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Running Title: Ground-Truthed Mauritius Mangrove Atlas

A ground-truthed national atlas of mangroves in Mauritius: spatial baselines, blue carbon significance, and implications for climate resilience in Small Island Developing States

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Abstract

Mangroves provide coastal protection, nursery habitat, nutrient retention and long-term carbon storage, yet national-scale mangrove information remains incomplete in many Small Island Developing States (SIDS), where forests are often narrow, fragmented and difficult to resolve using medium-resolution satellite products alone. This study presents a comprehensive national mangrove atlas for mainland Mauritius, developed from island-wide ground surveys, GPS-referenced site documentation, manually digitised mangrove polygons and district-level geospatial synthesis. Mangrove coverage maps were baseline-validated using 2019 field data and Google Earth Pro imagery. Subsequent 2026 update integrated latest available remote sensing data with sporadic field-truthing visits. The atlas identifies 244.5 ha (~2.445 km²) of mangroves distributed across the seven coastal districts, with strong spatial concentration in the eastern coastal areas, namely, Riviere du Rempart and surrounding islets (~92.80 ha; ~38.0%), Flacq and surrounding islets (~60.62 ha; ~24.8%) and Grand Port (~55.73 ha; ~22.8%). Boundary sensitivity analysis produced an indicative boundary-derived area envelope of ±24.9 ha (~10.2%). Field validation confirmed that mangroves occur as estuarine stands, lagoon fringes, hypersaline or saltpan-associated patches, islet mangals and restored stands. The atlas provides a reproducible spatial baseline for environmental impact assessment, restoration prioritisation, post-disaster monitoring and future national blue carbon accounting. We show that field-validated ecological atlases remain essential scientific infrastructure for SIDS, where mangrove systems are small in area but disproportionately important for coastal resilience and climate governance. Recent mapping upgrade indicates that the mapped mangrove extent increased by ~12.81% as compared to data captured in 2019. Using stable, mature stands as a predictive proxy, the mangrove extent yields an overall screening-level estimate of approximately 21,829.3 t AGB, corresponding to ~33,617.5 t CO_2e, and ~10,234.3 t BGB, corresponding to ~15,775.2 t CO_2e. Surface sediment carbon was estimated separately at ~0.25 t organic C per tonne of surface sediment, corresponding to ~0.71 t CO_2e.

Keywords: Mangroves, Blue Carbon, Coastal resilience, Small Island Developing States, Ground-truthing

INTRODUCTION

Mangrove ecosystems occupy a narrow ecological zone at the interface between terrestrial, estuarine and marine systems, but their ecological and climate significance is disproportionate to their global extent. They stabilise sediments, attenuate waves and storm surges, provide nursery habitats for fish and invertebrates, regulate nutrient and organic matter flows, and store large quantities of carbon in biomass and waterlogged soils (UNDP, 2023; Das et al., 2026). Global analyses have repeatedly shown that mangroves are among the most carbon-rich tropical forest ecosystems because they combine productive woody biomass with long-term soil carbon accumulation under anoxic conditions (Donato et al., 2011; Kauffman and Donato, 2012; Alongi, 2014). These functions are particularly important in Small Island Developing States (SIDS), where coastal land is scarce, exposure to cyclones and storm surges is high, and ecological degradation can rapidly translate into development, livelihood and disaster-risk consequences.

Despite the availability of global mangrove datasets such as the Global Mangrove Watch, many island-scale management questions require finer spatial and ecological detail than global products can provide (Chaiyana et al., 2025). Medium-resolution imagery and automated classifications can under-detect narrow fringing stands, young restoration areas, mixed mangrove-terrestrial vegetation and tidally submerged roots (Xia et al., 2018; Bunting et al., 2022; Zhang et al., 2025). The problem is not simply technical. In SIDS, where mangrove patches may be small but strategically located at river mouths, lagoon margins, saltpans, estuaries and settlement edges, omission or boundary error can affect environmental impact assessment, coastal permitting, restoration prioritisation and blue carbon activity data (Sunkur et al., 2024).

Mauritius represents a strong case for field-validated mangrove mapping. The island has a limited mangrove flora dominated by *Rhizophora mucronata* and *Bruguiera gymnorhiza*, with the recent reporting of three trees of *Heritiera littoralis* at Rivière des Creoles (Matsui et al., 2025) adding biodiversity significance to a system previously considered floristically simple. Historically, mangroves were far more extensive than at present, but clearance, coastal development, fuelwood extraction, infrastructure expansion, hydrological alteration and episodic environmental disturbances have produced a fragmented contemporary landscape (Friess et al., 2019). Restoration and replanting have occurred at several sites, but the national picture remains heterogeneous and requires a spatial baseline that distinguishes natural remnants, restored stands and stress-prone coastal fragments.

The objective of this paper is to present and analyse a comprehensive, field-validated national mangrove atlas for Mauritius. The study addresses four questions: (i) what is the current field-validated extent and district distribution of mangroves in mainland Mauritius; (ii) what typologies and ecological conditions characterise these mangrove systems; (iii) how do mapped mangroves relate to blue carbon and coastal resilience functions; and (iv) how can the atlas support repeatable monitoring and national environmental governance. The novelty of the study is framed specifically as the first comprehensive, field-validated national mangrove atlas for Mauritius. Its broader contribution is to show how field-verified national atlases can complement remote sensing products in fragmented SIDS settings.

METHODS

STUDY AREA

Mainland Mauritius is a volcanic island located at approximately 20°12′S, 57°30′E. in the southwest Indian Ocean. The island coastline is characterised mainly by a fringing coral reef system enclosing a shallow lagoon except for 'near river mouths, estuaries, and low-lying northern plains, as well as along the minor cliffs that define the western and southern coastlines' (ASCLME, 2012). Climatically, Mauritius experiences a subtropical maritime climate, with storm surges and cyclones that regularly expose coastal ecosystems to extreme waves/winds and sediment redistribution (Fiertz et al., 2024). These disturbances play a significant role in shaping mangrove structure and recovery dynamics.

GROUND-BASED MANGROVE SURVEYS

Island-wide mangrove mapping was conducted through systematic field surveys between October 2017 and February 2019 (Table 1) and sporadic visits undertaken thereafter. Additional visits were undertaken where tidal stage, water depth, private access or visibility limited boundary confirmation.

Surveys covered all coastal districts of mainland Mauritius where mangroves occur: Black River, Flacq, Grand Port, Pamplemousses, Port Louis, Rivière du Rempart and Savanne. Sites were accessed by vehicle, on foot, by jeep in difficult terrain and by small boat for lagoonal, estuarine and islet locations. The survey design focused on achieving full coverage instead of random plot sampling, since the main goal was to create a spatially explicit national atlas. Field teams recorded site identifiers, GPS coordinates, species presence, stand form, access conditions, visible pressures and photographic evidence.

Table 1. Field survey campaign used to establish the national mangrove atlas. Full GPS coordinate strings are retained in the atlas database and a summary is available as Supplementary Table S1.

Time period	District(s) covered	No. of sites	Sites
27.10.2017	Rivière du Rempart	2	Poudre d'Or – Hermitage
12.11.2017	Rivière du Rempart	4	Pereybere – Melville
17.11.2017	Rivière du Rempart	3	Melville – Ile D'Ambre and Islets-Belmont
24.11.2017	Rivière du Rempart - Flacq	7	Hermitage – Prince Maurice
01.12.2017	Flacq	9	Constance Poste de Flacq – Grand River South East Ile de L'Est/Ilot Mangenie & Ilets

			Ile aux Cerfs & Ilets
06.12.2017	Grand-Port	3	Ville Noire - Blue Bay
11.12.2017	Black-River	7	Baie du Cap - Tamarin
14.12.2017	Grand-Port	2	Le Chaland – Ilot Brocus
10.01.2018	Grand-Port	1	Mahebourg -Pte D'Esny
11.01.2018	Flacq - Grand-Port	9	Quatre Soeurs - Riviere des Creoles
09.02.2018	Pamplemousses	3	Le Goulet – Grand Bay
10.02.2018	Savanne – Black-River	6	Souillac – Petite Rivière Noire
23.02.2018	Black-River	4	Ilot Fortier - Albion
02.03.2018	Port-Louis	2	Pointe aux Sables – Baie du Tombeau
03.02.2019	Flacq	1	Poste Lafayette

BOUNDARY DELINEATION AND GIS MAPPING

Mangrove boundaries were delineated by combining direct field observation, GPS-referenced points, field sketches, photographic interpretation and high-resolution optical imagery. A polygon was classified as mangrove when rooted mangrove vegetation was present within the intertidal or tidally influenced zone, and where field evidence confirmed mangrove species.

