

2.2 “What” – the ecological representation of protected areas

2.2.1 Protected area coverage of Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are geographical sites of importance for the global persistence of biodiversity. Africa currently contains 1 966 KBAs, covering a total area greater than 2.8 million km², of which 41 % is covered by protected areas or other effective area-based conservation measures (OECMs). Target 3 of the Kunming-Montreal Global Biodiversity Framework prioritises the protection of areas of particular importance for biodiversity, so KBAs can play an important role in identifying sites most essential for biodiversity.

Key Biodiversity Areas (KBAs) are sites that contribute significantly to the global persistence of biodiversity¹. Sites can be considered KBAs if they host many threatened or geographically restricted species, a significant part of one or more threatened or geographically restricted ecosystems, comprise wholly intact ecological communities, maintain significant biological processes, or are highly irreplaceable^{1,2}.

For an area to qualify as a KBA, it has to meet the thresholds for at least one of the 11 criteria described by the KBA standard. This standard reflects an overarching set of criteria that can be applied across different taxonomies and ecosystems with the intention of integrating various existing prioritisation approaches, such as Important Bird Areas (IBAs) and Alliance for Zero Extinction (AZE) sites. The KBA standard builds on the IBA framework, so all IBAs (sites globally important for the conservation of bird populations) are by definition KBAs. AZE sites, which are discrete sites that contain an overwhelmingly significant population of an endangered or critically endangered species, are a subset of KBAs^{1,2}.

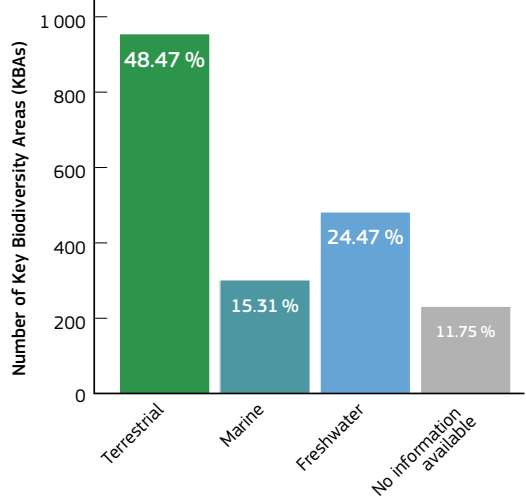
The method of identifying KBAs, for which the International Union for Conservation of Nature (IUCN) has produced guidelines, needs to be applied site by site though a nationally driven, bottom-up, inclusive and consultative process that uses locally available data¹⁻³. National KBA Coordination Groups normally bring together relevant stakeholders to identify and propose possible KBAs. Potential sites are delineated based on ecological, physical, administrative, or management boundaries, as long as these sites are manageable as a single unit. After identifying a potential site, the next step is scoping the species and ecosystems that might trigger KBA status. Regional focal points established by the KBA Partnership review proposals and sites can be nominated if no issues are raised. The KBA Partnership’s Secretariat will then validate the nomination and confirm the KBA, which is entered into the World Database of Key Biodiversity Areas^{1,4}.



Standards and guidelines for identifying Key Biodiversity Areas.

The International Union for Conservation of Nature (IUCN) has developed a global standard for identifying Key Biodiversity Areas, along with multiple versions of guidelines for using these standards. Sources: Left, IUCN (2016). A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. International Union for Conservation of Nature. Gland, Switzerland; Middle, KBA Standards and Appeals Committee (2020). Guidelines for using A Global Standard for the Identification of Key Biodiversity Areas. Version 1.1. Prepared by the KBA Standards and Appeals Committee of the IUCN Species Survival Commission and IUCN World Commission on Protected Areas. Gland, Switzerland; Right, KBA Standards and Appeals Committee of IUCN SSC/WCPA (2022). Guidelines for using A Global Standard for the Identification of Key Biodiversity Areas. Version 1.2. International Union for Conservation of Nature. Gland, Switzerland.

Africa currently contains 1966 KBAs, roughly 12% of sites globally. Approximately half of these KBAs (48.5 %) are terrestrial⁵.



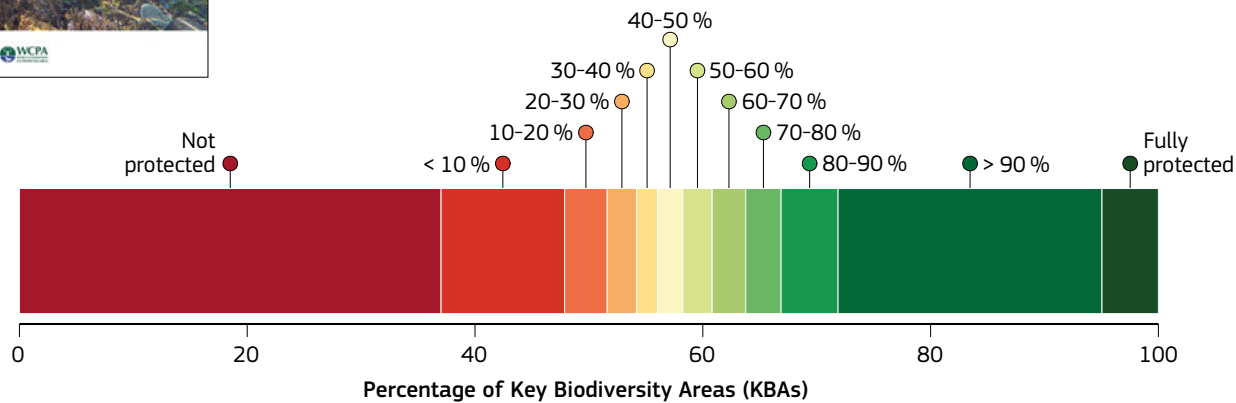
African Key Biodiversity Areas (KBAs) by system type.

KBA criteria are applicable to terrestrial, freshwater, marine, and subterranean environments. In Africa, nearly half (48.47 %) of the KBAs are terrestrial, 24.47 % are freshwater sites and 15.31 % are marine. There is no information available regarding the system type for 11.75 % of African KBAs. Source: BirdLife International (2024) The World Database of Key Biodiversity Areas. Developed by the KBA Partnership: BirdLife International, International Union for Conservation of Nature, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Rewild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, Wildlife Conservation Society and World Wildlife Fund. Available at: www.keybiodiversityareas.org. [Accessed 05/03/2024].



Frégate Island Alliance for Zero Extinction site in Seychelles.

The privately owned Frégate Island in Seychelles is an Alliance for Zero Extinction (AZE) site and, therefore, also a KBA. AZE are discrete sites that contain an overwhelmingly significant population of an endangered or critically endangered species. Frégate Island is an AZE site because of the endangered Seychelles Magpie Robin *Copsychus sechellarum*. The island is also home to other threatened species, such as the vulnerable Frégate Island Giant Tenebrionid Beetle *Polposipus herculeanus*, for which the island is the only known habitat. Although Frégate is also an Important Bird and Biodiversity Area (IBA), it lacks any formal protection. Sources: Seychelles Magpie Robin (Adrian Scott on Wikimedia Commons CC BY-SA 2.0 DEED), Frégate Island Giant Tenebrionid Beetle (Kernnarydenn on Wikimedia Commons CC BY-SA 3.0 DEED).

