crediting period (copy the table as necessary for each data/parameter). Data and parameters determined or available at validation are included in [Section 3.3.1 \(Data and Parameters Available at Validation\)](#) above.

Data / Parameter	Diameter (DBH)
Data unit	cm
Description	Diameter of the tree at 1.3m height
Source of data	Field measurements on "Data inventory sheets"
Description of measurement methods and procedures to be applied	Refer Section 5.4-sample plots will be established, the diameter tapes and calipers used in measurement of DBH and Suunto Clinometer will be used in Height measurements.
Frequency of monitoring/recording	Annual
Value applied	It would range from 1-10m depending on the age of the tree
Monitoring equipment	Diameter tape/Calipers
QA/QC procedures to be applied	For accuracy, three measurements are taken over DBH, at the DBH and below DBH then the results are averaged to get an accurate DBH.

Purpose of data	Calculation of actual GHG Removal by Sinks.
Calculation method	See section 5.4
Comments	N/A

Data / Parameter	Height
Data unit	m
Description	Total height of trees
Source of data	
Description of measurement methods and procedures to be applied	The height will be measured by use on Suunto clinometer, in different subplots, the highest and minimum height trees will be taken, by the forest commission experts.
Frequency of monitoring/recording	Refer section 5.4 for more details.
Value applied	Annual
Monitoring equipment	Ex –Post
QA/QC procedures to be applied	Suunto clinometer
Purpose of data	The technical expertise of the Forest Commission will be required and ensure all the field team is trained to collect accurate data.
Calculation method	Calculation of actual GHG Removal by Sinks.
Comments	See section 5.4

Data / Parameter	A
Data unit	m2
Description	Sampling population
Source of data	GPS coordinates (Mapping)
Description of measurement methods and procedures to be applied	Rectangular plots of 100m by 100m and sub plots of 0.5 each will be created; GPS will be used to mark plot centers.

Frequency of monitoring/recording	For detailed description refer section 5.4
Value applied	Annual
Monitoring equipment	Ex post
QA/QC procedures to be applied	Diameter tape
Purpose of data	Geo referencing of coordinates at the field.
Calculation method	Calculation of actual GHG Removal by Sinks
Comments	See section 5.4

3.3.3 Monitoring Plan

The monitoring activities during the project's implementation shall adopt an open and transparent structure that integrates community participation with other monitoring and evaluation technologies such as remote sensing. The objective of the activities being to capture trends of reduction of emission, environmental, and social benefits that may be directly/indirectly resulting from the project's implementation .

Monitoring of effectiveness shall be attained through having all the project's proponent working closely with the local community and other stakeholders. The proponent shall ensure that active parties including institutions of higher learning, research, and management actively take part in planning, designing, and implementing the various assessment and monitoring programs for the project. The approach shall ensure effectiveness in delivery of the vast project objectives. The objectives shall include ensuring robust collaboration, delivering on the conservation goals such as exploring the data collection methodologies, training of participants, and effective communication of the monitoring results. The monitoring exercise shall focus on assessing and evaluating progress and executing restoration activities, conducting training workshops, and collecting data on biodiversity and socioeconomic conditions. Additionally, the plan shall involve verification of procedures, programs, and processes as part of the quality control framework for purposes of attaining consistency with the project's conservation objectives.

Importantly, the Technical and Execution teams derived from both the project proponent and other key parties shall provide reports on project activities implementation and their impacts, positive or negative, as associated with the project. The monitoring plan targets to;

- Monitor invested resources and implemented activities based on planned project activities and its strategic conservation objectives. [Insert Section]
- Monitor and evaluate the impacts- of project activities based on socio/community and biodiversity indicators.

- Register project activities implemented in the project area, either through cooperation agreements with the local communities, local stakeholders, or other partnering institutions (national or regional).
- Monitor impacts to the buffer and non-project areas (project leakages)
- Design long-term sustainability strategies to ensure that there exists robust mitigation on the unintended impacts of the project to the project area as well as the non-project areas.

The key project aspects under continuous monitoring and evaluation shall include.

- The local governance structures
- The legal and institutional frameworks
- Any ongoing activities within the project area and their potential impacts (either as alternatives or drivers of change).
- The rehabilitation progress of the forest (Recovery and resilience).
- Monitoring of biotic and abiotic indicators [This shall include monitoring of physiochemical parameter changes across the period of the project implementation. Additionally, there shall be biotic indicators monitoring conducted through the observable changes in Indicator species].
- Evaluate the acceptance and impact of the alternative productive programs/projects introduced as part of the project activities to address the baseline scenario.
- Evaluating the indicator physiochemical parameters such as water quality within the project area

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

The monitoring outcomes shall be shared with the different actively involved parties including the communities. Equally, the access of the results from the monitoring activities shall be accessible on the internet. As the project's proponent, Climetrek shall formulate appropriate communication pathways that include but not limited to email correspondence, consultative meetings, media publications and messaging, all forming part of the information dissemination strategies. The results shall be disseminated in both English and French considering that majority of the DRC population are French speaking.

The dissemination strategies shall purposely outline solutions to key questions seeking to address results dissemination, including:

- What barriers exists along the dissemination pathways/knowledge sharing?
- What can be done to address the knowledge sharing barriers to make generation and assimilation of knowledge successful?

- What existing information is there among different stakeholders that need to be captured and shared as part of the monitoring results?

3.4 Optional Criterion: Climate Change Adaptation Benefits

Not Applicable

3.4.1 Regional Climate Change Scenarios (GL1.1)

Africa's tropical forests hold critical ecosystems that are currently facing threats from climate change and anthropogenic pressures, especially land use change. The recorded changes across these ecosystems have exposed communities to various challenges including increased rates of desertification attributed to vegetation loss from clearing for other land uses, degradation of water resources, both surface and groundwater reservoirs, food insecurity, increase of diseases, and extreme weather conditions. DRC holds some of critical yet vulnerable ecosystems of the world and the mangrove forests of Muanda are among such ecosystems. However, the integrity of such ecosystems remains threatened due to degradation and climate change.

3.4.2 Climate Change Impacts (GL1.2)

Community well-being.

Climate change has led to increased instances of extreme weather conditions, especially in tropical regions of the world. The coast of DRC and communities living in the region find themselves exposed to frequent cases of flooding, and drought. Additionally, seasonal unpredictability has significantly disrupted agricultural production since farming in this region remains rain reliant.

Biodiversity conservation status.

The mangrove ecosystems of West Africa, specifically the PMM, are considered biodiversity hotspots. The PMM is currently listed as a Ramsar site and its conservation status is of both regional and global importance. However, climate change compounds the ecosystem's conservation status as a critical biodiversity sanctuary.

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

The project shall adopt ecosystem conservation and community empowerment programs geared towards arresting the current anthropogenic drivers leading to vegetation loss of the PMM's forest cover.

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CM1.1)

Well-being information: people's experience of the quality of their lives; this may include environmental, social, economic, psychological, spiritual, and medical dimensions.

Community characteristics: these include shared language, mythology, history, culture, livelihood systems, traditional authority structures, institutions, practices, values, relationships with specific sites of historical, cultural or spiritual significance, relationships with natural resources, or the customary institutions and rules governing the use of resources and sites.

Diversity within the community: social, economic and cultural diversity, including at least wealth, gender, age and ethnicity.

The coastal regions have supported human settlements across civilizations making them a hotbed for human social, economic, and cultural histories. Evidently, present-day and ancient cities are found along the coastal areas. Additionally, more indigenous populations exist along coastal areas, making the regions among the longest continuously inhabited areas on the planet. Despite the prevalent modern-day pressures including urban immigration and development, coastal areas have remained culturally resilient with most communities managing to integrate the new ways of life into their cultures.

The DRC coast remains a reflection the attractiveness of coastal areas to human settlement. Apart from the rich Marine environment that affords the local communities' abundance in the forms of nutritional and other survival needs, the climate in the region remains an enabler that favors human settlement. The climatic conditions, access to natural abundance from ecosystem goods and services, and the fertile lowlands along the river Congo explain why the Kongo Central region, despite being a smaller region of the country, is highly populated. Various critical towns and cities in the country are found within this region of DRC including Matadi, Boma, Muanda, and Banana. At the coast, the PMM serves as a key influence on human settlement. The Bassolongo or Assolongo tribe live and draw their livelihood mainly from this ecosystem.

The changes on the PMM's management across the years has seen a shift in settlement trend within and on the periphery of the park. The demarcation of the park into a government conservation area brought with it restrictions on use and management, forcing many villages (especially in the Zone B area) to reconsider their interaction with the ecosystem. The park's management changes coupled with population growth and climate change have saw the Assolongo venture into various livelihood earning modes to compensate for the stricter management structures introduced by the government when the park ecosystem was declared a conservation area.

The Peoples of the PMM

The Bassolongo, often referred to as as Assolongo, are the indeginous community that occupies the Congo River mouth having lived in the area for generations predating the independence of the DRC. Presently, the Assolongo living in the area are grouped into villages, all from two groups, the Malela and the Kinlau. The Malela group comprises of 12 villages while the Kinlau comprises of 9 villages. The Villages of Malela include Kimongowolo, Kimpozia, Luangu, Nsenge, Kiabi, Kimuabi, Nteva, Mbanza, Kongo, Kabmvo, Miema and Kinsati. The villages of Kinlau include Kitombe, Kinimi, Kifuku, Kitona, Mbondo, Kindofula, Kikhenge, Kingalasa and Kinsongo.

The Well-being of Communities in the Project Area

Characteristics of the Bassolongo

Language

Kisilongo is a Bantu language and has five vowels like many others in Africa south of the Sahara such as Kiswahili, Ciluba or Kinyarwanda. As a tool of exchange and communication through which the different rituals, socialization and all oral literature occur, it was considered important to quickly analyze certain aspects of this language such as morphology, phonetics, and lexicon. The examination of these three aspects highlights the linguistic differences between the variants of Kisilongo which, despite everything, do not completely hinder mutual understanding between the Bakongo. It is undoubtedly this observation that has pushed certain authors to think or believe that there is linguistic unity not only in Kituba, but also between the variants of Kikongo. Once again, "Kituba" is a lingua franca born from the mixing of all the variants of Kikongo from the 16th century and which, today, is used among the four national languages in the DR Congo.

Social organization and lifestyle

The social organization of the Basolongo is based on the nuclear family, headed by 'the father'. One or more families can form a village that G. Buakasa (1973) calls a residential community. Each village is placed under the responsibility of a chief who is called the village chief. A set of families (on the paternal side and on the maternal side) forms the 'lineage or clan'. Members of the same family or lineage are linked by matrilineal or patrilineal kinship, as is the case among the Basolongo. A group of families or lineages constitute a clan. At the clan level, the notion of territoriality takes precedence. The clan includes within it all the ascendants and descendants (living or deceased) of a common stock, based on the community of blood conveyed by free women and on the basis of possession and establishment on a given territory (notion of territoriality). The clan chief decides on all family affairs such as marriage, initiation and protection of taboos and other ritual values. The main activities of the Basolongo are forestry work, fishing, hunting, crafts, cultivation (cassava, beans, bananas, papaya, coffee, cocoa, etc.), breeding of goats and gallinaceae and rarely that of large livestock. Several other activities punctuate the life of the Basolongo especially the social institutions of marriage, political organization, and spirituality.