Handheld GPS readings (Garmin GPS 73 Handheld Navigator) were treated as field control points (for mangrove loci for individual sites) rather than as exact survey-grade cadastral boundaries. Under open coastal conditions, positional accuracy was typically assumed to be within approximately 3 to 5 m, with larger uncertainty possible under canopy, near buildings, within narrow creeks or where satellite geometry was poor. For narrow fringing stands, this level of positional uncertainty can be proportionally important. Therefore, the atlas should be interpreted as an ecological baseline suitable for monitoring and planning, not as a legal cadastral boundary.

GIS WORKFLOW AND UNCERTAINTY TREATMENT

Field-verified mangrove polygons were digitised and assembled into district-level geospatial layers using WGS84 geographic coordinates. Digitisation was conducted manually to retain ecological interpretation in complex coastal settings, especially where mangrove crowns were spectrally similar to adjacent terrestrial vegetation or where roots and seedlings were partly submerged. Polygon attributes included district, locality, site code, species information where available, typology, dominant form, visible pressures, restoration status and notes on accessibility or confidence. A 2019 baseline was established by delineating site features from archival Google Earth Pro layers from 2019 and validating them through comprehensive field surveys conducted between October 2017 and February 2019. In May 2026, a mapping re-examination was performed using Google Earth Pro imagery which featured variable capture dates extending to May 2023, and was supplemented by periodic field checks.

Mapping uncertainty was assessed as a boundary-derived area sensitivity rather than as a statistical confidence interval. The main sources of uncertainty included image interpretation, tidal-stage effects and ecological boundary ambiguity. Following the planar parallel-set (Steiner) relationship, the potential area uncertainty for a small horizontal boundary displacement (E) was approximated as $\Delta A \approx P \times E$, where P is the total polygon perimeter (De Petris et al., 2024). Local comparisons between field-measured and Google Earth Pro road widths showed differences of approximately ±0.15 m. As mangrove boundaries are less distinct than road edges, a conservative boundary-delineation uncertainty of 0.75 m was adopted. Using a total polygon perimeter of 331,897.2 m, the estimated boundary-derived area uncertainty was ±24.89 ha (approximately 10.18% of the mapped area). This estimate represents a sensitivity envelope for potential boundary displacement and should not be interpreted as a formal confidence interval or as the absolute positional accuracy of Google Earth Pro imagery.

SITE TYPOLOGY AND ECOLOGICAL CONDITION ASSESSMENT

Sites were grouped into five functional typologies: estuarine mouth, lagoon-fringe, hypersaline or saltpan-associated, island/islet mangals and restored stands. Typologies were assigned using field setting, hydrological context, shoreline morphology, salinity or waterlogging indicators where available, species composition, stand structure and evidence of planting or management. Visible pressures were observed, including cutting, pruning, boat passage clearance, shoreline modification, infilling, trampling, pollution signals and proximity to coastal development. This approach is important to support management interpretation.

BLUE CARBON INTEGRATION

The blue carbon component integrated site-level biomass and sediment carbon evidence from our published Mauritian mangrove studies (Doodee et al., 2023; Doodee et al., 2025). Above-ground biomass, below-ground biomass and total biomass values for selected *Rhizophora mucronata* sites were obtained from Doodee et al. (2025), where biomass was estimated using 25 m × 25 m quadrats, five randomly selected 5 m × 5 m sub-quadrats, tree height measurements, diameter at breast height measurements and the allometric equations of Komiyama et al. (2005). Above-ground biomass and below-ground biomass were thus estimated using the following equations:

$$AGB = 0.251\rho D^{2.46}$$

$$BGB = 0.199\rho^{0.899} D^{2.22}$$

where D is diameter at breast height and ρ is wood density. Total biomass for each site was calculated as the sum of above-ground and below-ground biomass. Carbon biomass was estimated by multiplying biomass by 0.42, and carbon dioxide equivalent was obtained by multiplying carbon biomass by 3.67, following the conversion used in Doodee et al. (2025).

Sediment samples were collected using a 30 cm-long PVC corer with a diameter of 5 cm. Total organic carbon was determined using the loss-on-ignition procedure, with sediment samples oven-dried at 65°C, heated at 550°C for organic matter loss and then heated at 950°C for carbonate loss (Doodee et al. 2025).

A full blue carbon inventory for the island would require plot-based measurements across all major typologies and districts, including tree diameter, height, wood density, dead wood, litter, below-ground biomass, soil bulk density, carbon concentration and soil depth. The present study does not claim a definitive carbon stock for Mauritius. Instead, it provides the activity-data foundation, namely field-validated mangrove extent and site typology, required for future higher-tier blue carbon accounting under wetland carbon accounting frameworks. Nevertheless, the projected carbon stock was modelled using representative, mature stands with stable canopy cover, which served as a baseline to estimate potential long-term biomass storage.

ANALYTICAL TREATMENT

District-level mangrove area was summarised in hectares and as percentages of the mapped extent. Spatial concentration was assessed by ranking districts by mapped mangrove area and calculating their relative contribution to the total mangrove extent. Interpretation focused on the relationship between district distribution, site typology, species dominance, exposure and management pressure.

Given the atlas is designed as a census of mapped mangrove occurrence rather than as a statistically stratified plot experiment, inferential statistical tests were not used for polygon extent. For carbon comparisons, published site-level values were compared descriptively with global literature values for *Rhizophora*-dominated systems to identify whether selected Mauritian stands fall within, below or above expected ranges.

ATLAS DEVELOPMENT AND DATA DISSEMINATION

The Mauritius Mangrove Atlas was developed as an open-access interface linking district maps, site identifiers, field observations, photographs and interpretive notes. The atlas is structured as a living baseline: new field records, UAV products, restoration monitoring data or post-disaster assessments can be appended without altering the core district-site coding system. This design allows the atlas to serve simultaneously as a scientific dataset, a public communication platform and a monitoring instrument for agencies, researchers, students, NGOs and local coastal managers.

RESULTS

MAINLAND MANGROVE EXTENT AND SPATIAL DISTRIBUTION

The atlas (link in Figure 1) identifies a total mapped mangrove extent of ~244.5 ha across mainland Mauritius, distributed unevenly among the seven coastal districts (Table 2; Figure 2). Mangroves occur primarily as fragmented estuarine forests, lagoon-fringe stands, island/islet narrow coastal belts, with marked differences in extent among districts.

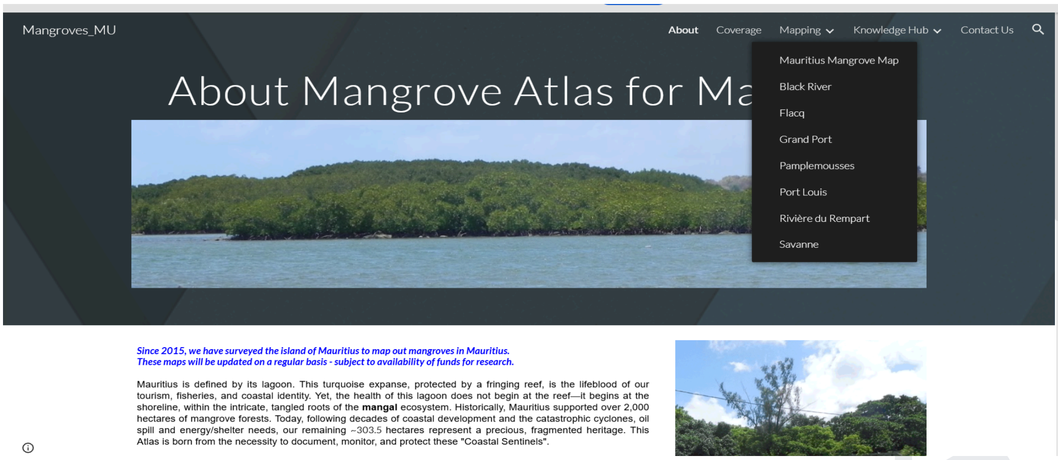


Figure 1. Public-facing interface of the Mauritius Mangrove Atlas. *Launched mid-Feb 2026 https://sites.google.com/view/mangrovesmu/about and updated in May 2026 utilising available Google Earth Pro satellite imagery. This atlas provides district-level interactive maps and site documentation.*