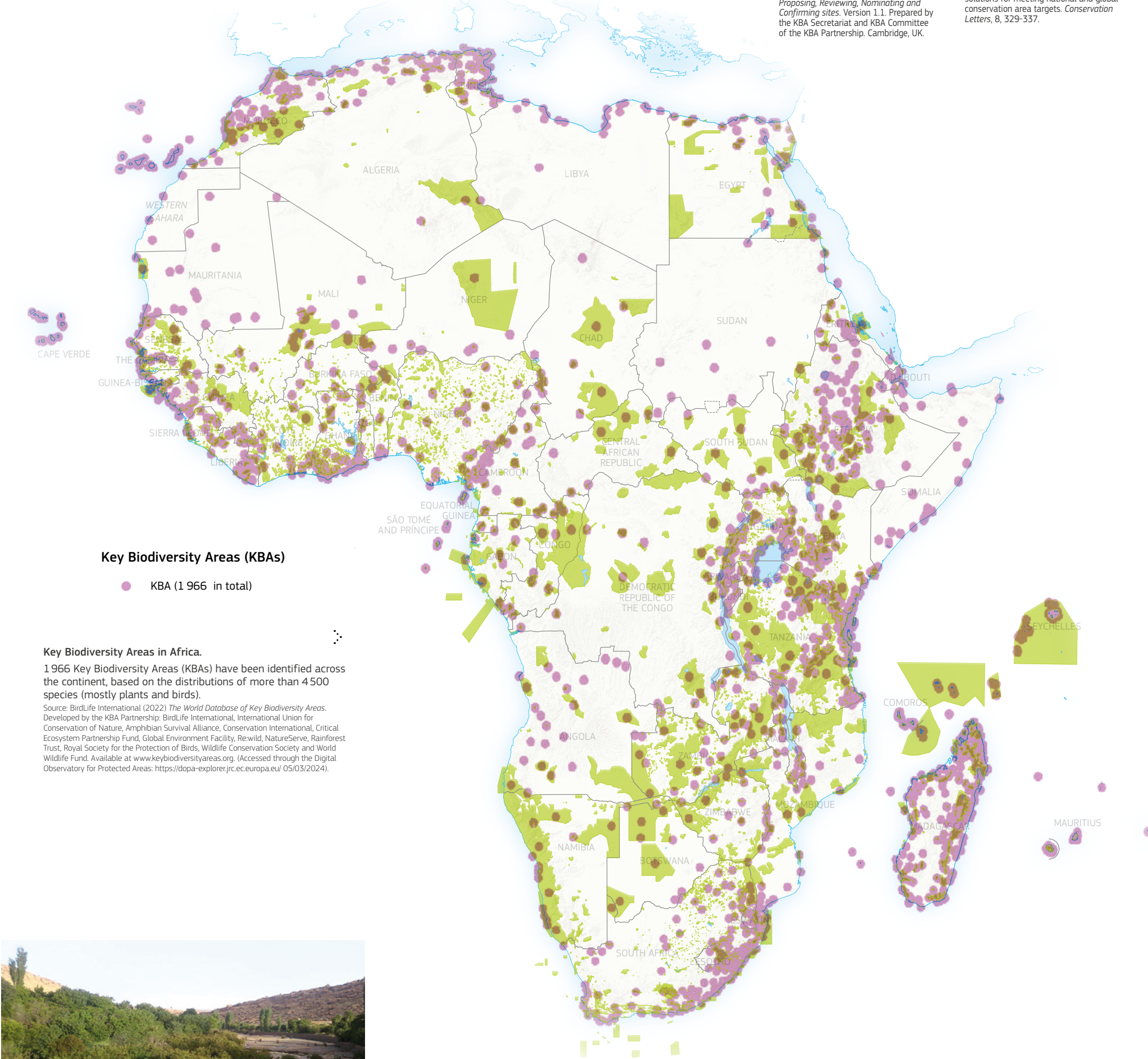


Protected area and OECM coverage (%) of African Key Biodiversity Areas (KBAs).

Although protected and conserved area coverage has grown, KBAs are still relatively poorly protected and conserved. Only a quarter of KBAs in Africa (27.2 %) have more than 90 % of their total area protected, whereas just under half of KBAs (46.2 %) have less than 10 % of their area protected. Information on protection status is unavailable for 67 KBAs (3.4 %). Source: BirdLife International (2024) The World Database of Key Biodiversity Areas. Developed by the KBA Partnership: BirdLife International, International Union for Conservation of Nature, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Rewild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, Wildlife Conservation Society and World Wildlife Fund. Available at: www.keybiodiversityareas.org. [Accessed 05/03/2024]. Right: KBA Standards and Appeals Committee of IUCN SSC/WCPA (2022). Guidelines for using A Global Standard for the Identification of Key Biodiversity Areas. Version 1.2. International Union for Conservation of Nature. Gland, Switzerland.

African KBAs cover an area of 2,878,418 km², of which approximately 41% is covered by protected areas and other effective area-based conservation measures (OECMs)⁵.

KBAs that have partial or no coverage of protected or conserved areas may be priority areas for protected area expansion or OECM recognition⁷. The protected and conserved area coverage of KBAs is a formal indicator for targets under the UN Sustainable Development Goals 14 and 15 as well as the Convention on Biological Diversity’s Aichi Target 11 and the current Target 3 of the Kunming-Montreal Global Biodiversity Framework.



Key Biodiversity Areas (KBAs)

● KBA (1 966 in total)

Key Biodiversity Areas in Africa.

1 966 Key Biodiversity Areas (KBAs) have been identified across the continent, based on the distributions of more than 4 500 species (mostly plants and birds). Source: BirdLife International (2022) The World Database of Key Biodiversity Areas. Developed by the KBA Partnership: BirdLife International, International Union for Conservation of Nature, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Rewild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, Wildlife Conservation Society and World Wildlife Fund. Available at: www.keybiodiversityareas.org. [Accessed through the Digital Observatory for Protected Areas: https://dopa-explorer.jrc.ec.europa.eu/ 05/03/2024].



Djebel Amour Key Biodiversity Area, Algeria.

Djebel Amour KBA is an example of a site that falls entirely outside of formal protected areas, but is fully covered by an OECM (in this case, by the Saharan Atlas Cultural Park). This terrestrial site corresponds to a mountain range in the Saharan Atlas and is located in a region that contains endemic plants. Source: MoudZijjel on Wikimedia Commons CC BY-SA 3.0 DEED.

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2.2.2 Protected area coverage of ecoregions

Target 3 of the Kunming-Montreal Global Biodiversity Framework prioritises an ecologically representative system of protected areas. Approximately 80% of African ecoregions are endemic to the continent, but the majority are under-protected. Insufficient representation of the world's ecosystems may hinder their ability to effectively achieve global biodiversity targets.

Target 3 of the Kunming-Montreal Global Biodiversity Framework (GBF) calls for an ecologically representative system of protected areas and other effective area-based conservation measures (OECMs). This implies that protection should adequately cover all aspects of the world's biogeographical variety¹, commonly represented by ecoregions. Ecoregions are areas of land, ocean, or freshwater with geographically-distinct biological characteristics²⁻⁴. A complementary indicator of the GBF's Target 3 is the *proportion of terrestrial, freshwater and marine ecological regions conserved by protected areas or OECMs*, which is intended to assess ecological representativeness. Africa contains approximately 15% of the world's terrestrial and marine ecoregions, and 32% of pelagic provinces. When combined, nearly 80% of these ecoregions are endemic to the continent.