Among the Basolongo, the regulatory mechanism of the social system is provided by the kinship system. This is achieved through marriage. The institution of marriage creates a structure of kinship relations between clans which, although sometimes having divergent interests and objects, must nevertheless, by sharing the mangrove forest as a providing resource for the Basolongo. The forest acts as a unique resource that creates a coherent system capable of supporting different institutions, especially marriage, in building coexistence among different kinships living within the forest. coexistence to guarantee continued use.

The Basolongo Belief system [The Kinship, Political, and social power]

M. L. Martin (1981) describes the Bakongo in general as "an ethnic group deeply believing in a superior or supreme being, alongside whom they join the ancestors, who serve as relays between the living and this being indescribably more powerful than their ancestors. The traditional political and social power of the Basolongo is assessed by the functions exercised by the chiefs at different levels of social life, notably the village chief, who coordinates a council made up of his potential assistant, old wise men, and members of the council of the traditional courtyard. Additionally, the spiritual power exercised by the customary chief includes, among other things, the initiation and

education of young people. In each family, the clan chief is the guardian of tradition and the transmission of knowledge accumulated by the ancestors.

Further, the village council acts as a people's court playing the role of guardian and maintainer of the peace and settles possible disputes between members of the residential community according to custom. The Congolese State, aware of these traditional achievements in the relationship between tradition and modernity, has placed at the head of each village chief a group leader who coordinates five to ten villages belonging to a modern administrative territory. This allows the State to have direct control over the social realities of basic traditional entities. He thus manages the values of the ancestors without stifling them (G. Hulstaert, 1950: 143.). The Basolongo gives an important place to the social hierarchy. Thus, even at the nuclear family level, the father and the eldest son manage the mother and the younger children. At the extended family level, the head of the clan manages the other members of the family.

Economic activities of Basolongo

The main economic activities in which the Basolongo engage are agriculture, livestock, fishing, hunting, crafts, and gathering. According to Lubana (1990) and W. Bal (1963), the main crops grown are cassava, corn, plantain, beans, peanuts, rice, and sweet potatoes. Cassava is the main food of all. The marketing of gallinaceous and caprine animals is organized at the level of each locality at least once a month. However, fish products are sold almost every day depending on the quantity of the catch and the demand from itinerant fishmongers. They practiced and still practice artisanal fishing, due to lack of technical means for industrial type fishing. Basolongo craftsmanship offers a range of sculpted objects in ivory, wood, and metal (copper and iron). The small basketry industry produces hats, baskets, straw or rush mats while pottery, an activity reserved mainly for women, is the origin of objects such as the mfunza (T.Barbara, 1999). The Basolongo way of life is deeply marked by the forest which contains the resources exploited by the villagers: housing construction material, medicinal plants, palm trees, raffia (from which 'palm oil' and 'palm wine' are extracted / transformed into 'fermented alcohol'), sugar canes from which the juice of the same name comes.

The canoes or the raft are built to serve as means of river and sea transport while the 'traps' make it possible to capture animals of all sizes. 'Hunting' allows the Basolongo to stock up on meat foods. This population practices individual and collective hunting during certain periods of the year and especially during the short rainy season and the long dry season. Hunters are almost always accompanied by dogs. The Musolongo also engages in the activity of setting traps. According to M. De Jonge (1949: 109), the study of the devices used reveals in the native a great ingenuity and a precise knowledge of the habits of animals. The game meat trade is flourishing in Bas-Congo, particularly on the Kinshasa-Matadi, Matadi-Boma and Boma-Muanda roads. The singularly growing demand for game meat on the one hand, and the persistent search for profit by professional hunters and their revenues. Basolongo has two types of watercourses: 'rivers' or 'streams' and the 'river'. The whole community can fish there. There are also ponds or tiny natural lakes, which can be private property (of a clan) or collective. The way of fishing varies according to gender. Men practice angling, cast net fishing, creel fishing and net fishing (Western type) while women mainly practice creel fishing. A good part of the fish caught is sold fresh or smoked. The activity of gathering consists of collecting, extracting, catching, in the forest, savannah or bush, natural products intended for immediate consumption or industrial processing (almonds,

mushrooms, certain edible lianas, caterpillars, certain wild plants, wine and palm oil, various kinds of wild fruits, as well as materials used in crafts).

The financial contribution of these products is rather difficult to assess. However, they believe that it is lower than that of agricultural products, hunting products and fishing products. The rural Basolongo raise chickens, pigeons, ducks, pigs, sheep, goats, etc., and rarely large livestock. According to custom, the breeding of chickens, ducks and pigeons is generally practiced feeding distinguished guests such as parents-in-law, brothers-in-law, nephews, and nieces while the goats serve as tokens during ceremonies. matrimonial (payment of dowry upon marriage) and/or to pay routine fines. The dog is a pet and hunting animal while the cat is used to eliminate rats and snakes in the house. Basolongo craftsmanship is essentially centered on basketry, pottery, fishing net weaving, ivory, wood, and copper. The presence of seaports stimulates the marketing of these different products. Apart from their aesthetic function, these works of art play a remarkable role in the symbolism of fertility, beauty, polygamy, love, strength, the authority of ancestors and fecundity.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The PMM and the neighbouring Bassolongo communities have continued to coexist, although with a growing unease. The need to continue drawing resources from the mangrove ecosystem by the local community, the adjacent urban towns, and the managing institution ICCN has always created different perspectives on use of the resource. There are documented instances of escalated, cases that saw the managing institution submit to court process to have members of the public apprehended on use-related cases.

The community's interaction with other stakeholders around the PMM remain mutual and beneficial. For example, the local drilling corporations such as Perenco have initiated and supported several community projects. Perenco's social programs around the park and in the communities include water projects, building of schools, employing locals, and financing welfare programs. Therefore, the community draws significant benefits from such stakeholder groups in benefit of the communities. Further, other startup companies such as RECOPLAST have engaged the community in several programs including Marine debris and litter collection, creating awareness on the importance of conserving the mangrove ecosystem.

Other community groups such as the oil transporters, the security and military agencies, cassava farmers, and learning institutions have all maintained close association with the Bassolongo communities living within and around the park. The interaction between the community groups remains that of interdependence especially from a socioeconomic perspective. The local communities depend on trading and services such as transportation from the urban community groups. The urban community groups, on the contrary, rely on the Bassolongo for critical household goods including fresh food produce, fish, fuel wood, charcoal for energy, and other wood products.

4.1.3 High Conservation Values (CM1.2)

High Conservation Value	The Mangrove Park of Muanda (PMM)
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Qualifying Attribute	The PMM comprises of a critical mangrove estuarine ecosystem that offers various ecosystem goods and services vital for the survival of both local communities and biodiversity in the area.
Focal Area	The project activities will aim to restore degraded areas of the forest in Zone A. In Zone B, project will engage communities through trainings and planting of alternative woodlots to act as buffer zones along the periphery of the PMM to reduce felling pressure on the main forest.

4.1.4 Without-Project Scenario: Community (CM1.3)

Considering the without-project scenario; the current land use and management practices around the PMM have allowed for an increased rate land conversion where the forest cover has been on the decline. The prevailing population growth remains an indicator of need for more land for agriculture, increased demand for wood products, increased demand for energy resources, and nutrition. The without project scenario outlines an unprecedented rate of loss and degradation of the supporting ecosystems such as the PMM mangrove ecosystem.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	Kinlau and Malela Communities
Impact(s)	Introduction of alternative livelihood practices through employment opportunities created for the local communities. Training on forest resource management as community will be trained and engaged in the forest inventory and monitoring skills.
Type of Benefit/Cost/Risk	Describe whether each impact is predicted or actual, direct or indirect, and whether it is a benefit, a cost or risk. Positive and Direct impact
Change in Well-being	The practices shall increase employment opportunities. There will be a reasonable improvement in livelihood.

4.2.2 Negative Community Impact Mitigation (CM2.2)

There is a dissenting belief among some community members that the project activities may hinder their continued use of the resource. Despite the PMM existing as a protected area, community members have been able to continuously take and use the resource both legally and illegally. However, it is the illegal uncontrolled users who appear disenfranchised and are voicing concerns on having increased management activities within Zone A of the PMM.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

There is an expectation that the project through its various activities will have positive socio-economic impact on the community. The project's target activities will improve the forest's capacity to offer ecosystem services and goods. Among the expected outcomes of the reforestation of the degraded areas and offering alternative livelihoods through employment of 510 out of which 150 will be women during the initial project implementation, the employment will increase during the next phases of the project, the project will support other activities such as fishing and agricultural activities are expected to empower the community. The project's intentions of inclusive participation will ensure that vulnerable and marginalized groups, youths, and women, are extensively involved and benefit from the project's proceeds. Other benefits including continuous training starting with 300 hundred individuals, governance capacity building, and establishment of alternative woodlot resources will ensure that different community groups concerns are addressed and the PMM is regarded as a resource owned not by the government through its agencies but the community.

These activities will lead to livelihood improvements for approximately 12500 people out of which 7700 are women ensuring equality /fairness in terms of resource benefits distribution.

4.2.4 High Conservation Values Protected (CM2.4)

The project activities shall be conducted extensively in Zone A of the PMM which is a protected area and currently managed by the ICCN. Therefore, the activities planned during the project including planting of new mangrove stands and rehabilitation of hydrological channels within the forest shall have no impact on the community either through displacing them or denying them rights of access to the forest. Instead, these activities shall positively lead to the restoration of the degraded areas of the forest.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The project activities shall have no impact on other stakeholders as the PMM already exists as a protected area managed under the law by government agency ICCN.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

The proponent shall ensure that all planted seedlings are from the forest to avoid instances of introducing new species that may disrupt the ecosystem's balance as it recovers from the current disturbance.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The impacts listed of the project are largely positive and it is expected that the project activities shall positively impact all stakeholders. It is in the interest of all stakeholders around the PMM that the forest is well managed to continue delivering on the goods and services that the local communities find irreplaceable.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

Indicators of impacts on women.

The Community Impact Monitoring Plan (CIMP) shall be derived from the projects Climate Monitoring plan in section 3.3.3. outlining the monitoring framework, processes, and objectives. The project's community impact monitoring shall focus on various socioeconomic aspects of the community including their access to the resources, engagement levels in the project, inclusion of different community groups, consultation processes, accrued benefits, and sustainability of the proposed livelihood programs of the projects. The monitoring of the project's community impact shall involve conducting of social surveys that target specific change aspects within the community including behavior change, knowledge retention, ownership of the project activities, and investments realized from the project. Additionally, there shall be need for monitoring of the institutional and community governance structures as instruments of sustainability.

4.4.2 Monitoring Plan Dissemination (CM4.3)

All the project documents will be available on the Verra Website for public review and comments. Additionally, for specific clarification, ClimeTrek can be contacted through email as provided in the communication section.

There are also plans to hold a community feedback session after monitoring to share the results of every monitoring exercise of the project. This will allow for community comments which will feed in to project adapt management.

4.5 Optional Criterion: Exceptional Community Benefits

Complete this section (4.5) if the project seeks to be validated to the Gold Level for exceptional community benefits. If not applicable, state so and leave this section blank.

4.5.1 Exceptional Community Criteria (GL2.1)

The Kinlau and Malela communities have rights to land in the project area since the PMM's management and land policies acknowledge the community as the custodians of the land rights in the project area. As such, the concession agreements on carbon rights are signed between Climetrek as the project proponent and the communities through their chiefs as custodians of their ancestral lands.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

As part of the project's long-term aims, Climetrek aims to introduce alternative livelihood methods targeting vulnerable community members, including oyster farming, apiculture, ecotourism, Marine waste recycling, and training of students in the area as part of the conservation groups.