The largest mapped mangrove extent was recorded in the three districts on the eastern coast namely: Rivière du Rempart (including surrounding islets) (~92.8 ha; 38.0% of the total estimated area), followed by Flacq (including surrounding islets) (~60.62 ha; ~24.80%) and Grand Port (~55.73 ha; ~22.8%). The mangrove coverage in the eastern region of the main island, Mauritius, thus accounted for ~85.56% of the total mapped mangrove areas. Black River accounted for ~27.27 ha (11.16%), while Pamplemousses, Port Louis and Savanne contributed comparatively small extents of ~2.91 ha (~1.19%), ~2.45 ha (~1.00%) and ~2.68 ha (~1.10%), respectively.

This distribution shows that the mangrove extent is both spatially concentrated and locally fragmented. This spatial heterogeneity reflects differences in exposure, freshwater input, historical land use, and restoration effort. Table 2 presents mangrove area, percentage contribution to the national mapped extent, dominant stand form, dominant mangrove assemblage, main pressures, and restoration presence. Descriptors such as “fragmented”, “linear” and “dense” are used as field-based structural descriptors rather than formal forest-inventory classes.

It is noteworthy that the mangrove coverage expanded from ~216.7 ha to ~244.5 ha, signalling a promising ~12.81% increase from data available from 2019 to May 2026 (using the most recent Google Earth Pro satellite imagery available). The highest increase (~16.01 ha) was recorded in the second most populated district Flacq, followed by ~6.25 ha in the most populated district Rivière du Rempart. A decrease of ~4.03 ha was, however, noted in the district of Grand Port. This may reflect a combination of disturbances including post-2019 coastal impacts, or even the impacts of the MV Wakashio oil spill that occurred on 25 July 2020 at Pointe d'Esny, Grand Port, on the south-eastern coast of Mauritius.

Table 2. District-level synthesis of mapped mangrove extent as per data collected in May 2026 (utilising the most recent available Google Earth Pro satellite imagery), stand form, dominant mangrove assemblage, pressures, and restoration presence in Mauritius.

District	Mangrove area (ha)	Share (%)	Dominant stand form / structural context	Dominant mangrove assemblage	Main pressures observed	Restoration presence / management context
Black River	~27.27	~11.16	Mostly narrow, linear and fragmented fringing patches; includes planted/restored stands in selected localities	Dominated by *Rhizophora mucronata*	Clearing for boat passages; coastal development; shoreline access pressure	Anthropogenic planting/restoration recorded at Le Morne and Case Noyale
Flacq	~60.62	~24.80	Mature fringing and estuarine mangrove stands, including relatively continuous patches around sheltered coastlines and islets	Mainly *Rhizophora mucronata,* with rare/localised occurrence of *Bruguiera gymnorhiza*	Coastal development; shoreline modification; access-related disturbance	Anthropogenic planting/restoration recorded at Quatre Soeurs
Grand Port	~55.73	~22.80	Mature mangrove forests and dense fringes associated with estuarine, lagoonal and sheltered coastal settings	Mainly *Rhizophora mucronata,* with mixed mangrove assemblages where *Bruguiera gymnorhiza* occurs locally	Coastal protection works; shoreline modification; development pressure	Restoration presence not recorded in the atlas survey; natural regeneration may occur locally

Pamplemousses	~2.91	~1.19	Small fringing patches and narrow mangrove belts	Dominated by *Rhizophora mucronata*	Coastal development; fragmentation	Restoration presence not recorded in the atlas survey
Port Louis	~2.45	~1.00	Small but locally dense mangrove stands in highly modified urban/coastal settings	Dominated by *Rhizophora mucronata*	Coastal development; urban pressure; shoreline modification	Anthropogenic planting/restoration recorded at Grande Rivière Nord Ouest
Rivière du Rempart	~92.80	~37.96	Largest mapped district extent; includes mature mangrove forests, dense fringes, island/islet mangals and sheltered lagoonal stands	Mainly *Rhizophora mucronata*, with mixed mangrove assemblages where *Bruguiera gymnorhiza* occurs locally	Clearing for boat passages; access pressure; localised coastal development	Restoration presence not recorded in the atlas survey
Savanne	~2.68	~1.10	Very small, fragmented mangrove patches in a high-energy coastal setting	Dominated by *Rhizophora mucronata*	Rocky shore; high-energy wave action; limited suitable sheltered habitat	Restoration presence not recorded in the atlas survey

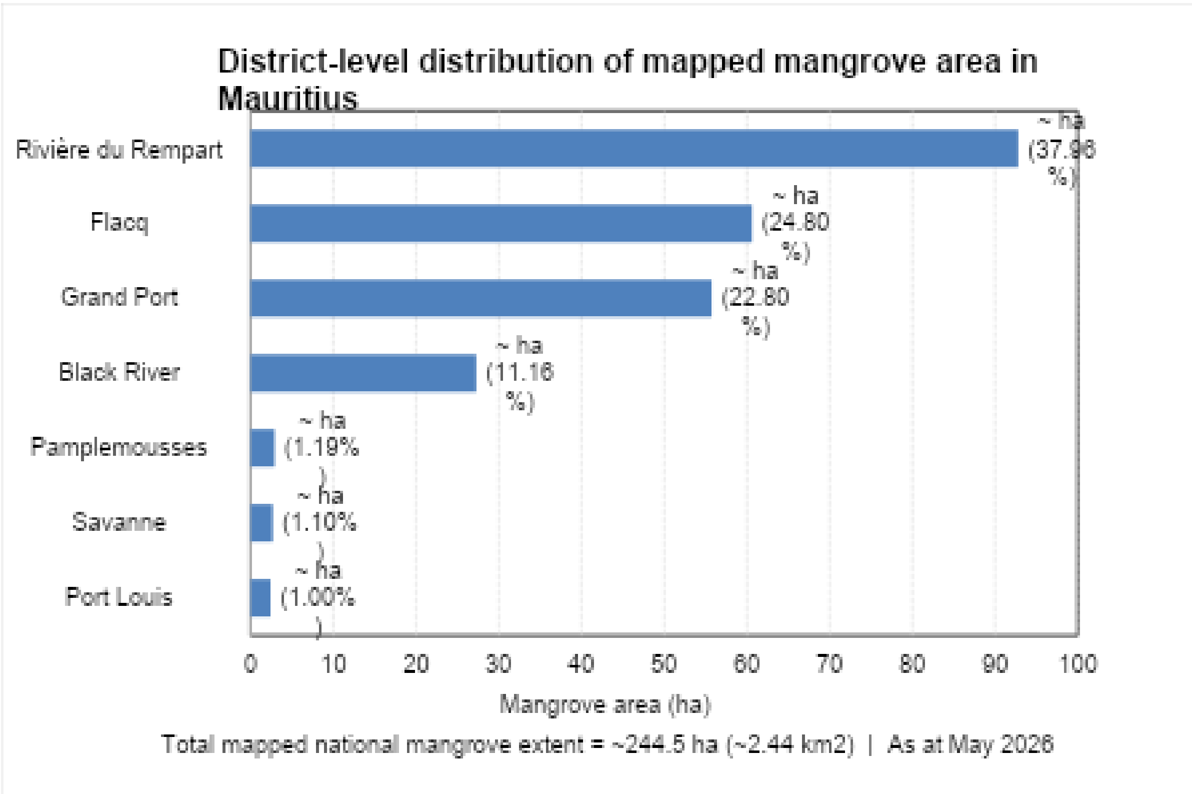


Figure 2. District-level distribution of mapped mangrove areas in Mauritius. Horizontal bar chart showing mapped mangrove extent by district, ranked from highest to lowest contribution. Values at the end of each bar indicate mangrove area in hectares and percentage contribution to the total mapped national mangrove extent of ~244.5 ha (the data were updated in May 2026, utilising the available Google Earth Pro satellite imagery).