The global protection of ecoregions has increased in the last decade, especially in the marine realm. Moreover, the percentage of marine and terrestrial ecoregions and pelagic provinces lacking any protection has decreased¹. Of the ecoregions endemic to Africa, roughly a third of terrestrial ecoregions (31.3%) and a sixth of marine (15%) ecoregions are more than 30% protected. Some terrestrial ecoregions, like Etosha Pan halophytics and Aldabra Island xeric scrub, and marine ecoregions, like the Prince Edward Islands, are protected fully.

However, roughly 70% of the continent's terrestrial ecoregions fall short of the GBF's Target 3 of 30% protection. For marine ecoregions, 85% fall short of the 30% target. Moreover, 6.25% of endemic terrestrial ecoregions and 25% of endemic marine ecoregions are unprotected (< 1% coverage); proportions that are similar to other parts of the world. As for pelagic provinces, the Guinea Current, which is the only province unique to the region, entirely lacks protection.



Angolan Montane Forest-Grassland ecoregion. Angolan Montane Forest-Grasslands are an example of a terrestrial ecoregion unique to Africa that is entirely unprotected. The ecoregion is a mosaic made up of the ecological remnants of the much larger moist forest biome surrounded by grasslands and Protea savannah. This combination of ecosystems resulted in the evolution of distinct biological communities, including 64 endemic or near-endemic species. The ecoregion is threatened by fires, agriculture, and logging, but is poorly studied because the mountains faced conflict and poverty for most of the Angolan Civil War (1975–2002).

Source: Benjamin Stauch on Wikimedia Commons CC0 1.0 DEED.

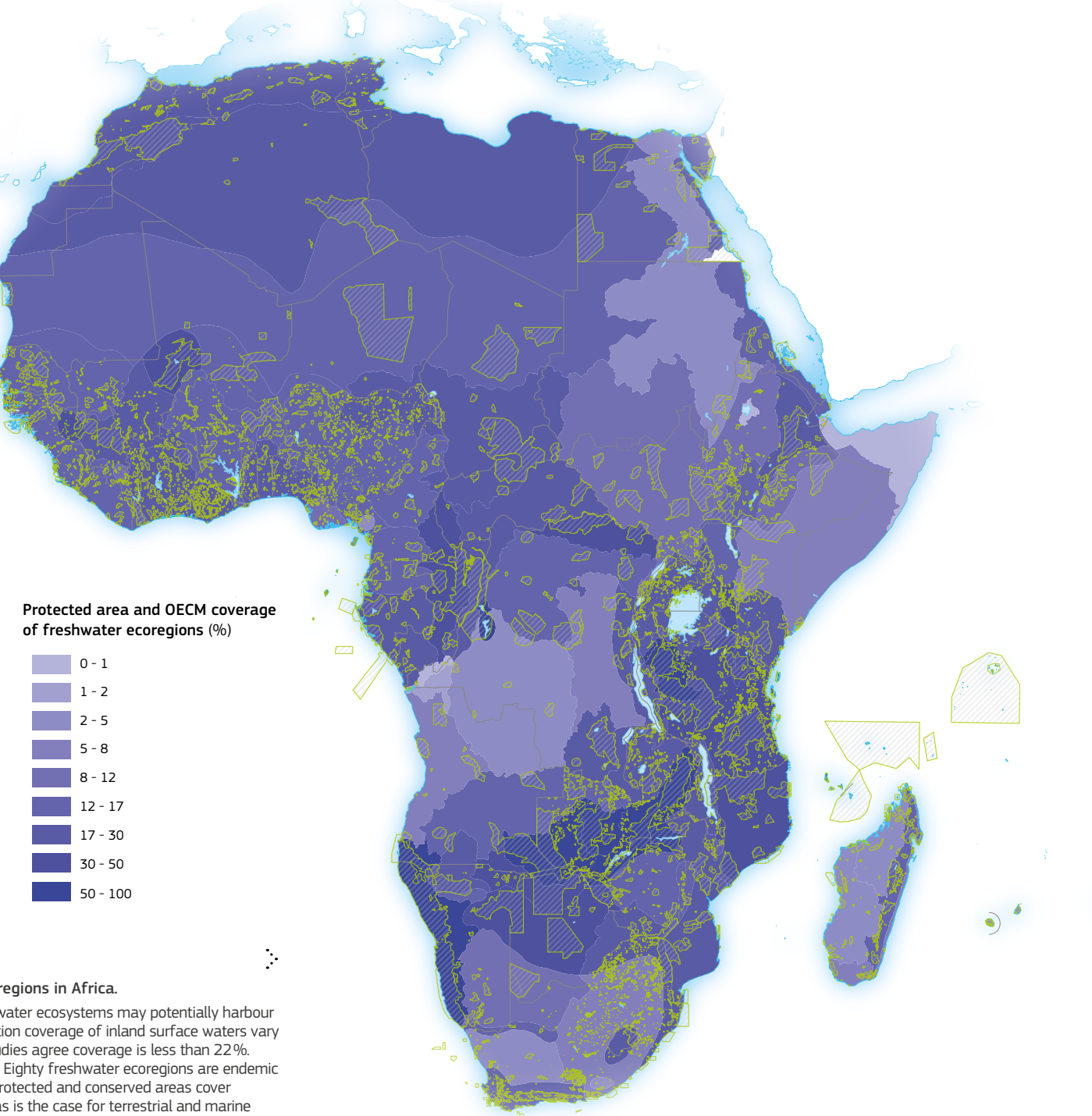
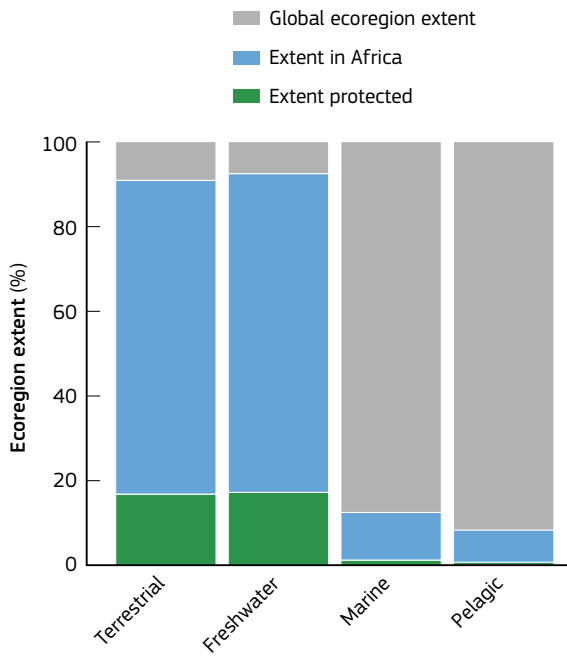
Ecoregions can be used for prioritising and planning protected area expansion efforts and strategies²⁻⁵. For Africa's protected areas to be representative, all ecoregions need some level of protection. Therefore, identifying poorly protected ecoregions would help breathe life into Target 3 of the Global Biodiversity Framework.