On the short-term, the project aims to offer immediate employment opportunities to the community members. The identified individuals from the local community will participate in different roles in the project including having roles as translators, guides, inventory assistants.

4.5.3 Community Participation Risks (GL2.3)

The project activities aim to halt illegal logging, this can be a risk for person directly involved and dependent on this activity. In the consultation process, the stakeholder suggested those doing the makala business be prioritized for local employment to avoid them turning back to harvesting. Also because the communities here heavily depend of the mangrove for fuelwood, better fuel efficient cookstoves were also proposed to reduce the high used of the fuel wood. Better fishing methods for increasing catch and avoid the supplementing with mangrove harvesting for makala production.

To avoid deforestation, to provide better technical skills on agriculture production to adjacent farms to the forest.

To avoid the community-rangers conflict, employ local scouts for patrols and surveillance in the project area.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

Community Group 1	Women and youth
Net positive impacts	Oyster farming targeting women as an empowerment program that will be sustainable as a source of income. Training on forest inventory and monitoring for the youth acting as a capacity building exercise that will offer youths direct employment during the project.
Benefit access	All barriers and risks associated with the project have been identified and mitigated.

Negative impacts	The project does not have any negative impacts to the community and thus will improve community livelihoods.

4.5.5 Net Impacts on Women (GL2.5)

The project shall aim to be gender impartial. ClimeTrek, in reference to its gender impartiality policy has spared no effort in ensuring that the representation of women in the DRC Blue Carbon Project is extensive. Already, the consultative stages of the LSC have ensured that women representation and engagement in the project is intended and objective. ClimeTrek seeks to have women take up various active and leading roles during the project implementation phases including leading nursery preparations, seedling and propagule collection, and planting activities. Additionally, ClimeTrek hopes to have women from both Kinlau and Malela trained on monitoring techniques to have them engaged during the monitoring exercise. Further, alternative activities such as oyster farming will mainly target women to empower them as contributing members of their households and the community.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

The project benefits will be channeled to a community account managed and operated by a community committee. Once the funds come to the community, the community are at liberty to choose the project to use the funds on. Technical advice will be provided by ClimeTrek where need be and only when consulted by the community on how to share the benefits. The foreseen project as mentioned by the communities include clean water projects, improved agriculture, improved fishing methods and local hospital and school supplies.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

All information on predicted and actual benefits shall be shared with the different actively involved parties including the communities. ClimeTrek shall ensure that, parties' access to communication are made accessible on the internet. Additionally, ClimeTrek shall formulate appropriate communication pathways that include but not limited to email correspondence, consultative meetings, media publications and messaging, all forming part of the information dissemination strategies. Communication to shareholders and community members shall be disseminated in both English and French considering that majority of the DRC population are French speaking. The strategies shall ensure that there exists a robust level of engagement at all levels of community and proponent interaction pacifying any avenues that may create conflict or misunderstanding with regards to benefit sharing, costs associated with the project, and other communication risks.

4.5.8 Governance and Implementation Structures (GL2.8)

The project is managed by ClimeTrek taking responsibilities on project logistics, project documentations, hiring personnels and Credit Trading. On the ground, ClimeTrek will employ local communities as field assistants and scouts. A community committee will be formed comprising of representative of each village and the ClimeTrek. Field based activities will be decided collaboratively through this committee and changes to the project design will be mutually agreed among the committee members but with feedback from the communities and ClimeTrek management team.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Climetrek, during the project active phase, aims to work closely with leading institutions, NGOs, learning and research institutions to develop a carbon offset project. During the project, ClimeTrek will ensure that a several conservation champions are identified and trained on different aspects of carbon ecosystem payment program development. Importantly, the local expertise from research and learning institutions working closely with ClimeTrek experts shall receive training on mangrove forest inventory and monitoring skills. Further, ClimeTrek will ensure that local community members through various meeting sessions, workshops, and consultations are trained and are aware of the benefits drawn from conserving the ecosystem around the PMM.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The evaluation of the existing project conditions of the project area anchored on a comprehensive review of primary and secondary sources of information, retrieved from past projects and studies that involved national and international collaborations. Collaborative works by different NGOs, scholars, and environmental institutions including WWF, GEF/UNDP, FAO, ULB, ICCN, AND CCPN. The description of the existing conditions references the International Union for the Conservation of Nature (IUCN) by listing the threatened species of flora and fauna whose recovery may be aligned with the status of the DRC PMM.

The mangrove forest within the PMM zone constitute a critical habitat that supports diverse species of flora and fauna of the coastal wetlands of DRC as it connects the great Congo Basin with the Atlantic Ocean through the Congo River estuary. Apart from the mangrove forest formations, the PMM lies on an estuarine ecosystem that connects Marine and freshwater habitats making it a biodiversity hotspot that provides habitats, breeding areas, and migratory areas for various species including mammals, avians, fish, and Marine reptiles.

Flora of the PMM

The study reports from C.S.B (2007) and PAN (2010) provide an overview of the flora and fauna of the coastal and coastal zone of the PMM. In addition to these studies, student dissertations from the Muanda Institute of Fisheries and Navigation on the monitoring of Marine turtles and other fishery resources have been added.

Mangrove vegetation forms the forest ecosystem formation of the Marine Park, characterized by impenetrable mangrove forests that anchor their strong roots in the calm waters where mud and silt accumulate. It belongs to the western type, and two categories are distinguished: the small Mangrove in the characteristic zone of clay soil and the high Mangrove on sandier soil at the foot of the Kindofula and Muanda plateaus, along the Rosa Island, the Bulambemba point, and the fishermen's island. The Vegetation and flora of Muanda and the Congo Estuary can be categorized along various site locations as indicated in the Botanical data collected from Tshende to Katala, passing through the Rosa, Bulambemba, and Malela islands.

The observed vegetation types included sites along the Tonde river, the Muanda-Nsiamfumu-Tshende Axis, between Lunga river and the Atlantic Ocean, Muanda-Kifuku-Kitona axis, Muanda Town-Port Banana axis, Rosa and Bulambemba islands, Kikala kiaku islands, Shrimp Island, Malela-Kambenyo axis, Katala axis, Sacred forests (Mbulu shrine among the Kinlau).

a) Along the Tonde River

The fauna along the Tonde River and its annexed zones include pioneer vegetation of coastal sands, mangrove, swamp forest, and savannah.

I) Pioneer vegetations of coastal sands

The pioneer vegetations of coastal sands is low vegetation that settles on the sandy outcrops of the Atlantic coast. The vegetation consists of a typically herbaceous floristic group, including *Alternanthera maritima* (Mart.) A. St-Hil., *Canavalia rosea* (Sw.) DC., *Cyperus dives* Del., *Ipomoea pes-caprae* L., *Remirea maritima*, *Sporobolus virginianus* L.

II) Mangrove

The mangrove of the Tonde River is a halophilic shrub formation found in the alluvial areas of the mouth of this small river. It consists of *Rhizophora racemosa* GFW.Meyer and *Avicennia germinans* (L.) L., which rarely exceed 6 m in height. Hence the designation "small mangrove" reserved for this formation.

On low banks, the small mangrove is sometimes delimited by a floristic group consisting of *Phoenix reclinata* Jacq., *Dalbergia ecastaphyllum* (L.) Taub., and *Drepanocarpus lunatus* (L.f) C.F.Mey.

The transition zones of the mangrove-swamp forest or mangrove-savannah is this group enriched with the establishment of *Antidesma rufescens* Tul., *Ormocarpum verrucosum* P.Beauv., *Annona glabra* L., *Ximenia americana* L., *Oncocalamus* sp, *Alchornea cordifolia* (Schumach. & Thonn.) Müll.Arg., *Dracaena mannii* Baker, *Bridelia ripicola* J.Léonard, *Jacquemontia* sp., and *Terminalia catappa* L.

III) Swamp Forest

The swamp forest only remains in patches in the Tonde River valley. Its degradation upstream leads to the installation of papyrus meadows with *Cyperus papyrus* L. Among the characteristic species of this forest are *Hallea stipulosa* (DC) Leroy, *Alstonia congensis* Engl., *Cleistopholis glauca* Pierre ex Engl. & Diels, *Anthocleista vogelii* Planch., *Dracaena camerooniana* Baker,

Stipularia africana P.Beauv., and *Vitex doniana* Sweet. This is a consequence of human pressure on this vulnerable space.

b) The Muanda-Nsiamfumu-Tshende Axis

The Muanda-Nsiamfumu-Tshende axis harbors a unique flora that includes alternating savannas and swamp forests.

I) Savannah

This is dominated by *Andropogon schirensis* Hochst.ex A.Rich. and *Hyparrhenia familiaris* (Steud.) Stapf., associated with a few scattered individuals of *Adansonia digitata* L. and *Anacardium occidentale* L., and even *Hyphaene guineensis* Sch. & Thonn.

II) Swamp Forest

The swamp forest includes: *Hallea stipulosa* (DC) Leroy, *Anthocleista vogelii* Planch., *Sarcocephalus pobeguini* Pobeg.ex Pelleg., *Musanga cecropioides* R.Br., *Alstonia congensis* Engl., *Vitex doniana* Sweet, *Pentaclethra macrophylla* Benth., and *Cleistopholis glauca* Pierre ex Engl. & Diels.

c) Between the Lunga River and the Atlantic Ocean

The region between the Lunga River and the Atlantic Ocean is dominated by savannah, where the grass stratum consists of *Andropogon schirensis* Hochst.ex A.Rich., *Trachypogon spicatus* (L.f.) Ktze, *Imperata cylindrica* P.Beauv., and *Hyparrhenia* spp.

In drier parts, the shrub layer is formed by *Dichrostachys cinerea* (L.) Wight & Arn., while in poorly drained areas, this layer is characterized by *Chrysophyllum welwitschii* Engl. and *Chrysobalanus icaco*.

As one approaches the ocean, the vegetation is mainly characterized by *Adansonia digitata* L. and *Hyphaene guineensis* Schum. & Thonn. whose fibrous and fragrant flesh is highly appreciated by the locals.

d) The Muanda-Kifuku-Kitona Axis

The observed flora along this axis included the Mabulu forests and the Kitona savannah.

I) The Mabulu Forests

The Mabulu forests are fringes of secondary forests located on either side of the Muanda-Kifuku road axis. The forest on the left side of the road is a sacred forest, access to which is forbidden to both locals and foreigners.

According to the leaders of the Kifuku group, it is believed to be the refuge of a monster called "Kisimbi," originating from the Angolan point of Soyo. Opposite the sacred forest, the forest fringe on the right side of the road is a non-sacred forest with a composition of dominant species similar to that of the sacred forest.

The floristic composition below pertains to the forest on the right side of the Muanda-Kifuku road. Species in different strata include:

Upper Stratum: *Adansonia digitata* L., *Antiaris toxicaria* (Rumph. ex Pers.) Lesch., *Lannea antiscorbutica* (Hiern.) Engl., *Trema orientalis* (L.) Blume, *Zanthoxylum gillettii* (De Wild.) Waterm.