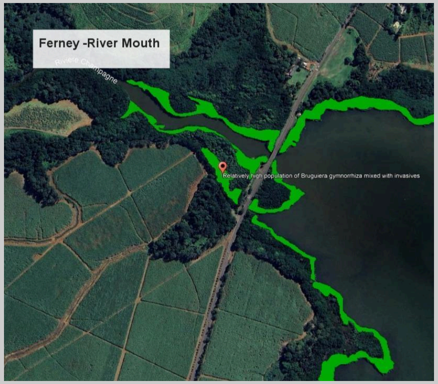
MANGROVE TYPOLOGIES AND FUNCTIONAL SETTINGS

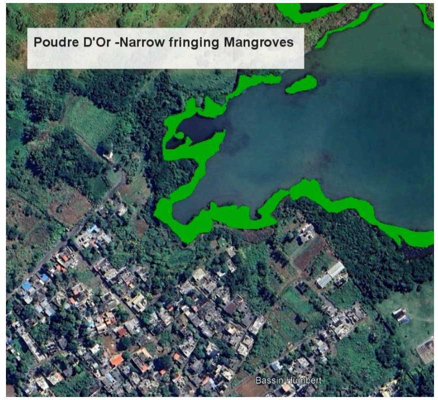
The atlas identifies five recurrent mangrove typologies in Mauritius: estuarine mouth systems, lagoon-fringe systems, hypersaline or saltpan-associated systems, island/islet mangals, and restored stands (Table 3). These typologies were assigned based on field setting, hydrological context, shoreline morphology, species composition, stand structure, salinity or waterlogging indicators where available, and evidence of planting or management.

The typology-based classification complements district-level mapping by distinguishing mangrove stands not only by location and area, but also by ecological setting and management relevance. This is important because mangroves of similar spatial extent may differ considerably in function, vulnerability and restoration potential depending on whether they occur at river mouths, along sheltered lagoon margins, within restricted hypersaline systems, on islets, or in planted/restored areas.

Table 3 summarises the defining criteria, representative atlas sites, ecological functions and risk profiles for each typology. Representative photographs are included to support the visual interpretation of the typological categories.

Table 3. Mangrove typologies, representative atlas sites, ecological functions and risk profiles in Mauritius.

Typology	Defining criteria	Representative site / photo	Main ecological functions	Main risk profile
Estuarine mouth	Mangroves near river mouths or stream outlets with tidal-fluvial mixing, brackish gradients and fine sediments.	Ferney [GP-LTR-F-S3-5] 	Fish nursery connectivity; sediment and nutrient trapping; flood and storm-surge buffering.	Upstream pollution; altered freshwater flow; dredging; channel modification; flood disturbance.
Lagoon-fringe	Narrow fringing or banded mangroves along protected lagoon shorelines and reef-lagoon margins.	Poudre d'Or [RdR-Pd'Or-S11-12]	Shoreline stabilisation; wave attenuation; habitat corridors along lagoon margins.	Coastal development; shoreline hardening; boat-access cuts; trampling; pruning or clearing.

				
Hypersaline / saltpan-associated	Mangroves in restricted or poorly flushed settings such as saltpans, back-reef depressions or evaporative basins.	Petite Rivière Noire [GP-M-S9] 	Stress-tolerant mangrove habitat; sediment stabilisation; potential sediment carbon storage.	Hydrological modification; infilling; reclamation; saltpan alteration; conversion pressure.
Island / islet mangals	Île d'Ambre or small lagoonal islands, often with limited	Île d'Ambre Channel	Refuge habitat; juvenile fish shelter; shoreline protection of low-lying islets.	Storm overwash; erosion; sea-level rise; invasive species;

	freshwater input and high edge exposure.			concentrated human disturbance.
Restored stands	Planted or actively restored mangrove areas, often showing even-aged cohorts, planting rows, protective structures or documented intervention.	Le Morne [BR-M-S4] 	Restoration monitoring; canopy development assessment; blue carbon gain tracking; evaluation of nature-based solutions.	Poor site/species matching; unsuitable hydrology; low survival; lack of maintenance or long-term monitoring.

SPECIES COMPOSITION, STRUCTURE AND CONDITION

Rhizophora mucronata dominates most mapped sites and is especially important in lagoon-fringe, estuarine and restored settings. Its prop roots increase surface roughness, stabilise soft sediments and provide structurally complex shelter for juvenile fish and crustaceans. *Bruguiera gymnorhiza* occurs less widely and is typically associated with landward or mixed zones where knee-root structures add vertical and below-ground complexity.

Figure 3 summarises representative structural and condition features observed during field surveys, including natural root morphologies, restored stands and anthropogenic disturbance. Rather than presenting nursery habitat and connectivity as a separate section, these functions are interpreted as part of the structural condition of mangrove stands because root complexity, canopy development and tidal setting together influence habitat value, sediment retention and ecological connectivity with adjacent lagoon and reef systems.