Extent of ecoregions and protected area and OECM coverage in Africa.

Many of the ecoregions in Africa are under-protected. Approximately 90% of the total extension of terrestrial and freshwater ecoregions present in Africa are completely within the African continent. However, from the area of these ecoregions located in Africa, only 18% is covered by protected and conserved areas. In the case of marine ecoregions, almost 10% of the ecoregion extent within Africa (which represents 12.48% of the total area) is under protected areas and OECMs. As for pelagic provinces, the coverage is 3.55% of the extent found in Africa (which represents 8.15% of the total area of the pelagic provinces present in the region).

Sources: Joint Research Centre of the European Commission (2024) The Digital Observatory for Protected Areas (DOPA) Explorer 4. Joint Research Centre, Ispra, Italy. Available at: <http://dopa-explorer.jrc.ec.europa.eu>

Own calculations based on data from the Freshwater Ecoregions of the World map (www.feow.org): Abell, R., et al. (2008). Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. *BioScience*, 58, 403-414.



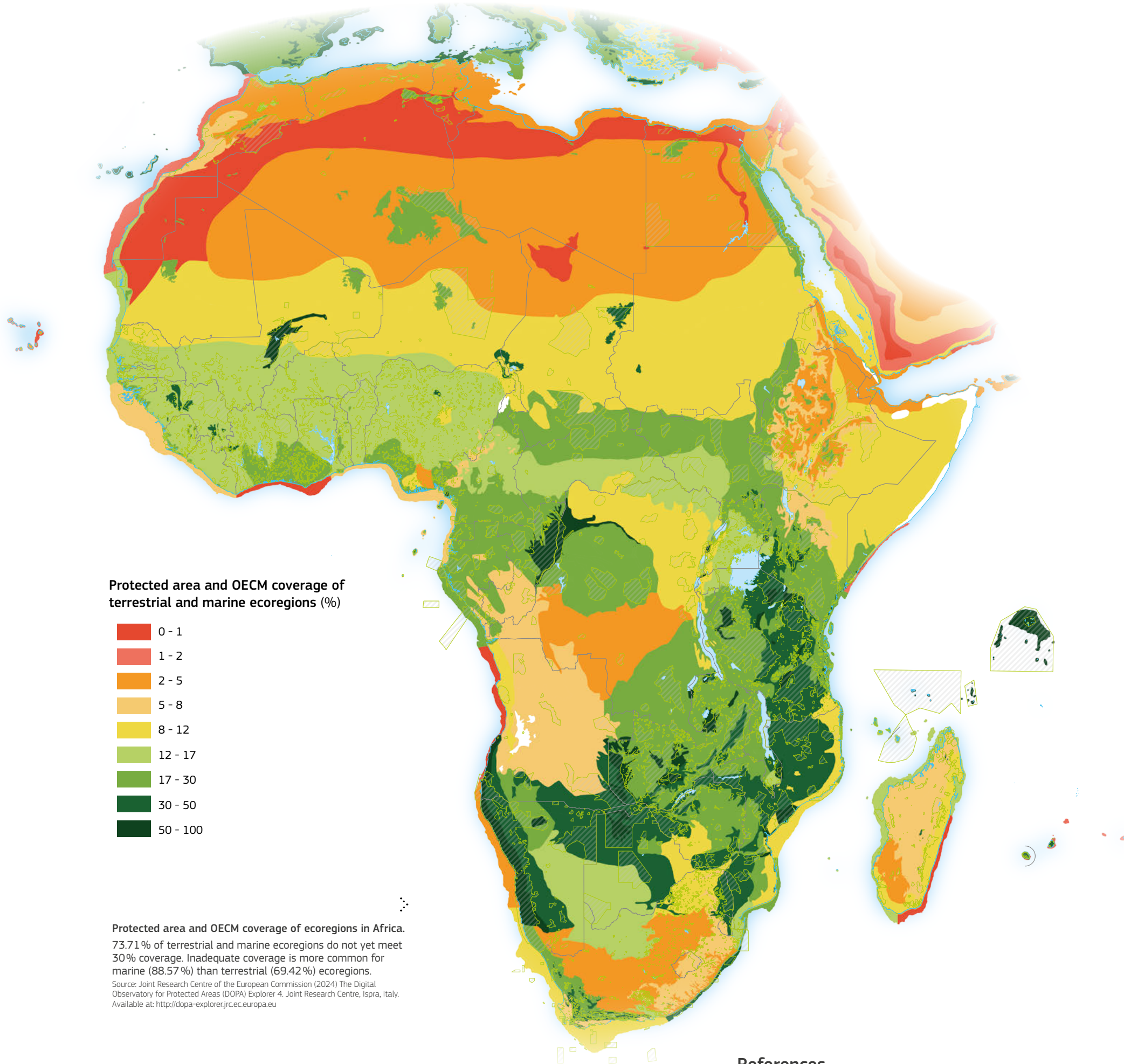
Protected area and OECM coverage of freshwater ecoregions (%)

- 0 - 1
- 1 - 2
- 2 - 5
- 5 - 8
- 8 - 12
- 12 - 17
- 17 - 30
- 30 - 50
- 50 - 100

Protected area and OECM coverage of freshwater ecoregions in Africa.

Despite covering less than 1% of the Earth's surface, freshwater ecosystems may potentially harbour up to 12% of all known species. Global estimates of protection coverage of inland surface waters vary depending on the methodologies and datasets used, but studies agree coverage is less than 22%. Africa has 92 out of the world's 426 freshwater ecoregions. Eighty freshwater ecoregions are endemic to Africa, covering 92.45% of the total continental extent. Protected and conserved areas cover approximately 18% of African freshwater ecoregions and, as is the case for terrestrial and marine ecoregions, 79.35% fall short of the 30% coverage target and seven are entirely unprotected.

Source: Own calculations based on data from the Freshwater Ecoregions of the World map (www.feow.org): Abell, R., et al. (2008). Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. *BioScience*, 58, 403-414.



Protected area and OECM coverage of terrestrial and marine ecoregions (%)

- 0 - 1
- 1 - 2
- 2 - 5
- 5 - 8
- 8 - 12
- 12 - 17
- 17 - 30
- 30 - 50
- 50 - 100

Protected area and OECM coverage of ecoregions in Africa. 73.71% of terrestrial and marine ecoregions do not yet meet 30% coverage. Inadequate coverage is more common for marine (88.57%) than terrestrial (69.42%) ecoregions.

Source: Joint Research Centre of the European Commission (2024) The Digital Observatory for Protected Areas (DOPA) Explorer 4. Joint Research Centre, Ispra, Italy. Available at: <http://dopa-explorer.jrc.ec.europa.eu>

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- [1] UNEP-WCMC and IUCN (2021) *Protected Planet Report 2020*. UNEP-WCMC and IUCN: Cambridge UK; Gland, Switzerland.
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- [5] Garcia-Moreno, J. et al. (2014). Sustaining freshwater biodiversity in the Anthropocene. In: A. Bhaduri et al. (eds) *The global water system in the Anthropocene: Challenges for science and governance*. Springer, Cham, Switzerland, pp. 247-270.