Middle Stratum: *Antidesma membranaceum* Müll.Arg., *Baphia pilosa* Baill., *Cissus aralioides* (Welw. ex Baker) Planch., *Cnestis corniculata* Lam., *Dalhousiea Africana* S. Moore, *Gaertnera paniculata* Benth., *Hensia crinata* (Afzel.) G.taylor, *Manotes expansa* Sol. ex Planch., *Milletia eetveldeana* (Mich.) Hauman, *Platycephalum violaceum* Welw. ex Baker, *Tarena laurentii* (De Wild.) Garcia,

Lower Stratum: *Chassalia ansellii* (Hiern.) K.Schum., *Anchomanes difformis* (Bl.) Engl., *Cissampelos owariensis* P.Beauv., *Secamone brevipes* (Benth.) Klack., *Cissus rubiginosa* (welw. ex Baker).

II) The Kitona Savannah

The Kitona savannah is a grassy formation consisting of *Hyparrhenia familiaris* (Steud.) Stapf. and *Panicum maximum* Jacq. There are also sporadic woody species such as *Annona senegalensis* Pers., *Urena lobata* L., and *Anacardium occidentale* L.

e) The Muanda Town-Banana Axis

The vegetation along the Muanda city-Banana axis includes mangroves and the Atlantic steppe.

I) The Mangrove

Situated in front of the ocean, the mangrove along the Muanda city-Banana axis grows on a muddy substrate regularly supplied with water by the waves crossing the road. Characteristic species include *Rhizophora racemosa* GFW Mey. and *Conocarpus erectus* L.

II) The Atlantic Steppe

This is a low vegetation located at the entrance of the Banana Naval Base along the Atlantic Ocean. It is dominated by *Opuntia ficus-indica* (L.) Miller. Some areas also have clumps of *Chrysobalanus icaco* L.

f) The Rosa-Bulambemba Islands

Botanical exploration conducted on the Rosa and Bulambemba islands indicates similarities in the types of vegetation on these two islands. This could be due to the respective substrates on which these vegetations develop and the proximity between the islands. Thus, the following types of vegetation are observed:

I) Floating Aquatic Vegetation

It mainly consists of *Eichhornia crassipes* (Mart.) Solms, *Salvinia molesta* D.S Mitchell, *Pistia stratiotes* L., *Ipomoea pes-caprae* (L) R.Br., and *Ludwigia stolonifera* (Guill. & Perr.) Raven. This

vegetation is sometimes accompanied by tufts of semi-aquatic herbs torn upstream from the banks by the current.

II) Semi-Aquatic Bank Vegetation

The bank vegetation is dominated by *Pandanus butayi* De Wild. (OCPE, 2004). Species include *Hibiscus tiliaceus* L., *Dalbergia ecastaphyllum* (L.) Taub., *Echinochloa pyramidalis* (Lam.) Hutch. & Chase, *Phragmites mauritanicus*, *Drepanocarpus lunatus* (L.F.) C.F.Mey., *Cyperus papyrus* L., *Cyperus articulatus* L., and *Pandanus butayi* De Wild and *Sporobolus virginianus* L.

III) Vegetation of Hydromorphic Soils

This vegetation is divided into three types:

a. Swamp Forest: It has an arboreal stratum consisting of *Syzygium littorale* De Wild., *Hallea stipulosa* (DC.) Leroy, *Berlinia bruneellii* (De Wild.) Torre & Hillc., accompanied by two Arecaceae: *Raphia sese* De Wild. and *Phoenix reclinata* Jacq.

b. Periodically Flooded Forest: This type is more observed on Bulambemba Island. Species include *Chrysobalanus icaco* L., *Cleistopholis patens* (Benth.) Engl. & Diels, *Anthocleista liebrechtsiana* De Wild. & Th. Dur., *Dracaena* sp., *Annona glabra* L., *Musanga cecropioides* R.Br., *Vitex doniana* Sweet, *Aframomum meleguetta*, *Lygodium microphyllum*, *Cissus aralioides* (Welw. ex Baker) Planch., and *Combretum* sp.

c. Mangrove: This type of arboreal vegetation has a paucispecific floristic composition. Characteristic species include *Rhizophora racemosa* GFW Mey., *R. mangle* L., and *Avicennia germinans* (L.) L. The first two grow in flooded areas where they are considered pioneers, while the latter develops in partially flooded environments. In addition to these species, *Althernanthera maritima* Beauv. Ex. Meq., *Laguncularia racemosa* (L.) Gaertn. f. grows on partially flooded soil, and *Acrostichum aureum* L., a heliophilic fern whose presence indicates mangrove degradation.

IV) Vegetation of Areas Inhabited by Humans

In some places inhabited either permanently or seasonally, there is vegetation consisting of *Elaeis guineensis* Jacq., *Cocos nucifera* L., *Adansonia digitata* L., *Ceiba pentandra* (L.) Gärt., *Chromolaena odorata* (L.) R. King & H. Robinson (an invasive and dangerous species for local species), *Colocasia esculanta* Schott, *Heteropogon contortus* (L.) Roem & Schult, *Imperata cylindrica* P. Beauv., *Peltophorum pterocarpum* (DC.) K. Heyne, *Terminalia catappa* L., and *Quisqualis indica* L. Although exotic, this vegetation is part of the mangrove.

g) Kikala Kiaku Island

Kikala Kiaku Island is dominated by mangroves species of *Rhizophora racemosa* G.F.W.Mey. and *Avicennia germinans* (L.) L. In degraded parts of the island, there is an establishment of *Dalbergia ecastaphyllum* (L.) Taub., *Phoenix reclinata* Jacq., *Pandanus butayi* De Wild., *Hibiscus tiliaceus* L., *Ormocarpus verrucosum* P.Beauv., and *Aechynomene elaphroxylon* (Guill. & Perr.) Taub.

h) Shrimp Island

The Shrimp Island vegetation consists of mangroves with *Rhizophora racemosa* G.F.W.Mey. and *Avicennia germinans* (L.) L. In some parts of the island where the mangrove has been degraded, there is an observation of a floristic composition consisting of *Cleistopholis patens* (Benth.) Engl., *Drepanocarpus lunatus* (L.f.) C.F.Mey., *Hibiscus tiliaceus* L., *Mimosa pigra* L., *Phoenix reclinata* Jacq. Near the stilt houses, there is vegetation consisting of *Commelina diffusa* Burm.f., *Ethulia conyzoides* L.f., *Pennisetum purpureum* Schumach., *Polygonum senegalense* Meisn., *Scleria racemosa* Poir., *Scoparia dulcis* L.

I) Malela-Kambenyo

The Malela-Kambenyo axis includes:

I) Mangroves

Primarily composed of *Rhizophora racemosa* G.F.Mey. and *Avicennia germinans* (L.) L., this area is where tourists can observe the manatee (*Trichechus senegalensis*), especially during oyster fishing.

II) Swamp Forests

These forests are found around the Malela village, the seat of the Malela group, and on the road leading to Kambemvo village.

III) Malela Village Swamp Forest

In the upper stratum, it comprises *Anthocleista vogelii* Planch., *Cleistopholis glauca* Pierre ex Engl. & Diels, *Corynanthe paniculata* Welw., *Daniellia klainei* (Pierre) De Wild., *Entandrophragma angolense* (Welw.) C.DC., *Gosweilerondendron balsaminiferum* Harms, *Hallea stipulosa* (DC.) Leroy, *Pseudospondias microcarpa* (A.Rich.) Engl., *Pycnanthus angolensis* (Welw.) Exell., *Samanea leptophylla* (Harms) Brenan & Brum., *Symphonia globulifera* L.f., *Zanthoxylum gillettii* (De Wild.) Waterman.

In the middle stratum, there are *Lannea welwitschii* (Hiern.) Engl., *Sarcocephalus pobeguini* (Pelleg.) Petit, *Pouchetia baumanniana* Büttner, *Syzygium congolense* Amshoff, *Vitex doniana* Sweet, *Raphia sese* De Wild., *Phoenix reclinata* Jacq., *Pandanus butayei* De Wild., *Antidesma membranaceum* Müll.Arg., *A. rufescens* Tul., *Elaeis guineensis* Jacq., *Alchornea cordifolia* (Schumach. & Thonn.) Müll.

The lower stratum consists of species such as *Aidia micrantha* (K.Schum.) F.White, *Bertiera congolana* De Wild. & T.Durand, *Nephrolepis biserrata* (Sw.) Schott.

In cleared areas, species of fallow land such as *Macaranga monandra* Müll.Arg., *Phyllanthus muellerianus* (O.Ktze) Exell., *Corchorus olitorius* L., *Hibiscus physaloides* Guill. & Perr., *Aspilia helianthoides* (Schum. & Thonn.) Oliv.Hiern., *Urena lobata* L., *Aframomum albobviolaceum* (Ridley) K.Schum., *Imperata cylindrica* P.Beauv., and *Milletia macroura* Harms can be observed. These various vegetation formations along the Malela-Kambemvo axis contribute to the botanical diversity of the region.

IV) The Kambemvo Swamp Forest

This forest extends from the southeast to the northwest of Kambemvo village. In the upper stratum, species such as *Entandrophragma angolense* (Welw.) C.DC., *Milicia excelsa* (Welw.) C.Berg., *Symphonia globulifera* L.f., *Hallea stipulosa* (DC.) Leroy, *Adansonia digitata* L., *Oxystigma oxyphyllum* (Harms) J.Léonard, *Ceiba pentandra* (L.) Gaertn., *Anthocleista vogelii* Planch., *Zanthoxylum* sp., *Tetrapleura tetraptera* (Thonn.) Taub. have been recorded.

In the middle stratum, species include *Cissus aralioides* (Welw. ex Baker) Planch, *Dracaena mannii* Baker, *Lannea welwitschii* (Hiern.) Engl., *Sarcocephalus diderrichii* (De Wild.) Th.Dur., *Vitex doniana* Sweet.

In the lower stratum, species like *Anchomanes difformis* (Bl.) Engl., *Costus phyllocephalus* K.Schum., *Lasimorpha senegalensis* Schott, *Thalia geniculata* L., are present.

V) The Savannahs

The savannas explored in Malela and Kambemvo are dominated by *Andropogon pseudoapricus* Stapf and *Euclasta condylotricha* (Hochst. ex Steud.) Stapf. Also, *Heteropogon contortus* (L.) Roem. & Schult., *Imperata cylindrica* P.Beauv., and *Pennisetum polystachyon* (L.) Schult. are observed. In flood-prone areas, this savanna is characterized by *Echinochloa stagnina* (Retz.) P.Beauv. and *Phragmites mauritanicus* Kunth

J) Katala Island

Katala Island comprises two villages: Katala-center and Mbanza Seke. The vegetation on the island consists of savanna and swamp forest.

I) The Savanna

The savanna extends from the southwest of Katala Island, between Katala-center and Mbanza Seke. It is dominated by *Hyparrhenia diplandra* (Hack) Stapf and *Imperata cylindrica* P. Beauv. Occasional individuals of *Hyphaene guineensis* Sch. & Thonn and *Adansonia digitata* L. are observed. In the floodplain, this savanna is dominated by *Echinochloa colona*.

II) The Swamp Forest

The swamp forest forms a belt around Katala Island. It is dominated by *Hallea stipulosa* (DC.) Leroy and *Anthocleista vogelii* Planch. *Ceiba pentandra* Gaertn., *Pseudospondias microcarpa* (A.Rich.) Engl., *Samanea leptophylla* (Harms) Bren. & Brumm, *Sarcocephalus diderichii* De Wild. & T.Dur., *Vitex doniana* Sweet are also found.