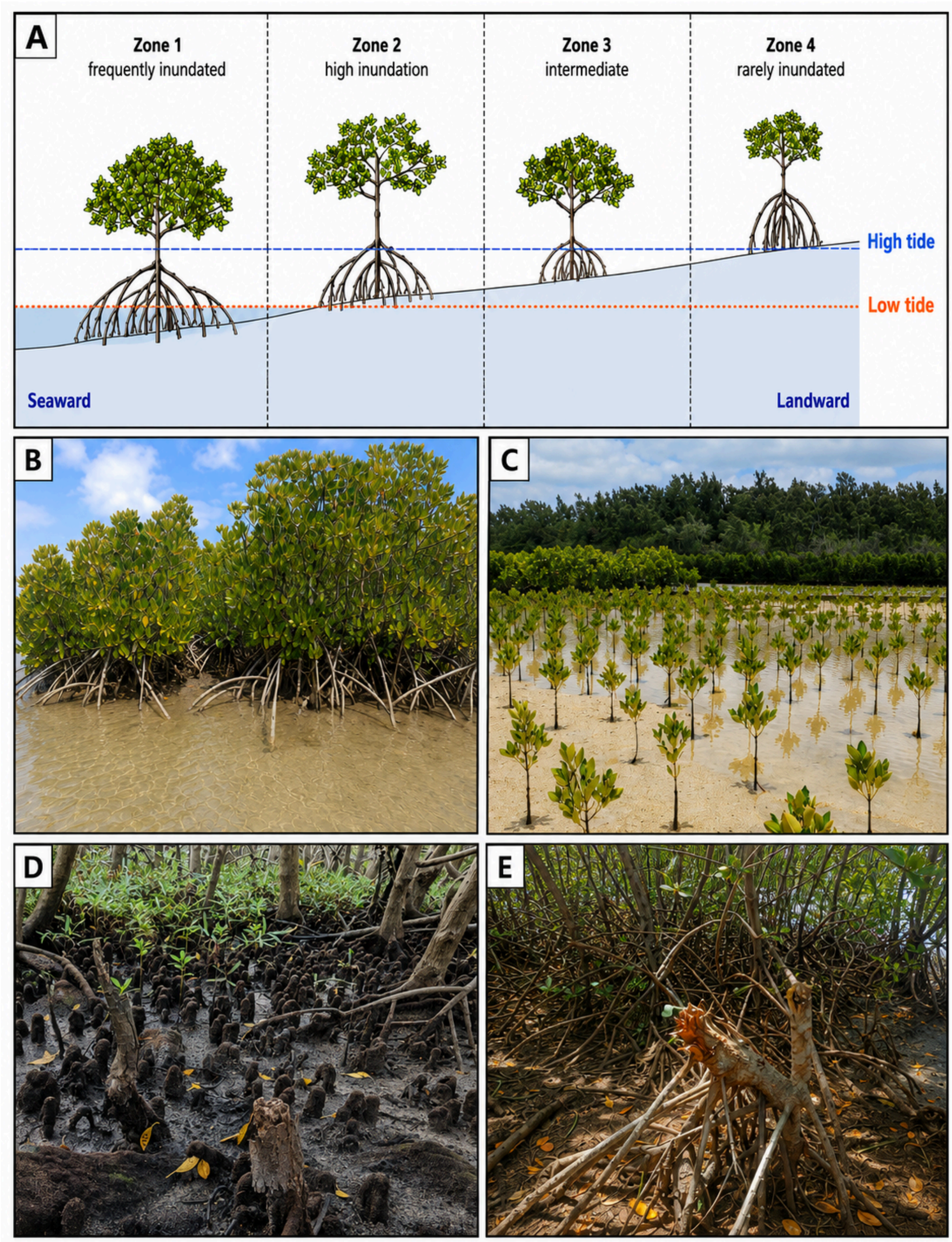


Figure 3. Mangrove inundation zonation, structural features and condition indicators observed in Mauritius. (A) Conceptual inundation zonation framework used to interpret seaward-to-landward variation in tidal exposure across mangrove stands (AI generated). Zone 1 represents frequently inundated areas, Zone 2 high-inundation areas, Zone 3 intermediate-inundation areas and Zone 4 rarely inundated landward margins (Doodee et al., 2025). The high- and low-tide lines illustrate inundation of the substrate and root zone rather than complete submergence of the canopy. (B) *Rhizophora mucronata* prop roots form above-ground stilt structures that enhance stability in soft substrates and increase habitat complexity. (C) Representative restored mangrove stands (D) *Bruguiera gymnorhiza*

knee roots emerging as arched pneumatophore-like structures that facilitate gas exchange in waterlogged soils and indicate adaptation to frequent inundation. (E) Example of anthropogenic pressure through cutting.

BLUE CARBON SIGNIFICANCE

In this study, the blue carbon component was assessed using representative site-level above-ground biomass (AGB), total sediment organic carbon (TOC) and biomass-based CO_2 equivalent values from ten Mauritian mangrove sites, integrated with the mangrove extent of ~244.5 ha. These data are interpreted as site-level and screening-level indicators of blue carbon significance, rather than as a complete national blue carbon inventory.

The ten representative stations comprised Le Morne (LM), Grande Rivière Noire (GRN), Résidence La Chaux (RLC), Ferney (FN), Roches Noires (RN), Melville (ML), Poudre d'Or (PD), Anse Jonchée (AJ), Vieux Grand Port (VGP) and Grand Gaube (GG) (Figure 4). Based on our field observations and satellite-based monitoring of the rate of increase of canopy coverage (Doodee et al., 2023; Doodee et al., 2025), Le Morne, Poudre d'Or and Résidence La Chaux were considered as not yet fully stable, since they represented developing, restored or transitional mangrove settings. The remaining seven sites were treated as relatively stable, established stands given that their canopy cover had stabilised and were therefore utilised as a predictive variable to estimate potential total carbon storage. Where district-specific representative stations were not available, values from the nearest or most ecologically comparable site were used as proxies.

The AGB for Ferney (326.2 ± 26.3 t ha^{-1}) was the only site exceeding the reported global average for *Rhizophora* spp. (281 t ha^{-1}) and was also well above the reported global average for *R. mucronata* (94.8 t ha^{-1}) (Sahu and Kathiresan, 2019; Doodee et al., 2025). Roches Noires (176.2 ± 15.3 t ha^{-1}) also exceeded the *R. mucronata* global AGB reference value, while Melville (94.7 ± 5.9 t ha^{-1}) was comparable. The remaining sites were below the *R. mucronata* AGB global average, reflecting differences in stand age, hydrological setting, site condition and restoration status. Sediment TOC also varied among sites (Figure 4B) with the highest sediment TOC recorded at Ferney (47.3 ± 6.1%) again exceeding (~40.0%) the reported upper global reference value. The other sites were within the reported global reference range of ~2.0–40.0% (Kristensen et al., 2008; Sakho et al., 2015).

To translate the site-level evidence into a first-order district-level screening estimate, representative AGB and biomass-based CO_2e values were assigned to mapped district mangrove areas (Table 4). Representative stations were selected based on site stability, ecological similarity, availability of biomass data and suitability as reference conditions. This approach generated a total screening estimate of approximately 21,829.3 t AGB corresponding to 33,617.4 t CO_2e across the latest main island mapped mangrove extent.

The combined AGB, BGB and sediment carbon estimate provides a Tier 2, screening-level estimate of national mangrove blue carbon stocks. Based on the mapped mangrove area, the total biomass stock is estimated at approximately 49,392.7 t CO_2e, while surface sediment organic carbon corresponds to approximately 0.71 t CO_2e per tonne of sediment. These values should be interpreted as indicative stock estimates, as annual carbon accumulation and net carbon removals were not measured.

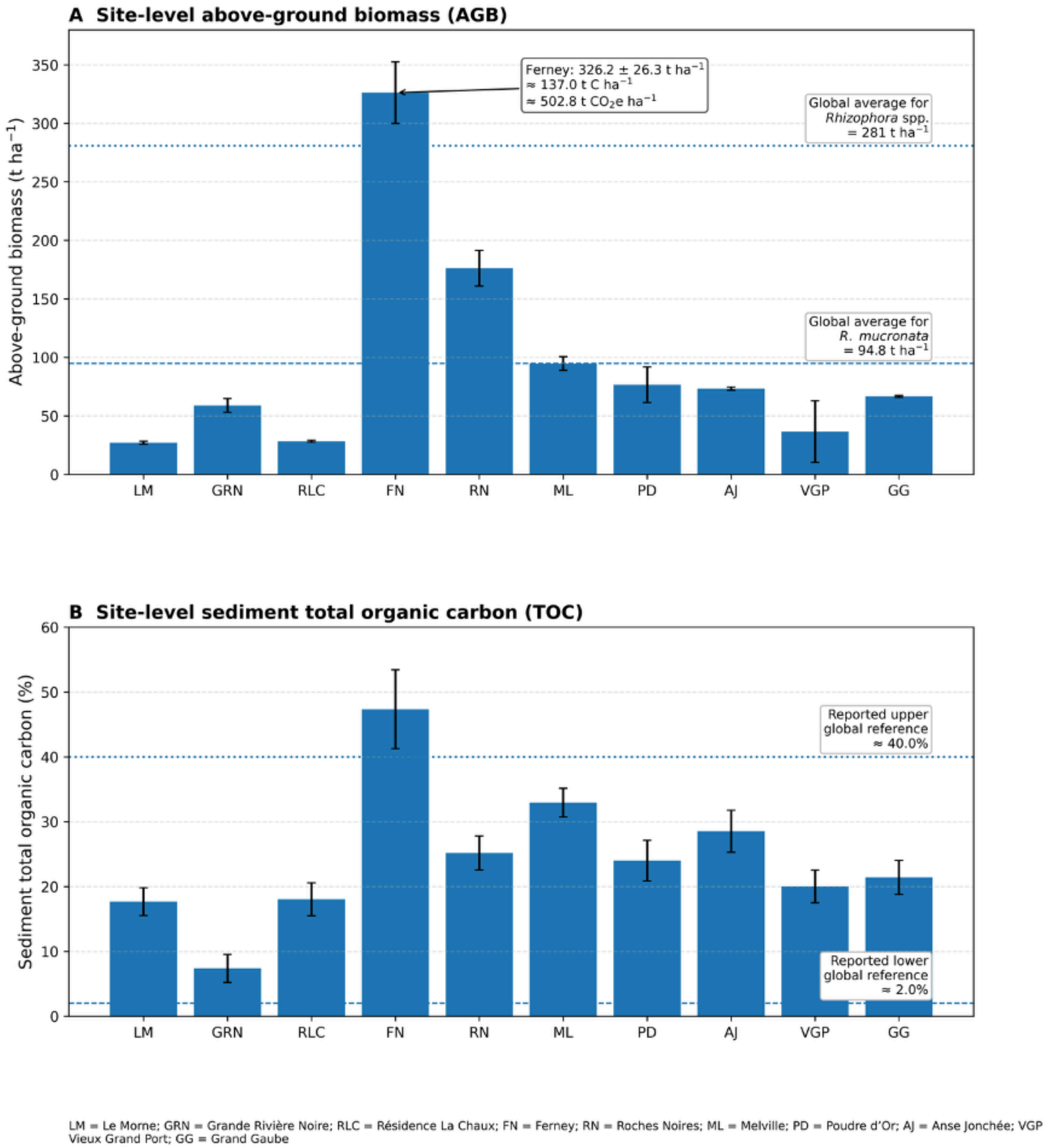


Figure 4. Site-level blue carbon indicators for selected Mauritian mangrove systems, with global reference values for context. (A) Above-ground biomass (AGB) of selected *Rhizophora mucronata* sites, with error bars showing ± SD. Dashed reference lines show reported global averages for *R. mucronata* and *Rhizophora* spp. (B) Sediment total organic carbon (TOC, %) for the same sites, with error bars showing ± SD. Reference lines show the reported global TOC range.