African mountain ecosystems overlap with 9 of the world's 36 Biodiversity Hotspots and are focal areas of endemism. Despite supplying services to a large portion of the African population, mountain ecosystems are extremely vulnerable to climate and land use changes.

These three mountain types are formed by combination of plate tectonics (e.g. Atlas Mountains, Cape Fold Mountains), volcanic origins (e.g. Mount Kilimanjaro, Mount Cameroon), and historical sedimentation and erosion (e.g. Great Escarpment). These processes determine the relative ages, geology, and lithology of different mountains, which together affect the evolutionary forces on plants and animals.

Montane endemic species can be sensitive to environmental changes, but they are not always effectively protected across the continent. In the Eastern Arc Mountains, several of the endemic terrestrial vertebrate species are unique to specific mountains and have tiny ranges in isolated remnant forest patches, e.g. the Grey-faced sengi, cryptic chameleons and amphibians. Their small ranges make it hard to find these species in field surveys^{5,6}, and the unique evolutionary patterns of similar-looking species mean that they can only be distinguished using molecular techniques^{6,7}. The well-studied Albertine Rift Montane Forests host the highest number of endemic vertebrate species on the African mainland, including the mountain gorilla. In southern Africa, a recent study highlighted a centre of montane endemics in the Limpopo-Mpumalanga-Eswatini Escarpment, with 496 endemic plant taxa⁸, suggesting this should become a major focus of conservation efforts in this region. In West Africa, though montane endemic frogs in Cameroon are threatened by land use and climate change, official protection and quantitative studies on population status are lacking⁹.



2.2.4 Coverage of seagrass by protected areas

Around 12 % of the extent of the world’s seagrass is in Africa. These ecosystems are important habitats for marine species, supply valuable ecosystem services, and support the livelihoods of coastal communities. Marine protected areas are an essential tool for safeguarding seagrass ecosystems, with nearly 17 % of African seagrass ecosystems currently within marine protected areas.

Seagrasses are often referred to as the ‘lungs of the ocean’ because they are highly productive and produce large amounts of oxygen through photosynthesis. This makes seagrass meadows vital habitats for coastal and marine species. Seagrasses do not consist of just one plant species, but are a collection of flowering plants that form meadows in shallow coastal waters. These ecosystems modify nutrient cycles, stabilise marine sediments, dampen the effects of coast floods, and store large quantities of carbon. The capacity of seagrass meadows to sequester and store carbon has meant that countries are starting to recognise their value in nationally determined contributions to climate change mitigation. Moreover, seagrasses are important habitats for marine species, particularly as nursery habitats for fish, which maintain the productivity of fisheries.

Seagrasses are found along all continents, except for Antarctica, covering roughly 0.1% of the ocean floor¹. Although the importance of conserving and restoring seagrass meadows is recognised globally, their extent is still poorly mapped and understood. Estimates of the global extent of seagrass vary considerably, between 160 000 km² to 670 000 km² depending on different sources². So, simply knowing how much seagrass is out there, remains a main challenge to seagrass conservation.

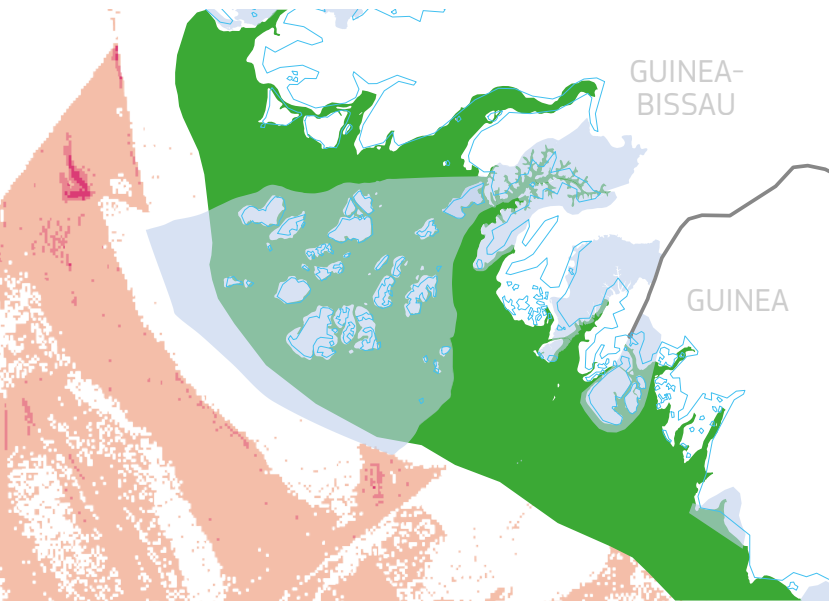
Despite their considerable benefits, seagrass meadows have decreased by 30% since 1990³ due to a wide variety of human activities, including urbanisation, coastal development, land-use changes and climate change. Unregulated fishing activities, anchoring, trampling, and dredging also jeopardise these habitats.

Marine protected areas are an important way to slow the degradation and loss of seagrass habitat. Globally, roughly 26% of the known seagrass meadow are protected⁴, while 17% of African seagrasses are within protected areas.

Fishing activities

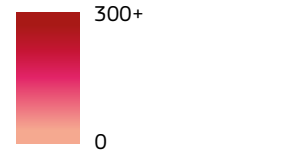
Seagrasses meadows support the productivity of fisheries, which is important for food security. Artisanal fishing communities often prefer fishing in seagrass because they are easily accessible and pose low risk of damaging fishing equipment⁵. At the same time, fishing is one of the biggest threats to seagrass habitats. Unregulated fishing and destructive methods such as bottom trawling cause direct physical damage to seagrasses. Bottom trawling disturbs the seafloor, alters communities of grazing animals, and uproots and damages seagrass⁶. Marine protected areas and fishing exclusion zones are increasingly important in preserving seagrass habitats.

West African seagrasses are among the most poorly studied worldwide. The ResilienSEA (Resilient Seagrasses) project (<https://resiliensea.org/>) supported research and capacity building activities to map and monitor seagrasses between 2018 and 2022. This project focussed on seven countries – Cabo Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone – and culminated in an atlas of West African seagrasses⁷.