Table 1: Systematics of plant species in the PMM

N°	Family	Species
1	Acanthaceae	<i>Asystasia gangetica</i> , <i>Brillantaisia patula</i> , <i>Elytraria</i> sp.

2	Agavaceae	Dracaena camerooniana, D. Mannii, D.sp.
3	Amaranthaceae	Alternanthera maritime, Celosia trigyna, Gomphrena celosioides;
4	Anacardiaceae	Anacardium occidentale, Lannea antiscorbutica, L. Welwitschii, Pseudospondias microcarpa, Spondias mombin
5	Annonaceae	Annonaglabra, A. Muricata, A. Reticulate, A. Senegalensi, A. Squamosa, Cleistopholis glauca, C. Patens
6	Apocynaceae	Alstonia congensis
7	Araceae	Anchomanes difformis, Lasimorphasenegalensis, Pistia stratiotes
8	Arecaceae	Cocos nucifera, Elaeis guineensis, Hyphaene guineensis, Oncocalamus sp., Phoenix reclinata, Raphia sese
9	Asclepiadaceae	Calotropis procera, Secamone brevipe
10	Asteraceae	Acanthospermum hispidum, Aspilia helianthoides, Ethulia conyzoides, Galinsoga parviflora, Grangea maderaspatana, Stomatanthus sp., Vernonia amygdalina, V. Cinere
11	Avicenniaceae	Avicennia germinans
12	Bombacaceae	Adansonia digitata, Ceiba pentandra ;
13	Cactaceae	Opuntia ficus indica
14	Caesalpiniaceae	Berlinia bruneellii, Daniellia klainei, Gosweilero dendron balsamiferum, Oxystigma oxyphyllum, Peltoporum pterocarpum, Senna occidentalis
15	Cecropiaceae	Musanga cecropioides
16	Chrysobalanaceae	Chrysobalanus icaco
17	Cleomaceae	Cleome rutidosperma
18	Clusiaceae	Harungana madascariensis, Symphonia globulifera
19	Combretaceae	Conocarpus erectus, Laguncularia racemosa, Quisqualis indica, Terminalia catappa
20	Commelinaceae	Commelina diffusa
21	Connaraceae	Cnestis corniculata, C. urens, Manotes expansa, Rourea coccinea
22	Convolvulaceae	Ipomoea aquatica, I. pes-caprae, Jacquemontia sp.
23	Costaceae	Costus phyllocephalus

24	Cyperaceae	Cyperus articulatus, C. dives, C. haspan, C. papyrus, Fiurenaumbellata, Remireamaritima, Scleria racemosa
25	Euphorbiaceae	Alchornea cordifolia, Antidesma membranaceum, A. rufescens, Bridelia micrantha, B. Ripicola, Croton hirtus, Macaranga monandra, Phyllanthus muellerianus
26	Fabaceae	Aechynomene elaphroxylon, A. sensitiva, Alysicarpus ovalifolius, Baphia pilosa, Canavalia rosea, Dalbergia ecastaphyllum, Dalhousiea africana, Drepanocarpus lunatus, Indigofera hirsuta, Milletia eetveldeana, M. macroura, M. versicolor, Ormocarpum verrucosum, Platycephalum violaceum, Uraria picta, Vigna luteola, Zornia latifolia
27	Lauraceae	Cassitha filiformis
28	Lobaniaceae	Anthocleista liebrechtsiana, A. vogelii
29	Malvaceae	Hibiscus physaloides, H. tiliaceus, Urena lobata
30	Marantaceae	Thalia geniculata
31	Meliaceae	Entandrophragma angolense
32	Menispermaceae	Cissampelos owariensis
33	Mimosaceae	Albizia ferruginea, A. gummifera, Dichrostachys cinerea, Mimosa pigra, Pentaclethra macrophylla, Samanea leptophylla, Tetrapleura tetraptera
34	Moraceae	Antiaris toxicaria, Artocarpus incise, Ficus thonningii, Milicia excelsa
35	Myristicaceae	Pycnanthus angolensis
36	Myrtaceae	Syzygium littorale
37	Nephrolepidaceae	Nephrolepis biserrata
38	Nyctaginaceae	Boerhavia diffusa, B. erecta
39	Olacaceae	Ximenia americana
40	Onagraceae	Ludwigia leptocarpa, L. stolonifera
41	Pandanaceae	Pandanus butayei

42	Poaceae	Andropogon pseudoapricus, A. schirensis, Dactyloctenium aegyptium, Echinochloa colona, E. pyramidalis, E. stagnina, Eleusine indica, Eragrostis tremula, Euclasta condylotricha, Heteropogon contortus, Hyparrhenia diplandra, H. familiaris, H.involucrata, Imperata cylindrica, Jardinea congoensis, Leersia hexandra, Monocymbium ceresiforme, Panicum maximum, Paspalum orbiculare, Pennisetum polystachyon , P. purpureum, Phragmites mauritanus, Sorghum arundinaceum, Sporobulus virginianus, Trachypogon spicatus
43	Polygalaceae	Carpolobia alba
44	Pontederaceae	Eichhornia crassipe
45	Pteridaceae	Acrostichum aureum
46	Rhizophoraceae	Rhizophora mangle, R. racemosa
47	Rubiaceae	Aidia micrantha, Bertiera congolana, Chassalia ansellii, Corynanthe paniculata, Gaertnera paniculata, Hallea stipulosa, Hensia crinita , Pouchetia baumanniana, Sarcocephalus diderrichii , S. pobeguinii, Stipularia africana, Tarenna laurentii
48	Rutaceae	Zanthoxylum gillettii, Zanthoxylum sp.
49	Salviniaceae	Salvinia molesta
50	Sapotaceae	Chrysophyllum welwitschii, Manilkara sp.
51	Schizazeaceae	Lygodium microphyllum
52	Scrophulariaceae	Sauvagesia erecta
53	Sterculiaceae	Cola bruneelii , Waltheria indica
54	Thelypteridaceae	Cyclosorus gongylodes
55	Thymeleaceae	Dicranolepis sp.
56	Solanaceae	Schweinkia Americana, Scoparia dulcis
57	Tiliaceae	Corchorus olitorius, Triumpheta cordifolia
58	Ulmaceae	Trema orientalis
59	Verbenaceae	Clerodendrum splendens, C.sp , Vitex doniana
60	Vitaceae	Cissus aralioides, C. rubiginosa
61	Zingiberaceae	Aframomum alboboviolaceu, A. angustifolium, A. melegueta.

k) Existing Sacred forests (Shrines)

It should be noted that the populations of the Kinlau group recognize the existence of a sacred forest (Shrine) called "Mabulu" in their region, considered the residence of sea spirits. Access to this forest is prohibited for the general population, except for customary leaders invested with this power when certain situations demand it. The forest contains various animals (harnessed guib, civet, etc.) and food or medicinal plants, as well as a chain of rocks that was exploited during the colonial period for the construction of the Catholic Church in Muanda.

In the islands of the estuary, there are no sacred forests. Each family has its own forest where they exploit resources. There are no taboos except for one myth: the story of a tree that was cut to make a canoe and supposedly grew back, enclosing all the tools inside. Designating the forest as sacred and the existence of this myth fortunately contribute to the conservation of coastal biodiversity.

Fauna of the Coastal Zone and the Congo River Estuary

The PMM comprises unique coastal wetland ecosystem along the Congo River estuarine comprised of a unique mangrove ecosystem, estuarine wetlands, as well as the adjacent ecosystems providing reptiles, amphibians, fish, and bird species with habitats, while the local communities draw from among its benefits, important food resources. The documented and identified fauna on the Atlantic coast and in the Congo River, estuary can be categorized into five components: Macro-invertebrates, Fish, Amphibians, Reptiles, Birds, and Mammals.

Exploited and Consumed macroinvertebrates

Crustaceans such as *Caridina* sp., *Palaemon* sp. (Family Palinuridae), *Nephropsis atlantica* (langoustine, Family Nephropidae), *Lysiosquilla hoevenii* (Stomatopodes), *Panulirus argus* (Latreille), and crabs like *Callinectes amnicolor*, *Cronius ruber*. These are abundant in mangrove undergrowth and beach sands.

Bivalve mollusks or oysters of the genus *Egeria* (*Egeria congica* and *E. Bernardii*, Family Donacidae) found in the estuary near the village of Malela. Oyster harvesting is the main activity for women in "Dilondo" and "Mbanza Malela." It is done individually or in pairs, using a lead-weighted canoe while the fisher dives into the river bottom to bring back the oysters. Oyster fishing in the mangroves of the DRC is most productive during the rainy season. It is practiced by diving without appropriate equipment. Only the canoe allows the fisher to reach the middle of the river and transport the harvested oysters. The fisher dives to depths of 7 to 10 meters, picking up 6 to 18 oysters by hand, bringing them to the surface after a maximum of 1 minute. Each fisher harvests between 1200 and 2000 oysters per day.

Other camps, such as "Nganda crevette," specialize in shrimp fishing. This is done during the rainy season using barriers with large-sized traps and locally made traps with palm nuts and crabs as bait. The products are sold at \$6 US per kilo in Muanda.

Fish

Fishing is the main activity for families due to the proximity of the river and the ocean. It is carried out by men, while women handle the marketing and salting of fish. Fishing techniques include nets (dormant and trailing) with mesh dimensions ranging from 1.5 to 24, variously sized hooks (8 to 16), and traps. Fishing products are diverse, varying from one season to another, and are intended

for both commerce and family consumption. Fishing is primarily artisanal and of low productivity, producing about 15 kg of fish per week during less fruitful periods, while professional fishing can yield up to 80 kg per day.

The selling price varies between \$3 and \$6 US per kilogram depending on the species. According to the population, the decline in production is explained by overexploitation (irrational exploitation) due to population growth.

It should be noted that this fishing is less rational, given that recommended mesh sizes and fish reproduction periods and locations are not respected. This is compounded by the lack of organization and the low level of education among the communities present.

Observation of Table 1 below shows 35 families and about sixty species. Ifuta's data (unpublished) indicates 80 species found throughout the Marine Mangrove Park (PMM).