Table 4. District-level extrapolation of representative above-ground biomass and biomass-based CO_2e estimates for mapped mangroves in Mauritius.

District	Representative sites	AGB (t/ha)	Total avg AGB (t) per district	Total avg Estimation of CO_2 Equivalent (t) per district - biomass-based CO_2e	TOC (t per t topsoil 0 – 30 cm)	Estimation of TOC CO_2 Equivalent in topsoil (t/t topsoil) - per district
Black River	Grande Riviere Noire	~58.9	~1606.2	~2473.5	~0.074	~0.271
Flacq			~4889.0	~7529.1		~0.880
Grand Port	Ferney	~326.2	~8099.4	~12473.1	~0.473	~1.171
	Anse Jonchee	~ 73.3			~0.285	
	Vieux Grand Port	~36.5			~0.200	
Pamplemousses			~234.7	~361.4		~0.785
Port Louis			~197.6	~304.3		~0.785
Riviere du Rempart	Grand Gaube	~66.6	~6644.5	~10241.8	~0.214	~0.832
	Poudre d'or	~76.6			~0.240	
Savanne			~157.9	~234.2		~0.271

	Total estimation	**~21829.3**	**~33617.4**	**Average estimation of TOC CO_2e per t of topsoil sediment**	**~0.248**	**~0.714**

DISCUSSION

Mangrove extent, spatial distribution and atlas interpretation

This study addressed four main questions: the current field-validated extent and district distribution of mangroves in mainland Mauritius; the typologies and ecological conditions that characterise these systems; how mapped mangroves relate to blue carbon and coastal resilience functions; and how the atlas can support repeatable monitoring and environmental governance. The results show that the Mauritius Mangrove Atlas is not only a spatial inventory, but an ecological baseline that can be used to interpret mangrove distribution, functional settings, carbon relevance and management priorities.

The mapped extent of approximately 244.5 ha confirms that mangroves occupy a limited but strategically important part of the Mauritian coastal zone. Their distribution is strongly concentrated in Rivière du Rempart, Flacq and Grand Port, which indicates the importance of sheltered eastern and north-eastern coastal settings, including lagoon margins, estuarine inputs, islets and low-energy shorelines (Davidson-Arnott, 2009). This pattern suggests that mangrove distribution in Mauritius is shaped less by coastline length alone than by the availability of suitable intertidal substrate, tidal exchange, freshwater influence and protection from high-energy wave exposure (Doodee et al., 2025). At the same time, the smaller mapped areas in Black River, Port Louis, Pamplemousses and Savanne should not be treated as ecologically marginal. In districts where mangroves are scarce, fragmented or embedded in modified coastlines, small patches may provide locally important shoreline stabilisation, habitat refuge, sediment retention and restoration opportunities.

The comparison between the 2017–2019 field-validated baseline and the May 2026 atlas update highlights the value of maintaining the atlas as a dynamic monitoring tool rather than a one-time inventory. The updated mapping shows that mangrove estimates are sensitive to survey timing, image availability, boundary interpretation and the detectability of narrow or recently established stands. This is particularly relevant in Mauritius because many mangrove patches occur as small, linear or fragmented features. Apparent changes in the island extent should therefore be interpreted through both ecological and methodological lenses. Species richness is low compared with Indo-West Pacific continental mangrove regions, but functional diversity is produced by differences in hydrological setting, stand age, geomorphic context and disturbance history (Ferreira et al., 2024). Future atlas revisions should clearly separate confirmed ecological change, such as restoration growth or natural regeneration, from mapping refinement due to improved imagery, revised boundary delineation or better detection of small stands.

Mangrove typologies and ecological conditions

The typology-based interpretation strengthens the scientific value of the atlas because it shows that mapped mangrove polygons are not functionally equivalent. Estuarine mouth systems, lagoon-fringe systems, hypersaline or saltpan-associated systems, island/islet mangals and restored stands differ in ecological role, vulnerability and management needs. Estuarine and lagoon-fringe systems are likely to be particularly important for sediment retention, hydrological exchange, nursery connectivity and shoreline stabilisation. Island and islet mangals may provide refuge and shoreline-retention functions, but they are also vulnerable to overwash, erosion and sea-level rise. Restored stands require a different interpretation because their ecological value depends not only on planted area but also on survival, tidal inundation, sediment stability, canopy development and long-term maintenance.

This typological interpretation is important because it prevents the atlas from being used as a simple area-counting exercise. Two mangrove patches of similar size may differ greatly in ecological function depending on their hydrological setting, maturity, disturbance history and connectivity with lagoon or estuarine habitats. For Mauritius, where the national mangrove estate is small and fragmented, this distinction is particularly important for prioritising conservation, restoration and monitoring. Management should therefore not be based only on mapped area, but on a combined interpretation of typology, condition, disturbance pressure and restoration potential.

Comparison with mangrove studies in other Small Island Developing States

Evaluating the Mauritian mangrove ecosystem requires contextual cross-analysis with other Small Island Developing States (SIDS), moving beyond raw surface area metrics to evaluate localised geomorphological typologies and ecological pressures (Cameron et al., 2021; Wartman et al., 2025; Farhath et al., 2025). Mauritius harbours a highly localised, fragmented mangrove footprint of approximately ~244.5 ha. Despite its limited spatial coverage, this network exhibits an exceptionally dense carbon footprint. Peak sites like Ferney (~1,295.4 Mg C ha^{-1}) more than double the mean ecosystem stocks found in expansive, deltaic networks like Fiji (481.6 Mg C ha^{-1}) (Cameron et al., 2021). Nationally, Mauritius stores approximately 49,392.7 t CO_2e in total mangrove biomass, comprising both above-ground biomass (AGB) and below-ground biomass (BGB). This reinforces that micro-scale island ecosystems yield disproportionately high localised climate mitigation value.

Distinct structural contrasts and fragmentation states emerge across the other SIDS systems. While the Seychelles illustrates the preservation value of unfragmented, remote island carbon stores, protecting 2,195 ha of contiguous forest primarily within the Aldabra Atoll (Wartman et al., 2025), Mauritius and the Maldives present extreme models of coastal fragmentation. Farhath et al. (2025) demonstrate that Maldivian mangroves are highly fragmented across 162 low-lying islands, exhibiting degraded, mono-specific stands in their central atolls. Both Mauritius and the Maldives encounter severe anthropogenic strain, driven by rapid tourism development and leasing in the Maldives

(Farhath et al., 2025) and urban-economic encroachment along the populated, accessible coastlines of Mauritius.

Despite these macro-scale structural differences, all four island states highlight the importance of below-ground carbon components in mangrove blue carbon accounting. Soil organic carbon pools account for approximately 64.6% of ecosystem carbon stocks in Fiji (Cameron et al., 2021) and around 70% in Seychelles, where mangroves store ~688,091 t C (Wartman et al., 2025). In Mauritius, a complete national soil carbon stock has not yet been quantified; however, the screening-level estimate indicates a substantial below-ground biomass contribution of approximately 10,234.3 t BGB, equivalent to ~15,775.20 t CO_2e, in addition to a separately estimated surface sediment carbon value of ~0.71 t CO_2e per tonne of surface sediment. This highlights the likely importance of below-ground components in Mauritian mangroves while also reinforcing the need for future soil carbon stock assessment using bulk density and depth-specific sampling. Fiji's capacity to store 73.3% of equivalent terrestrial rainforest carbon within only 7.3% of its land area further validates the extreme carbon concentration potential across SIDS substrates (Cameron et al., 2021).