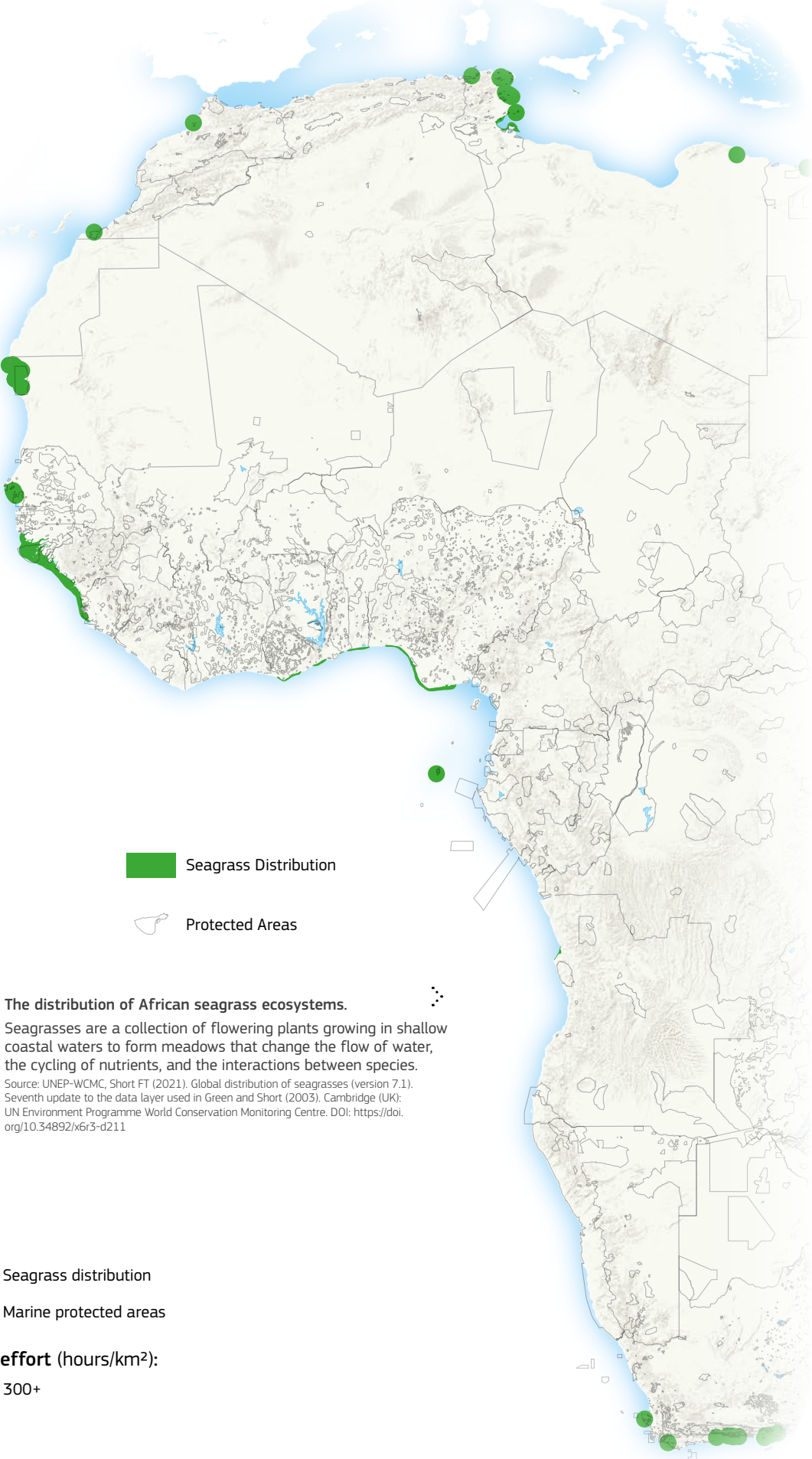
Seagrass distribution
Marine protected areas

Fishing effort (hours/km²):



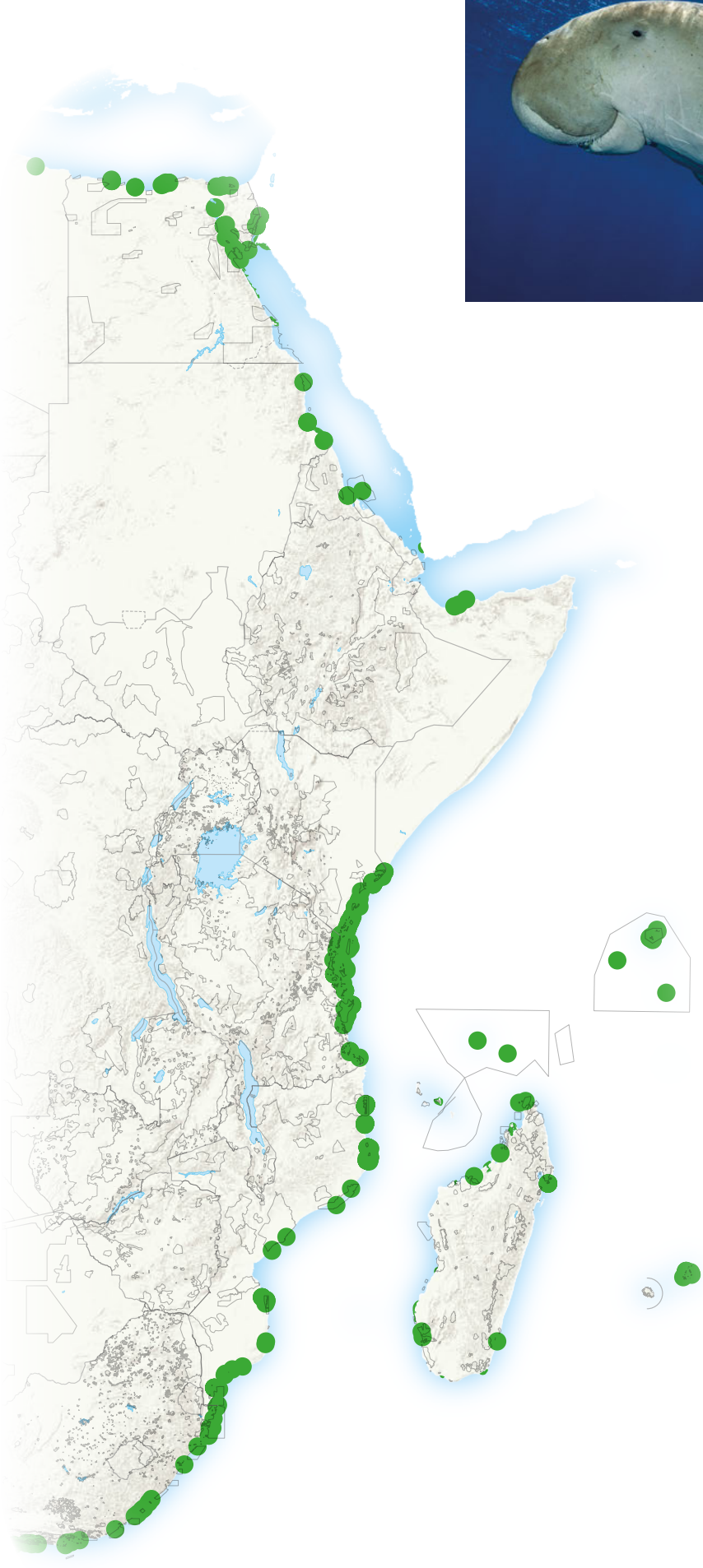
The protection of seagrasses affects fishing effort of bottom trawling. Inappropriate fishing practices, such as bottom trawling, are among the most destructive pressures on seagrasses. Marine protected areas off the coast of Guinea-Bissau seem to reduce fishing pressures on seagrasses, because fishing boats steer clear of protected area boundaries.