N°	Families	Species
1	Haemulidae	<i>Plectorhinchus macrolepis</i> , <i>Pomadasys peroteti</i> , <i>Pomadasys jibelini</i>
2	Monodactylidae	<i>Monodactylus sebae</i>
3	Carangidae	<i>Alectis alexandrinus</i> , <i>Trachinotus goreensis</i> , <i>T. ovatus</i> L., <i>Selene dorsalis</i>
4	Ephippidae	<i>Drepane africana</i>
5	Belonidae	<i>Tylosurus acus</i> , <i>Strongylura senegalensis</i>
6	Hemiramphidae	<i>Hyporhamphus picarti</i>
7	Ophichthyidae	<i>Dalophis boulengeri</i> , <i>Myrichthys pardalis</i> (Serpent léopard)
8	Schilbeidae	<i>Schilbe intermedius</i>
9	Pristigasteridae	<i>Ilisha africana</i>
10	Clupeidae	<i>Pellonula vorax</i> , <i>Ethmalosa fimbriata</i> , <i>Odaxotrisa ansorii</i>
11	Soleidae	<i>Pegusa cadenati</i>
12	Bothidae	<i>Citharichthys stampfli</i>
13	Dasyatidae	<i>Dasyatis margarita</i> , <i>D. margaritella</i>
14	Gerreidae	<i>Gerres melanopterus</i>
15	Elopidae	<i>Elops lacerta</i>
16	Mugilidae	<i>Mugil urema</i> , <i>Liza falcipinnis</i> , <i>Liza dumerili</i>
17	Sciaenidae	<i>Pseudotolithus (Fanticulus) elongatus</i> , <i>P. senegalensis</i>
18	Polynemidae	<i>Galeoides decadactylus</i> , <i>Pentanemus quinquarius</i>
19	Claroteidae	<i>Chrysichthys auratus</i> , <i>Chrysichthys teugelsis</i> , <i>Chrysichthys</i> sp.
20	Ariidae	<i>Arius latiscutatus</i>
21	Lutjanidae	<i>Lutjanus goreensis</i>
22	Elotridae	<i>Elotris senegalensis</i>

23	Cichlidae	<i>Sarotherodon melanotheron</i> , <i>Tilapia guinensis</i> , <i>T. rendalli</i> , <i>T. cabrae</i>
24	Sphyraenidae	<i>Sphyraena guachancho</i> , <i>Sphyrna couardi</i> , <i>Rhisopriondo acoutus</i> , <i>Rhincodon typus</i> , <i>Sypharma lewini</i> , <i>Carcharodon carcharias</i> , <i>Ciorhinus maximus</i>
25	Scombridae	(Indéterminé)
26	Megalopidae -	<i>Tarpon atlanticus</i>
27	Sparidae	<i>Dentex sp</i>
28	Trichiuridae	<i>Trichiurus lepturus</i> (ceinture), <i>Orcynopsis unicolor</i>
29	Clariidae	<i>Arius parkii</i> , <i>A. latiscutatus</i>
30	Tetraodontidae	<i>Ephippion guttifer</i> Bennet (non comestible), <i>Tetraodon lagocephalus</i> (non comestible)
31	Batrachoididae	<i>Batrachoides liberiensis</i> Steindachner (non comestible), <i>Halobatrachus didactylus</i> (non comestible)
32	Cynoglossidae	<i>Cynoglossus senegalensis</i>
33	Polynemidae	<i>Pentanemus quinquarius</i> , <i>Galeoides decadactylus</i>
34	Sciaenidae	<i>Pseudolithus elongatus</i> , <i>P. senegalensis</i>
35	Kuhliidae	<i>Parakuhlia macrophthalmus</i> , <i>Periophtalmus papilio</i>

Reptiles

Operators of the Marine Mangrove Park mention 5 other snake names, but they are represented by their vernacular names in the Assolongo or Woyo dialect. It is currently difficult to provide their scientific names. Of all these herpetological resources, sea turtles are the most threatened because their eggs and meat are found in markets, and in some villages, their shells. The sea turtles *Lepidochelys olivacea*, *Chelonia mydas*, *Eretmochelys imbricata*, and *Dermochelys coriacea* are the species along the Congolese Atlantic coast threatened with extinction for several reasons, including irrational fishing, Marine pollution from coastal activities, extensive fishing in the highseas using trawlers.

Reptiles of Muanda and the Mangrove zone.

Orders	Families	Species
Chéloniens	Cheloniidae	<i>Cheloniamydas</i> , <i>Dermochelys coriacea</i> , <i>Lepidochelys olivacea</i> , <i>Eretmochelys imbricata</i>

Squamates/S.O Ophidiens	Elapidae	<i>Boulangerina annulata</i> , <i>Psammophis sp</i> , <i>Philothamnus sp</i> , <i>Trasops jacksoni</i> , <i>Dasypeltis sp</i> , <i>Lamprophis sp</i> , <i>Naja melanoleuca et N. nigricollis</i> , <i>Dendroaspis jamesoni</i> , <i>Bitis nasicornis</i> , <i>Bitis gabonica</i> , <i>Python sebae et Python regius</i> , <i>Charina reinhardtii</i> , <i>Typhlops punctatus</i>
Lacertiliens	Varanidae	<i>Varanus niloticus</i>
Crocodyliens	Crocodylidae	<i>Crocodilus cataphractus</i> , <i>Crocodilus niloticus</i>

Irrational artisanal fishing activities include activities such as regular and unconcerned exploitation of the Congolese coastal strip by trawlers from Angola, Cabinda, Benin, etc. Additionally, capture of these species and collection of eggs laid along the coast during the nesting period. Further, Marine pollution by ships incompatible with the conservation of rare species, thus promoting their migration to the open sea or to other coasts. Finally, natural predation by reptiles (Nile monitor), birds (herons, episcopal stork), and small carnivorous mammals (civet, genet, and mongoose) (Mbungu, 2009).

In the Marine Mangrove Park, sea turtle species are observable in Zone B along the 20-meter-wide coastal strip along the ocean, and in Zone A, mainly in all the camps and villages of the Rosa and Bulambemba islands. It should be noted that the exploitation of these species is linked to the periodicity of their breeding cycle (November - February for nesting).

Fishermen are aware of the prohibition of turtle fishing: those caught in nets are released, but the dead ones are taken for consumption. In some fishing camps like Kikala kiaku, nets with small mesh sizes and pockets that catch fry or fingerlings and turtles are used, disregarding existing norms and regulations.

Avian Fauna

Avian fauna of Muanda and the Congo River estuary.

Orders	Families	Species
Anseriformes	Anseridae	Anseridé indéterminé
Charadriiformes	Scolopacidae	Limicola falcinellus
	Sternidae	Sterna paradisiaca
Ciconiiformes	Ardeidae	Ardea goliath
	Threskiornithidae	Bubulcus ibis, Egretta gazetta, Plegadis falcinellus

Columbiformes	Columbidae	Treron calva
Coraciiformes	Alcedinidae	Cerylerudis, Halcyonmalimbicus, Halcyon senegalensis
Cuculiformes	Cuculidae	Centropus sp.
Falconiformes	Accipitridae	Gypohierax angolensis, Milvus migrans
Galliformes	Phasiidae	Francolinus spp.
	Numididae	Numida meleagris
Pelecaniformes	Phalacrocoracidae	Phalacrocorax sp.
Psittaciformes	Psittacidae	Psittacus erithacus
Procellariiformes	Hydrobatidae	Pelagodroma Marina
Passeriformes	Estrildidae	Uraeginthus angolensis
	Corvidae	Corvus albus
	Hirundinidae	Hirundo sp.
	Passeridae	Passer griseus
	Pycnonotidae	Andropadus sp.

The number of bird species inventoried in the DRC is significantly higher than that of other Gulf of Guinea countries (TDA, 2006). In the table above, it is worth noting migratory species such as pelagodroma Marina, phalacrocorax sp., and plegadis falcinellus. Reading Table 4 above indicates 24 bird species belonging to 19 families and 12 orders.

Mammalian Fauna

TDA (2006) indicates that the DR Congo has 415 species of mammals, with 28 being endemic and 38 endangered. These figures once again place the DRC at the forefront among all other countries in the Gulf of Guinea. The table below reveals 35 mammal species belonging to 13 families and 8 orders observed in the coastal zone.

Mammalian fauna of Muanda and the Congo River estuary

Orders	Families	Species
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Insectivores	Potamogalidae	<i>Potamogale velox</i>
Rongeurs	Hystriidae	<i>Atherurus africanus</i>
	Sciuridae	<i>Funisciurus lemniscatus, Funisciurus anerythrus, Protoxerus stangeri</i>
	Thryonomyidae	<i>Thryonomys swinderianus</i>
Carnivores	Felidae	<i>Felis sylvestris, Genetta tigrina, Nandinia binotata</i>
	Viverridae	<i>Viverra civetta</i>
	Canidae	<i>Canis adustus</i>
Primates	Cercopithecidae	<i>Cercopithecus ascanius, Perodicticus potto, Galagomidovii, Cercopithecus cephus, Colobus angolensis et Colobus sp.</i>
Pholidotes		<i>Manis gigantea, Manis tricuspis</i>
Sireniens	Sirenidae	<i>Trichechus senegalensis</i>
Artiodactyles	Bovidae	<i>Cephalophus monticola, Cephalophus dorsalis, Tragelaphus scriptus, Tragelaphus spekei (Sitatunga), Syncerus caffer.</i>
	Hippopotamidae	<i>Hippopotamus amphibius</i>
Cétacés	Baleine	<i>Balaenoptera physalus, Balaenoptera borealis, Balaenoptera acutorostrata, Balaenoptera musculus, Megaptera novaeangliae, Hypergodon ampullatus,</i>
	Dauphin	<i>Delphinus delphis, Tursiops truncatus, Tursiops sp.</i>
	Cachalot	<i>Physeter macrocephalus</i>

In Kambemvo and its surroundings, the presence of salt pans in the savannah attracts numerous herds of animals, including buffaloes (*Syncerus caffer*), whose passage sometimes leads to the destruction of villagers' crops. The Marine Mangrove Park was mainly created for the preservation of aquatic manatees, mangroves, and turtles.

Threats and Challenges relating to Biodiversity and Natural Resources management in the PPM

Scientific name	Common name	Threat Level	
		Global	National
<i>Trichechus senegalensis</i>	African Manatee	Vulnerable (VU)	Vulnerable (VU)

Lepidochelys olivacea	Olive Ridleys	Vulnerable (VU)	Vulnerable (VU)
Dermochelys coriacea	Leatherbacks	Vulnerable (VU)	Vulnerable (VU)

Endangered plant and animal species .

At the terrestrial level, timber such as Limba, Okume, Wenge, etc. are widely exploited for the export of logs (without added value). In terms of mangroves, mangrove trees are destroyed for the manufacture of charcoal and for construction materials. Oysters are running out in the Mangroves and on the sea-coast. Therefore. They are threatened with extinction following irrational exploitation and overexploitation due to the population's ignorance about the reproduction period, the average size of adults, the fishing equipment used, etc. The different species concerned are *Ostrea sinuata*, *O. lurida*, *O. densamellosa*, *O. chilensis*, *O. Stentina*, *O. puelchana*, *Crassostrea gigas*, *C. angulata*, *C. margaritacea*, *C. glumarata*, *C. rhizophora*, *C. guyanensis* and *C. cucullata*. The manatee (*Trichechus senegalensis*), a species of aquatic cow of the mangrove, which only gives one calf per year, is threatened with extinction; because it is sought after and slaughtered with impunity by indigenous hunters for its highly valued and commercialized meat. The hippopotamus (*Hippopotamus amphibius*), an aquatic mammal in the Marine Park, is in danger because it is regularly hunted by local populations and traded. Marine turtles: *Caretta caretta*, *Lepidochelys olivacea*, *Lepidochelys kempii*, *Chelonia mydas*, *Ertmochelys imbicata* and *Dermochelys coriacea* are the species of Marine turtles on the Congolese Atlantic coast threatened with extinction for several reasons, including:- Irrational artisanal fishing;

The regular and worry-free exploitation of the Congolese coastal strip by Angolan, Cabindan, Beninese trawlers, etc;- Capture of these species and collection of eggs laid along the coast during the spawning period;- Marine pollution by ships incompatible with the conservation of rare species; thus, promoting their migrations towards the high seas. Marine shrimp are also endangered and require special protection as they are threatened with extinction for reasons mentioned below:- Overexploitation of the Congolese Marine coast by indigenous fishermen and Angolan trawlers, (MECN-EF, 2006);-The use of nets and trawls with reduced mesh sizes;- Pollution of the Marine coast favoring the migration of rare species to the high seas. The fish species listed below are threatened with extinction for one or other of the reasons already mentioned above. This is particularly about: Sharks, Bonitos, Congers, Rays, White Captains, Bearded Captains, Sole and Carp. For example, territorial data on fish production in Nsiamfumu over the last 5 years demonstrate the danger of extinction of the aforementioned species (SENADEP, 2007).