Blue carbon significance

The Table 4 estimate of approximately 21,829.3 t AGB across ~244.5 ha is equivalent to an indicative national mean of about 89.3 t AGB ha^{-1}. This places the Mauritian screening value below the global mangrove AGB mean of approximately 115.23 Mg ha^{-1} reported by Hu et al. (2020) but close to the reported *Rhizophora mucronata* global reference value of 94.8 t ha^{-1} (Sahu and Kathiresan, 2019). Mauritian mangroves show moderate above-ground biomass density relative to global mangrove forests, while selected sites such as Ferney greatly exceed both the national mean and the ***R. mucronata*** reference value. Scientifically, this indicates strong within-country variability: the national mangrove estate is small and fragmented, but some mature or favourable sites can develop high biomass density.

It is therefore important to distinguish the carbon indicators used in this study. Above-ground biomass and biomass-based CO_2e provide useful screening information but do not represent the full ecosystem carbon pool unless below-ground biomass, dead wood, litter and soil carbon are also included. Similarly, sediment TOC expressed as a percentage indicates organic matter accumulation but does not represent sediment carbon stock without bulk density and depth-specific carbon measurements. The atlas, therefore, provides the spatial activity data and typological framework required for future higher-tier blue carbon accounting.

In this context, this study moves beyond Tier 1 defaults by incorporating Mauritius-specific, site-level biomass and sediment carbon data – including AGB, BGB, TOC, direct field measurements, allometric equations, and mapped national mangrove extent. Given that Tier 3 includes an inventory covering all major typologies, districts, and complete carbon pools (such as dead wood, litter, soil bulk density, carbon concentration, and depth profiles), the district-level extrapolation is best characterised as a Tier 2 screening-level estimate based on representative and proxy sites, rather than a definitive national carbon stock.

Coastal resilience and ecosystem connectivity

The atlas also has direct relevance for coastal resilience. Mauritian mangroves occur within a reef-lagoon-land continuum, where their ecological role depends on tidal exchange, sediment dynamics, freshwater input and connectivity with adjacent lagoon habitats. Lagoon-fringe mangroves may contribute to shoreline stabilisation and connectivity with seagrass and reef systems, while estuarine systems may support flood buffering and sediment trapping. These functions are consistent with studies showing that mangroves reduce coastal hazard risk by attenuating waves, trapping sediments and stabilising shorelines (Horstman et al., 2014) and that mangrove–seagrass–coral reef connectivity supports biodiversity, nursery habitat and broader coastal resilience. Islet mangals may protect low-lying landforms but are vulnerable to overwash, erosion and sea-level rise. These functions are particularly important in SIDS, where coastal land, settlements and infrastructure are highly exposed to sea-level rise, cyclones, storm surges and erosion (Martyr-Koller et al., 2021; Hernández-Delgado, 2024; Carlson et al., 2021; Mao et al., 2026). However, these resilience functions were inferred from structure and setting rather than directly measured; future studies should quantify sediment accretion, wave attenuation, nursery habitat use and post-cyclone recovery.

Governance applications of the atlas

The atlas has direct relevance to environmental governance because it provides a national spatial baseline for mangrove extent, condition and management context. This is particularly useful for environmental impact assessment, coastal permitting, integrated coastal zone management, protected area and wetland management, fisheries habitat protection, restoration planning and climate reporting. Table 5 summarises these applications and clarifies how atlas data can support compliance, monitoring and decision-making.

For the atlas to be operationally useful, future data integration should follow a defined institutional workflow. New data should first be collected by implementing bodies, such as environment agencies, fisheries officers, universities, NGOs, restoration practitioners or local authorities, depending on the type of update. The data should then be submitted with minimum metadata, including date, location, method, observer, photographs, GPS accuracy and confidence level. This would allow the atlas to function as a living baseline while preserving traceability and scientific quality control.

When monitoring, we should avoid treating all mangrove polygons as equivalent. Large and relatively continuous systems in Rivière du Rempart, Grand Port and Flacq should be treated as core areas for conservation, monitoring and blue carbon sampling. Small remnant patches in urbanised or high-energy districts should be protected as local ecological infrastructure, especially where they provide scarce habitat or shoreline stabilisation. Restored sites should be monitored using survival, growth and canopy indicators rather than simple planting counts. Sites exposed to cutting, boat-passage creation, dumping, infilling or shoreline modification should be prioritised for compliance checks and community engagement.

The atlas also has educational and public-facing value. By making mangrove distribution visible, it can improve awareness of ecosystems that are often overlooked because they occur as narrow strips, muddy shorelines or degraded coastal edges. Public accessibility should, however, be balanced with safeguards for sensitive or vulnerable sites.

Table 5. Legal and governance applications of the Mauritius Mangrove Atlas. The governance instruments listed are implemented under relevant national environmental, coastal and fisheries management frameworks. For operational use, new atlas updates should be submitted with minimum metadata, verified by a designated technical custodian, integrated into the GIS database, and recorded through a version-control log.

Instrument	Relevance to mangroves	Atlas contribution (how it supports compliance)
Environmental Impact Assessment (EIA) process	Regulates coastal development likely to affect mangrove extent, hydrology, and ecological condition.	Provides baseline mangrove extent and condition layers for screening and scoping, supports impact quantification, and enables post-approval monitoring against mapped baselines.
Coastal permitting and environmental compliance controls	Supports prevention and control of unauthorised clearance, infilling, or alteration of mangrove areas.	Enables location-specific compliance checks using mapped boundaries, site documentation, and repeatable reference layers for enforcement.
Integrated coastal zone management (ICZM) / coastal spatial planning instruments	Guides zoning, setbacks, buffers, and compatible-use planning in the coastal zone.	Delivers spatially explicit mangrove layers to delineate protection zones and buffers and identify conflict hotspots for planning decisions.
Protected area and wetland management instruments	Allows designation and management of ecologically important mangrove and	Identifies candidate areas, supports boundary definition, and provides indicators for

	wetland areas.	condition reporting and periodic review.
Biodiversity conservation and restoration planning instruments	Supports conservation of priority habitats and implementation of restoration actions.	Pinpoints degraded sites and restoration opportunities and supports monitoring of outcomes through consistent mapping and condition attributes.
Fisheries habitat protection / coastal fisheries management measures	Mangroves function as nursery habitat and support fisheries productivity and coastal livelihoods.	Maps mangrove lagoon interfaces and priority habitat areas to support spatial fisheries measures and target compliance and monitoring.
Climate reporting and MRV linkages using national environmental data systems	Mangroves contribute to mitigation and adaptation reporting needs, including blue carbon and coastal resilience.	Reduces uncertainty in activity data through national baseline mapping and supports repeatable monitoring for reporting and audit trails.

Monitoring framework and standardisation needs

The atlas provides a baseline for repeatable monitoring, but future use will require standardised indicators and simple protocols. Table 6 proposes a monitoring framework for future atlas updates and national mangrove measurement, reporting and verification. The indicators include mangrove extent and boundary change, canopy cover, restoration survival and growth, carbon stocks, sediment stability, anthropogenic pressure, and water quality or hydrological stress.

To make this framework operational, each indicator should be linked to a standard operating procedure. For example, mangrove extent monitoring should specify the imagery source, minimum mapping unit, projection, boundary rules, field validation method and uncertainty class. Restoration monitoring should specify plot size, number of tagged plants, survival categories, height measurements, photo-point position and reporting frequency. Carbon-stock monitoring should specify allometric equations, soil coring depth, bulk density measurement, laboratory carbon analysis and conversion factors. Anthropogenic pressure monitoring should standardise geotagged photographs, disturbance categories and reporting pathways.

These standard procedures would allow data collected by different agencies and partners to be integrated into the atlas without reducing comparability. They would also support future reporting under national climate, biodiversity and coastal management frameworks. Although formal SOPs are not yet available for all indicators, Table 6 identifies the main monitoring domains for which SOPs should be developed in the next phase of atlas implementation.