Source: Global Fishing Watch. (2024). <https://globalfishingwatch.org/> [Accessed on 20 February]



The distribution of African seagrass ecosystems. Seagrasses are a collection of flowering plants growing in shallow coastal waters to form meadows that change the flow of water, the cycling of nutrients, and the interactions between species. Source: UNEP-WCMC, Short FT (2021). Global distribution of seagrasses (version 7.1). Seventh update to the data layer used in Green and Short (2003). Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. DOI: <https://doi.org/10.34892/x6f3-d211>

Atlantic Ocean coast

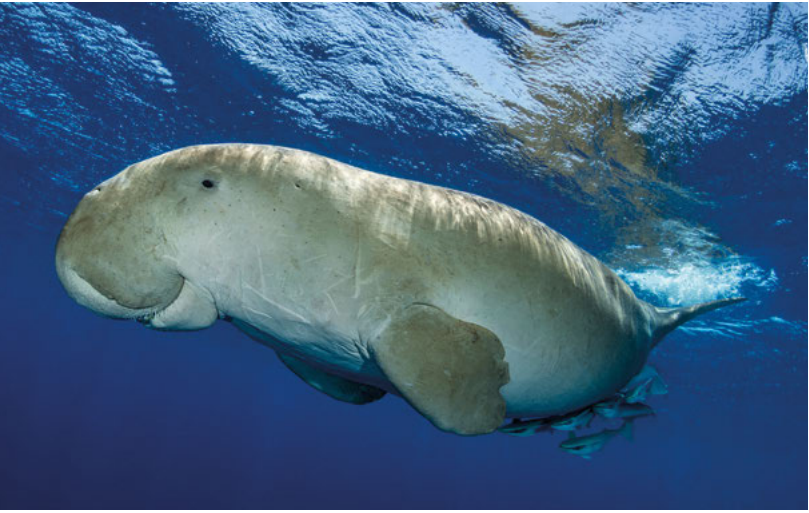


Indian Ocean coast

Dugong and seagrass

Seagrass beds provide key feeding grounds for several endangered species, such as the dugong (*Dugong dugon*), the green sea turtle (*Chelonia mydas*), and various seahorses. Dugongs and adult green turtles use seagrass meadows as principal foraging habitat.

The *Memorandum of Understanding on the Conservation and Management of Dugongs and their Habitats throughout their Range* (October 2007) of the Convention on Migratory Species, aims to promote internationally coordinated actions to ensure the long-term survival of these animals and their seagrass habitats throughout

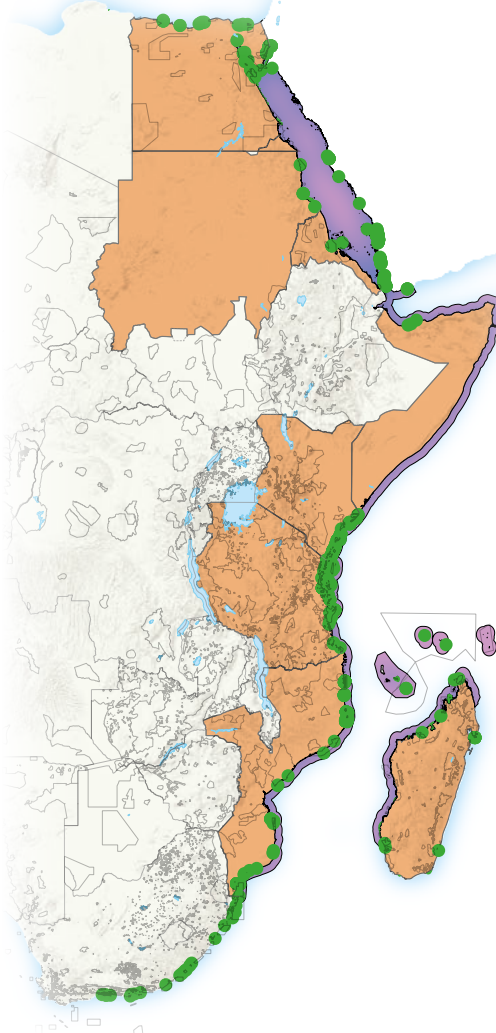


The Dugong, *Dugong dugon*, photographed off the coast of Marsa Alam, Egypt.

The diet of the herbivorous dugong consists mainly of seagrass, which explains why their distribution overlaps closely with seagrass habitats throughout the warm coastal waters of the Indian and western Pacific Oceans. Source: Fabrice Dudenhofer / Ocean Image Bank.

Seagrass distribution
Dugong distribution
MOU Signatory
Protected areas

The distributions of dugongs in East Africa. Dugongs are listed as *Vulnerable* globally by the International Union for Conservation of Nature, but regional assessments suggest that this species is *Endangered* in East Africa and Data Deficient in the Red Sea and the Gulf of Aden. As signatories to the Convention on Migratory species, several African countries have signed a memorandum of understanding (MOU) to protect dugongs and their seagrass habitats. Source: Marsh, H. & Sobczak, S. (2019) Dugong dugon (amended version of 2015 assessment). The IUCN Red List of Threatened Species 2019. e16909A160756767. <https://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T6909A160756767.en> [Accessed on 26 February 2024].



Green sea turtles, *Chelonia mydas*, feeding on seagrass in the Atlantic Ocean.

These sea turtles migrate long distances between feeding grounds and hatching beaches. Throughout their lives, their diets shift from carnivory as juveniles to omnivory as adults. The higher percentage of vegetation in adult diets, including seagrasses, turns their body fat green, hence the name green sea turtle.

Source: Liam McGuire / Ocean Image Bank.

References

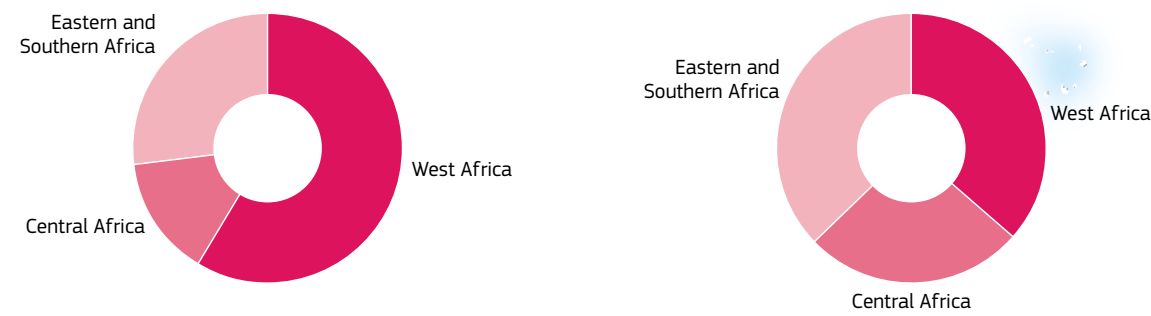
[1] Fu, C., et al. (2023) Substantial blue carbon sequestration in the world's largest seagrass meadow. *Communications Earth & Environment*, 4, 474.
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2.2.5 Coverage of mangroves by protected areas