Special protection measures for endangered species Given the danger that future generations face from these threatened and endangered species, there is a need to ensure sustainable protection and conservation. In reality, these species are protected by the creation of the Mangrove Marine Park; however, this monitoring is not effective. Currently, the guards assigned to this activity do not have the logistical and financial means for the effective and sustainable protection of the park. Generally speaking, it is up to the Congolese State to assume its responsibilities in order to flawlessly apply the provisions contained in the national action plan on biodiversity.

However, an emergency program can be considered outside of this action plan. The proposed elements are as follows:

- An awareness campaign for the protection and usual return to the sea of captured Marine turtles, including eggs laid along the coast
- Regulate oil exploitation because the population of the waters contribute to the migration of certain Marine species- Identify manatee poachers and Mangrove slaughterers; raise their awareness; replace their activities with employment and relaunch agricultural activities
- Think about the coastal population; give them work before involving them in protection, conservation and sustainable use of forest and Marine ecosystems
- Strengthen the capacities of the Congolese Institute for Nature Conservation to ensure continuous and regular monitoring of the Mangrove Marine Park. The results of the surveys show that the animal species below are no longer caught by fishermen and trawlers. So, they disappeared years ago. Among these species, we can cite: - The beaked whale (*Hyperodon ampullatus*); - The sand shark (*Sypharma sp.*); - The bull shark (*Carcharias taurus*). To restore these extinct species on the Congolese Marine coast, the main measure planned would be the importation of their eggs to other countries (Anonymous, 2006b).

Threats to Biodiversity

The PMM's continues to face deleterious conditions following its compromised ecosystem integrity arising from anthropogenic pressure from continued land-use change and land conversion on the peripheral settlements as well as direct unsustainable take-activities, mainly felling and uncontrolled harvesting of mangrove trees for charcoal (*makala*) production as well as for construction purposes. Additionally, agriculture-related uses have seen significant land acreages around the PMM converted into crop lands to produce cassava leaves that is consumed in the neighbouring towns of Muanda, Banana, Matadi, and Boma.

Notably, the overall deterioration of the mangrove ecosystem has led to the alteration of the trophic chain and natural ecosystem interactions between the physical environment, the flora, and the fauna. The outcome of the ongoing mangrove ecosystem disturbances documented in the PMM has orchestrated a reduction in the ecosystem's productivity potential as various habitats and reproduction spaces for various species have reduced or disappeared in entirety. Below are other activities that continue to negatively impact and threaten the PMM's ecosystem integrity hence threatening biodiversity.

Hunting and gathering of exploited biodiversity elements

Hunting practiced by humans has become less productive because several game species have become rare or have disappeared due to deforestation. The species regularly hunted nowadays include porcupines (*Atherurus africanus*), bats, squirrels (*Funisciurus anerythrus*), and pangolins (*Manis gigantea*, *M. tricuspis*).

Hunting is associated with gathering, mainly done by women and children, for a very limited number of wild vegetables (*Gnetum africanum*, *Colocasia esculenta*), caterpillars (*Imbrasia erli*, *Bunaea alcinoe*, *Antheua insignata*), and mushrooms (*Auricularia polytricha*, *A. fuscusuccinea*, *Schizophyllum commune*, *Lentinus*

spp). Most of the products from hunting and gathering are intended for sale in the markets of Muanda. Only a small portion is used for household consumption. Since hunting and gathering techniques have remained rudimentary, they are likely to affect the self-regenerative power of species.

Note: Hunting and fishing are individual and non-professional activities carried out for survival. According to the population, the decline in production is due to irrational exploitation, a consequence of population growth and trade.

5.1.2 High Conservation Values (B1.2)

Globally, regionally or nationally significant concentrations of biodiversity values, protected areas, threatened species, endemic species and/or areas that support significant concentrations of a species during any time in their lifecycle.

Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

Threatened or rare ecosystems.

Below are the High Conservation Values that relate to the project area biodiversity.

High Conservation Value	Mangrove Ecosystems.
Qualifying Attribute	Mangroves are unique ecosystems with cross-cutting functionalities based on their interconnectedness to land, freshwater, and Marine systems. Mangrove forests are crucial systems that help stabilize coastal zones by prevention of erosion, reducing wave energy, and sediment accumulation through soil retention, fixation, and accretion. Further, Mangroves offer communities livelihood opportunities that include fishing areas and protection from coastal dynamics. Ecologically, mangroves act as natural filtration zones preventing sedimentation of other critical Marine ecosystems such as coral reefs, seagrasses, and water column from continental sediment discharge, all which support rich Marine and freshwater biodiversity that include amphibians, reptiles, fish, mammals, and micro-invertebrates.

	Finally, mangroves productivity and carbon sequestration potential positions the ecosystem among the most valuable tropical ecosystems offering both communities and biodiversity with irreplaceable ecosystem goods and services including food security, climate mitigation, and emission reduction through sequestration.
Focal Area	Mangroves in the PMM: Conserving the current mangrove area of the PMM is vital, and conducting restoration activities in the project area offers a viably sustainable approach to guarantee the ecosystem's integrity

5.1.3 Without-project Scenario: Biodiversity (B1.3)

The current landcover transformations taking place in and around the PMM are likely to continue considering the population growth and urbanization trends in Muanda, Boma, and Banana. The resultant population pressure exerted by the need for more land for settlement, agriculture for food production. The two anthropogenic drivers shall continue to propagate increased rates of land conversion from natural forest lands to agricultural or settlement areas. Additionally, the expected urbanization and settlement increment around the PMM would lead to a higher demand for mangrove ecosystem goods such as timber for housing construction, charcoal for fuel in nearby urban areas, all exerting increased pressure on the mangrove ecosystem.

Presently, the existing external anthropogenic pressure has seen increased cases on uncontrolled, illegal take activities within the PMM where local communities defy the existing control mechanisms on the PMM exploitation to selectively cut young mangrove trees (*Rhizophora racemosa*) for purposes of producing charcoal. The resultant impact on the mangrove biodiversity has been a reduction in the ecosystem's resilience as young trees with good genetic vigor are extracted/harvested prematurely from the forest leaving behind older trees which have low genetic vigor to adapt to the changing ecosystem conditions. With a compromised resilience rate, the mangrove ecosystem loses its viability and capacity to support the diverse biodiversity that depends on the forest's robustness. This leaves all conservation efforts for both flora and fauna within this unique ecosystem in jeopardy.

However, the conservation project is projected to conserve approximately 500ha within 10-year period in support of biodiversity conservation.

Consequently, in the scenario of land use without the project, the PMMs biodiversity remains negatively impacted through:

- Reduction of mangrove forest cover and loss of ecosystem services.
- Decrease in water quality because of increased sedimentation and siltation.

- Habitat destruction leading to increased species vulnerability, especially threatened Marine species.
- Loss of biotic structure and composition due to fragility of the trophic chain.
- Lack of governance compliance and enforcement due to increased rate of illegalities within the PMM.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Biodiversity Element	Flora
Estimated Change	Positive
Justification of Change	The project shall focus/involve avoiding deforestation and degradation of the PMM's mangrove forest cover. To achieve this, the project shall implement sustainable land management tools that can help maintain a robust ecological structure and species composition within the PMM's ecosystem. The approach will guarantee that the ecosystem can recover from the current anthropogenic disturbances and sustainably provide the necessary ecosystem services while conserving both the forest's flora and fauna currently threatened by the ongoing degradation activities both within and around the PMM.

Biodiversity Element	Fauna
Estimated Change	Positive
Justification of Change	The fauna within any ecosystem remains dependent on species abundance, as an indicator of biodiversity richness. As key influencers within an ecosystem's food chain, fauna relies on a good vegetation cover for habitat, food, and breeding purposes. Mangrove forests, like the PMM, are uniquely

5.2.2 Mitigation Measures (B2.3)

To mitigate the negative impacts of the project in the off-site areas, the project proponent shall install woodlot areas across Zone B, the savanna areas to act as alternative take areas for fuelwood and timber. The woodlots shall include fast-growing species of acacia trees that are regarded by locals as producers of better fuelwood and timber for poles. Additionally, the proponent shall conduct consultative meetings that train local fisher folk on sustainable fishing methods to reduce fishing pressure on the mangrove areas.

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The main project objective is conservation of the existing mangroves. Unsustainable activities will be kept out through well-structured proposed measures. In that manner, better conditions for biodiversity to thrive will be provided and monitored, in terms of refuge for aquatic species and endangered species. Rare or near extinct plant and animal species existing will be protected and thus multiply or regenerate in the near future. This way the conservation project signifies positive impact for both fauna and flora existing within the project area. Furthermore, proposed management activities aim at reducing negative impacts within the project area in turn favouring the protection of the marine ecosystem. Therefore, the net impact on biodiversity of the project will be positive.

5.2.4 High Conservation Values Protected (B2.4)

There shall be no negative impacts on the HCVs as all conservation efforts conducted in the degraded areas including nursery preparation, propagule collection, replanting, forest inventory, and monitoring are all management practices geared towards improving the status of the forest.

5.2.5 Species Used (B2.5)

Mangrove propagules collected from *Rhizophora racemosa* and *Avicennia germinans*

5.2.6 Invasive Species (B2.5)

No known invasive species shall be introduced during the project activities. Replanting of all degraded areas shall be done from propagules collected from the PMM.

5.2.7 Impacts of Non-native Species (B2.6)

There shall be no non-native species used during the project. All species shall be collected from local species and the nurseries shall be prepared from propagule of *Rhizophora racemosa* and *Avicennia germinans* species which are the predominant species in the PMM.

Species	Not Applicable
Justification of Use	Not Applicable
Potential Adverse Effect	Not Applicable

5.2.8 GMO Exclusion (B2.7)

There shall be no introduction or use of GMO in the project to generate GHG emissions reductions or removals. All propagules for nursery preparation shall be collected from the forest. No propagules or saplings planted shall be from outside the forest.

5.2.9 Inputs Justification (B2.8)

No use of fertilizers, pesticides, bio-control agents, and other input materials shall be involved in the project.

Name	Not Applicable
Justification of Use	Not Applicable
Potential Adverse Effect	Not Applicable

5.2.10 Waste Products (B2.9)

No waste products shall be generated from the project activities.

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

There is no negative offsite impact.