Table 6. Proposed monitoring framework for future atlas updates and national mangrove MRV. The indicators provide a basis for repeatable monitoring using field surveys, UAV products, satellite imagery and laboratory analyses. Formal SOPs have not yet been developed for all indicators; therefore, future implementation of the atlas should include SOPs specifying methods, frequency, metadata requirements, responsible implementing bodies, quality-control steps and data-integration procedures.

Indicator	Method	Frequency	Purpose	Who can implement
Canopy cover / canopy density	Satellite time-series (e.g. Sentinel-2) and UAV orthomosaics; optional ground plots for calibration	Quarterly (UAV) and annually (satellite summary)	Track vegetation condition and detect gradual decline or recovery	Environment agency; NGOs; university teams; local councils
Mangrove extent (area) and boundary change	GIS change detection using satellite imagery; repeat GPS shoreline/edge surveys for validation	Annually; after major development works	Detect loss or gain of mangrove area; support compliance and reporting	Environment agency; planning authorities; universities
Fragmentation index / patch metrics	Landscape metrics computed from classified mangrove maps (GIS)	Annually	Quantify habitat fragmentation and guide zoning, protection, and restoration prioritisation	Universities; environment agency; technical consultants
Restoration survival and growth	Repeated field plots and photo-point monitoring; UAV for planted	3, 6, 12 months post-planting; then annually	Evaluate restoration performance and adapt planting/maintenance protocols	Restoration practitioners; NGOs; community groups; environment agency

	block condition			
Illegal cutting / encroachment signals	Field patrol observations with geotagged photos; UAV reconnaissance; review of recent high-resolution imagery where available	Monthly to quarterly; event-driven	Early warning for enforcement and targeted compliance actions	Fisheries enforcement; environment inspectors; local rangers/community monitors
Post-disaster damage (cyclones, storm surge, flooding)	Rapid UAV survey + satellite imagery; field verification along transects	Within 1 to 4 weeks after event; follow-up at 3 to 6 months	Assess impact, prioritise interventions, and document recovery trajectories	Disaster management units; environment agency; universities; NGOs
Sediment elevation / erosion-accretion proxy	Sediment surface markers or simple benchmarks; repeat cross-shore profiles; optional drone-derived DEMs	Biannually; after major storms	Track stability and vulnerability to sea-level rise and hydrodynamic change	Universities; environment agency; coastal engineers/consultants
Water quality stress signals near mangroves	In-situ measurements (salinity, turbidity) and visual stress indicators; targeted grab samples	Quarterly; higher frequency during known pollution events	Identify stress drivers and support mitigation and compliance investigations	Environment agency; water authorities; universities

CONCLUSION

This study presents the first field-validated mangrove atlas for mainland Mauritius, mapping approximately 244.5 ha of coastal mangroves with a Tier 2 carbon stock biomass estimated at 49,392.7 t CO_2e and surface sediment organic carbon estimated at ~0.71 t CO_2e. The atlas reveals functionally diverse systems shaped by hydrology, geomorphology, restoration, and natural disturbances. Because estuarine, lagoon-fringe, saltpan, islet, and restored variants perform distinct ecological roles, they require site-specific management. While site-level indicators demonstrate high blue carbon relevance, district-level estimates provide the first national baseline for future assessments. However, a complete inventory will eventually require stratified sampling of biomass and soil carbon across all districts and stand conditions. Beyond scientific value, this atlas serves as a practical decision-support tool. It integrates mangrove data into environmental impact assessments, coastal permitting, restoration planning, fisheries protection, compliance monitoring, and climate reporting while establishing a repeatable baseline to track changes. For Small Island Developing States like Mauritius, where fragmented coastal ecosystems face intense development and climate pressures, such field-validated data is essential. This study proves that even small systems carry significant importance when their ecological function and carbon value are fully recognised. To build on this foundation, future efforts must focus on extending mapping to other islands of the Republic using UAV validation, long-term monitoring, and standardised protocols to transform the atlas into a living platform for conservation.

AI USE STATEMENT

Generative artificial intelligence was used to assist in producing the conceptual inundation schematic in Figure 3A and to refine the English language. The authors verified and take full responsibility for the scientific interpretation and final content.

DATA AVAILABILITY STATEMENT

Spatial data underpinning the mangrove atlas are publicly accessible through the Mauritius Mangrove Atlas portal https://sites.google.com/view/mangrovesmu/about and may be made available for research purposes.

SUPPLEMENTARY MATERIAL

Table S1. Field survey campaign

Time period	District(s) covered	No of sites	Sites	GPS	Site access modes
27.10.201	Rivière du	2	Poudre	20° 03' 07" S, 57° 41'	Van, On

7	Rempart		d'Or – Hermitage	12" E to 20° 05' 04" S, 57° 42' 20" E	Foot
12.11.2017	Rivière du Rempart	4	Pereybere – Melville	19° 59' 40" S, 57° 35' 02" E to 20° 01' 18" S, 57° 40' 55" E	Van, On Foot
17.11.2017	Rivière du Rempart	3	Melville – Ile D'Ambre and Islets-Belmont	20° 01' 18" S, 57° 40' 55" E to 20° 03' 04" S, 57° 41' 13" E	Van, On Foot, Boat
24.11.2017	Rivière du Rempart - Flacq	7	Hermitage – Prince Maurice	20° 05' 04" S, 57° 42' 20" E to 20° 08' 54" S, 57° 42' 20" E	Van, On Foot
01.12.2017	Flacq	9	Constance Poste de Flacq – Grand River South East Ile de L'Est/Ilot Mangenie & Ilets Ile aux Cerfs & Ilets	20° 09' 08" S, 57° 44' 51" E to 20° 17' 27" S, 57° 46' 58" E	Van, On Foot, Boat
06.12.2017	Grand-Port	3	Ville Noire - Blue Bay	20° 24' 04" S, 57° 42' 06" E to 20° 26' 34" S, 57° 42' 14" E	Van, On Foot

11.12.2017	Black-River	7	Baie du Cap - Tamarin	20° 29' 39" S, 57° 22' 50" E to 20° 19' 16" S, 57° 22' 43" E	Van, On Foot
14.12.2017	Grand-Port	2	Le Chaland – Ilot Brocus	20° 26' 33" S, 57° 41' 57" E to 20° 28' 33" S, 57° 40' 11" E	Van, On Foot
10.01.2018	Grand-Port	1	Mahebourg -Pte D'Esny	20° 24' 10" S, 57° 42' 29" E to 20° 25' 41" S, 57° 43' 37" E	Van, On Foot
11.01.2018	Flacq - Grand-Port	9	Quatre Soeurs - Riviere des Creoles	20° 17' 26" S, 57° 46' 41" E to 20° 23' 59" S, 57° 42' 02" E	Van, On Foot
09.02.2018	Pamplemousses	3	Le Goulet – Grand Bay	20° 07' 20" S, 57° 29' 53" E to 19° 59' 40" S, 57° 35' 02" E	Van, On Foot
10.02.2018	Savanne – Black-River	6	Souillac – Petite Riviere Noire	20° 30' 59" S, 57° 31' 11" E to 20° 23' 10" S, 57° 22' 32" E	Van, On Foot
23.02.2018	Black-River	4	Ilot Fortier - Albion	20° 23' 11" S, 57° 22' 31" E to 20° 12' 22" S, 57° 24' 17" E	Van, Jeep, On Foot
02.03.2018	Port-Louis	2	Pointe aux Sables –	20° 10' 29" S, 57° 25' 52" E to	Van, On Foot

			Baie du Tombeau	20° 07' 20" S, 57° 29' 53" E	
03.02.2019	Flacq	1	Poste Lafayette	20° 24' 04" S, 57° 42' 06" E to 20° 08' 21" S, 57° 45' 08" E	Van, On Foot

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AUTHOR CONTRIBUTION

S.D.D.V.R.: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualisation; Writing – original draft; Writing – review & editing; Read and approved final version

M.D.D.D.: Formal analysis; Field surveys; Investigation; Validation; Visualisation; Data Compilation; Writing – review & editing; Read and approved final version

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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