Negative Offsite Impact	Mitigation Measure(s)
Not Applicable	Not Applicable

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The project activities are expected to have cumulative positive biodiversity impacts. Through the reforestation activities, the proponent aims to restore the forest vegetation cover, rehabilitate the hydrological channels around degraded areas of the forest, plant new mangrove stands and rehabilitate the degraded carbon pools that are currently emitting carbon into the atmosphere, and plant an alternative woodlot outside the PMM to act as a source of wood products for the community. The activities shall have positive impact on both flora and fauna within and outside the PMM. As a Ramsar site, the activities are likely to improve the hydrological system of the Congo Basin and the estuary creating a key biodiversity area (KBA) from the additional freshwater habitat created along the Congo River Basin. The resultant landscape connectivity that shall arise from conservation activities conducted in the PMM shall include an interconnected ecosystem around the Congo River Mouth, the Mangrove Forest, and the offshore seagrass zones that support abundant biodiversity including the African manatee.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

The project's biodiversity monitoring shall focus on biodiversity aspects of both flora and fauna. The monitoring of the project area's fauna shall involve identifying activities aligned to specific performance indicators including monitoring the forest structure and its interaction with associated fauna. Additionally, there shall be need for monitoring of the basic physiochemical parameters of the hydrological channels within the project area.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The Biodiversity Monitoring Plan (BMP) is derived from the projects Climate Monitoring plan in section 3.3.3. outlining the monitoring framework, processes, and objectives. The project's biodiversity monitoring shall focus on biodiversity aspects of both flora and fauna. The monitoring of the project area's fauna shall involve identifying activities aligned to specific performance indicators including monitoring the forest structure and its interaction with associated fauna. Additionally, there shall be need for monitoring of the basic physiochemical parameters of the hydrological channels within the project area.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

Not Applicable

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

The PMM and the coastline of Muanda act as a critical habitat for several vulnerable species including the African manatees and sea turtles. The African manatee's global vulnerability is compounded by degradation of their foraging habitats which has caused their numbers to dwindle across the world, in particular, the Gulf of Guinea and the entire West Africa's coastline. Additionally, the coastline of Muanda acts as a sea turtle nesting ground where annual turtle visits on the sandy beaches of Muanda are recorded by both the ICCN and the community. This enables the different species of turtles listed as vulnerable in the IUCN red list occasion to mate and lay their eggs on the beach.

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

Trigger Species	Mangroves
Population Trend at Start of Project	The mangrove degradation observed in the PMM over the last decade warrants immediate conservation of the area as a critical ecosystem. The loss of 116 ha/annum as currently reported indicates an unsustainable decline rate that if left in the present without-project scenario, the entire DRC mangrove ecosystem will be lost to land-use change and conversion.

Without-project Scenario	Without the project, the rate at which mangrove vegetation is declining and forest land is converted to other uses by the local communities infers a total loss of the mangrove ecosystem. The degradation rate if left unchecked has the potential to lead to further fragmentation of the forest, conversion of the peripheral areas into settlement areas, and loss of the biodiversity and ecological goods and services attributed to the forest.
With-project Scenario	The project activities on reforestation aim to restore and conserve the mangrove ecosystem as a critical resource that not only supports the unique biodiversity within itself but maintain the entire coast's ecological balance. The mangrove forest act as a coastal stabilizer without which, the entire coastline remains threatened by direct wave action that has manifested through beachline erosion, settlement flooding, species migration, and seawater intrusion into groundwater wells. The project shall endeavor to restore the dwindling species of various mangrove in the region, especially <i>Avicennia germinans</i> which across the years has seen a significant decline in abundance.

APPENDICES

Appendix 2: Project Activities and Theory of Change Table

Stakeholder category <i>Identify communities and any community groups within them, any cross-cutting community groups, and list other stakeholders.</i>	Stakeholder Specific Type/Rights	Role/interest	Objective of Engagement	Overall Relevance to the Project
Traditional Authorities	Chieftains	Influence/ Decision making role in local resource use	To provide information on community structure and hierarchy of leadership. Consulted to give feedback on project decision making	Consent on development projects in the resource within their jurisdiction. Authorizes implementation of site-based activities such as the village meetings, feasibility study in the mangrove, and socioeconomic field studies Participate in community level consultation on resource use assessment and mapping.
Resource Users	Local community members	Project beneficiaries Share local knowledge. Project Implementation partners	To provide information on community activities and use of	Provide information on community's use of the mangrove resource, threats to the mangrove as well as local solutions that can be integrated in a project.

			mangrove resources. Provide feedback on project decision making process. Collaborate in the project implementation.	Participate in resource use assessment and mapping (Participation and consultation among stakeholders enables sound project policies and legislation). Local ambassadors creating awareness outreach on the upcoming project to adjacent villages. Community field technicians (trained under the project to become carbon assessors) Members of Local Project Committee to oversee project implementation, benefit sharing and addressing grievances.
	Mangrove harvesters Mangrove charcoal producers Mangrove firewood producer Mangrove honey producers Mangrove herbal medicine producers Mangrove fishermen Mangrove tour guide	Ultimate beneficiaries Share local knowledge. Project implementers	Consulted for feedback on project decision making and to provide systematic way to integrate feedback in in the decision-making process. Collaborate (seek active project ownership)	Participate in community level consultation on benefits of projects in their area. Participate in resource use assessment and mapping. Participate in site visits, feasibility studies and result dissemination. Participate in developing community sound practice around the project. Form part of the community project committee to oversee project implementation, benefit sharing and addressing grievances

Government	Ministry/ Department of Environment ICCN (Institut Congolais pour la Conservation de la Nature) CCPN Muanda (Le Centre Congolais pour la Conservation de la Nature)	Project beneficiaries Authority for forest Co-Management and other policy Facilitate implementation of Co-management approaches Collaborate to seek Active Project Ownership	To provide information on the legal aspects and policy decisions of the government. Consulted to give feedback and systematic ways to integrate feedback to project decision making process	Give consent to developing a project in the mangrove forest by signing exclusive MOUs with the project proponent. Participate in community consultation meetings on project development. Participate in resource assessment and mapping
	Sub-national and local authorities	Facilitate implementation of co-management and other policies	Consulted to give feedback and systematic ways to integrate feedback to project decision making process	Participate in community consultation meetings on project development. Participate in resource assessment and mapping and result dissemination
Academia	Universities	Provide science for decision-making on co-management policy and implementation. Provide outreach and training on co-management approaches and technical skills.	Inform (Mangrove ecosystem level education) Consulted to give feedback and provide systematic ways to	Participate in consultation with project developers on design and implementation of the project objectives. Participate in field site visits and results dissemination workshops. Provide relevant research work/articles on the mangrove areas.

		Educate future Human Resources in the sector	integrate feedback into the project decision-making process	Consulted in refining the results of the site-based research. Assists develop a community of practice around the mangrove carbon project by Establishing a Development Committee and a Group of Reviewers from among Stakeholders
NGOs	Environment al and/or Development	Provide outreach and training on co-management approaches and technical skills	Inform on previous/ ongoing projects in the project area. Consulted to give feedback and provide systematic ways to integrate feedback in project decision making process	Participate in community-level consultation on project design, and benefits sharing. Participate in site visits and results dissemination workshops. Consulted on lessons and experiences from previous or ongoing projects in the project area.
Private Sector	Small businesses, firms and corporations in the mangrove resource or other value chains associated with the coastal mangrove ecosystem	Value chain actors Investors Potential drivers, champions Potential providers of technical training and improved infrastructure	Participate in providing systematic ways to integrate feedback into the decision-making process. Collaborate to provide active	Participate in results dissemination workshops. Assist to foster a community of practice around a Toolkit

		Potential participants in research for decision-making and adaptive management	project ownership in partnership with resource users, government, and academia	
Bilateral or Multilateral Projects	Fisheries management Biodiversity Conservation Coastal ecosystem Restoration	Provide Collaboration	Provide data on the area. Consulted to provide feedback on project decision-making	Participate in project consultation meeting with local and state stakeholders Participate in interview as Key informants (Provide experience and lessons from current and previous projects)

Appendix 3: Project Risks Table

Use this appendix, if necessary, to identify project risks and fulfill the requirements of Section 2.1.18 above. Modify the table, if necessary, to suit the project activities, or delete if not used.

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Political risk -- Governance (Mitigation through institution collaboration)	The DRC average governance score across the six indicators of governance listed by world bank in 2022 stood at -1.4^{32} The underlying governance inefficiencies are a result of the sociopolitical situation in the country that includes fiscal risks, civil unrest, political instability, and other relatable governance bureaucracy. The prevailing governance challenges have curtailed any form of political or institutional transformation for decades. Socially, the current situation has jeopardized critical sociopolitical systems including education, local administration, physical infrastructure, and bilateral relationships with neighboring countries, especially Rwanda and Uganda. For example, corruption in DRC remains a leading fiscal risk that not only discourages foreign direct investment (FDI) of the country but compromises local investment. Today, the high corruption has enabled public officers and the elite of the country to misappropriate and misallocate revenues generated from the country's resources and taxes	

³² World Bank. Worldwide Governance Indicators <https://www.worldbank.org/en/publication/worldwide-governance-indicators/interactive-data-access>.

	leaving the country lacking in physical, institutional, and legal infrastructure to support effective governance. (What are root causes. How do you link this to SGDs How will the project contribute to eliminating corruption through proposed SGDs. Rule of law: Policies that exist. And what are the risk severity of compliance. (Complying under the of ICCN which is a national authority. (How are we ensuring we are compliant with the DRC policies on carbon assets. Voice: Justice and fairness (Equality gender aspects) Accountability: [Benefit sharing scheme] transparency and continued communication channels. Stakeholders are involved throughout the project activities and decision making. Responsibility/conflict management Openness. Regulatory quality: Policies and their quality and propose how to refine their enforcement. (Gaps in policies and where they exist.) how can we propose/add value to the existing laws. Redefine the laws. The political system in the country across decades has seen the entrenchment of political corruption	
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	and manipulation of electoral systems Local administrative bureaucracy Civil unrest/instability remains another challenge that continues to compromise management and conservation of natural resources in the DRC. The 'ever-present' state of warring in different parts of the country has not only jeopardized governments' agenda but led to displacement of indigenous communities from their ancestral lands. Further, civil unrest has contributed to the unrelenting and unregulated exploitation of some of the critical natural ecosystems in the country through increased poaching of biodiversity. Government effectiveness/structure: Stabilize through corruption.	
Political, environmental, and social risk -- Challenges of managing transboundary resource -- Political instability	The PMM lies on the boundary between DRC and Angola. Therefore, there exist management challenges that include jurisdictional surveillance along the border areas of the PMM that are immediately adjacent to the border with Angola. [enforcement collaboration among authorities on beneficial aspects of the resource] initiate holistic stakeholder engagement through bilateral collaboration. Immigrant agents (The Angola Sayo Town) The change in political leadership and government policy directives on conservation. The country's political system through a periodic electioneering exposes management of natural resources to political uncertainties.	

	Poverty levels in the project area. This compliance with management. Training communities, revenue from the project credits, improved livelihood. Awareness creation Low literacy levels around the project: Affects the perceptions around the project.	
Community risk -- Community reliance on the resource	The local indigenous community, the Bassolongo, continue to rely on the mangrove forest for several forest goods including fishery grounds for oyster, fuelwood, timber for building, and the surrounding lands for settlement and agriculture. It is from this continued reliance that human activities around the forest especially conversion of land from forest land to farmlands and settlements that been the leading drivers of degradation. Additionally, the increased demand for cooking energy arising from the surging urban population in Muanda has led to an increased rate of mangrove tree felling for charcoal production. Incentivize the PMM management teams (community guards through stipends to ensure efficient and sustainable immigrant agents.) Sensitization of the community on the importance of conservation (ownership of the project). Land use change: Agriculture Encroachment. Human-wildlife conflict into	

Natural risk -- Sea level rise	The coast of DRC faces an increased threat from sea level rise resulting from climate change. Presently, the coast experience increased instances of tidal flooding around low lying areas around Banana leading to population resettlement around the area. Additionally, the absence of natural buffers such as mangroves around Nsiamfumu, Kumbi, and Muanda has exposed the coastline to high wave action eroding away the beaches and shorelines around the PMM. River/tidal flooding flooding: Extreme weather: El-nino/la-nina cycle: Siltation substrate sediment accentuation. Storm surges (to check) Coastal erosion (wave action)	
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