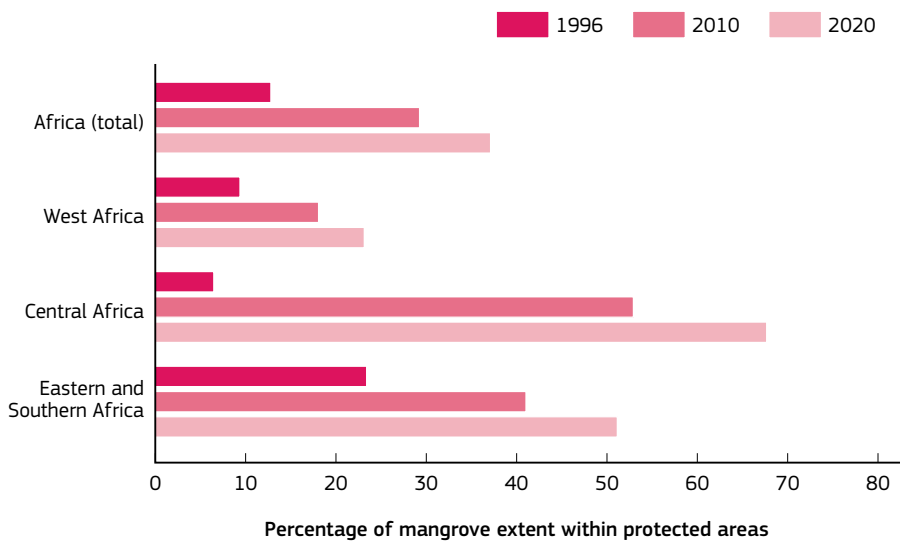
Mangrove forests are among the most ecologically important ecosystems globally when it comes to providing habitat for species and supplying ecosystem services. African coastlines contain nearly 20% of the world’s mangroves, with more than half along the coast of West Africa. Approximately one-third (37%) of African mangroves are within protected areas thanks to protected area expansion over the last three decades. These protected areas now account for 7% of the world’s mangroves.

Mangrove forests are one of the world’s most critical ecosystems. They provide several key ecosystem functions and services, vital for both human livelihoods and biodiversity. These ecosystems provide Africa with coastal protection to the value US\$ 3 500–US\$ 5 000 per km² each year¹. According to data from Global Mangrove Watch, African mangroves cover 29 137 km², representing nearly 20% of the global mangrove extent².

West Africa’s coastline has the most extensive area of mangroves (17 088 km²) covering 12 different countries. Nigeria has the greatest coverage of mangrove forest, hosting 28% of the total African extent. In East Africa, Mozambique and Madagascar account for 10.2% and 9.4% of the continental coverage, respectively. In Central Africa, Cameroon has the largest area of mangroves, accounting for 6.7% of the total extent of African mangroves.



As of 2020, African countries protected 10 817 km² (37.2%) of mangrove ecosystems. These protected areas are distributed relatively equally amongst West Africa (36.6%), Central Africa (26.5%) and Eastern and Southern Africa (37%). Protection efforts have grown over the last three decades, from just 12% coverage of mangroves in 1996 to 37% in 2020. Protected area expansion was particularly effective in Cameroon, where coverage increased from a meagre 2% of mangroves in 1996 to over 70% in 2020.

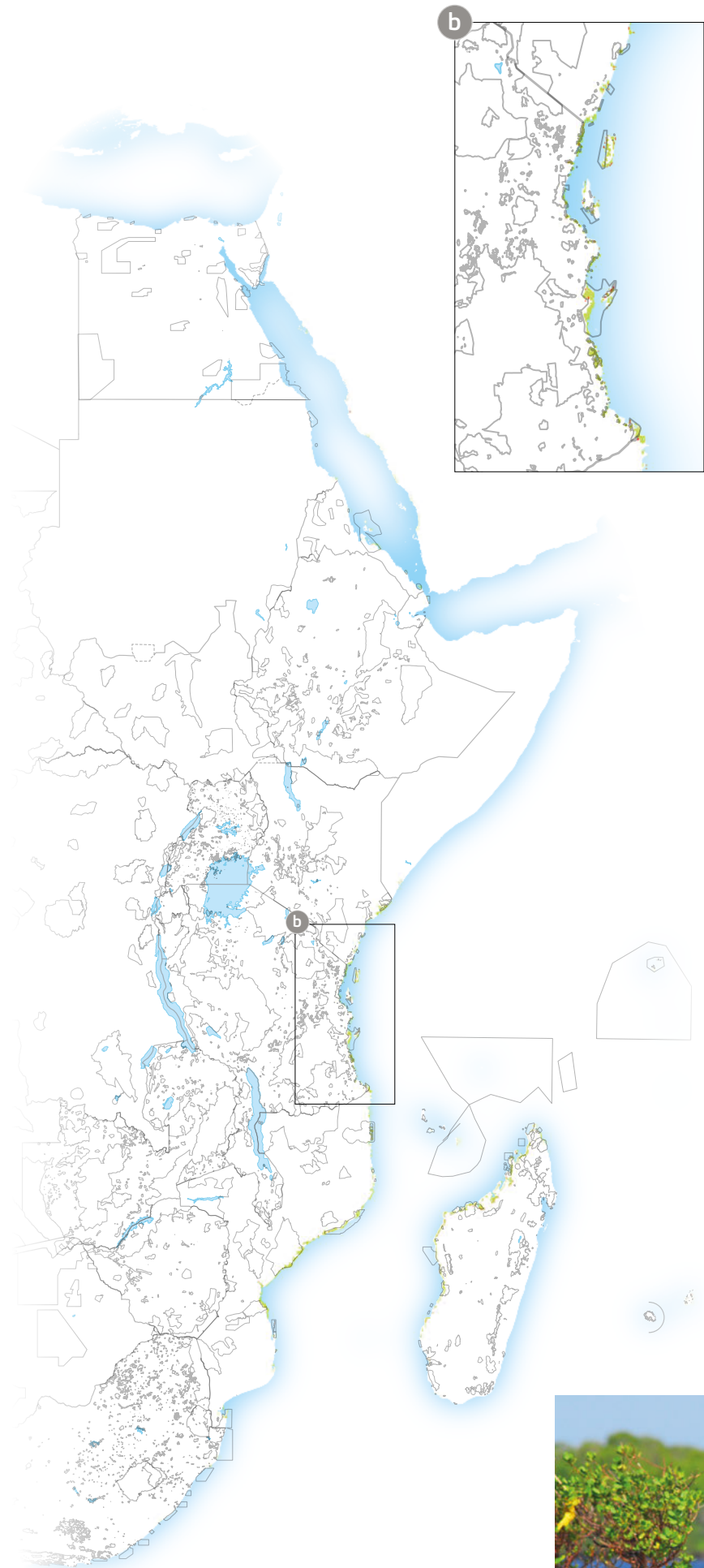


The distribution and net change of African mangroves.
In 2020, the area of mangrove forests in Africa was approximately 30 000 km², representing nearly 20% of the world’s mangrove habitat extent.
Source: Bunting, et al. (2022). Global Mangrove Watch (1996–2020) Version 3.0 Dataset (3.0) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.6894273> year 2020

Atlantic Ocean coast

Mangrove forests provide key ecosystem services that support local and regional livelihoods of coastal communities. They provide timber and fuel wood, support fisheries, protect shorelines, and play a critical role in climate change adaptation and mitigation as one of the largest carbon sinks in the tropics and subtropics³. According to Global Mangrove Watch, each year African mangroves shield 2 707 km² of the coastal zone, which houses roughly 1.3 million people, from floods during an average storm.

Mangrove deforestation and degradation are likely to have severe consequences for important ecosystem functions, ecosystem services, and climate change mitigation and adaptation strategies. Climate change, anthropogenic activities, and the expansion of the human settlements along coastal areas intensify the pressure on coastal habitats. Protected areas are crucial for safeguarding mangroves⁴ though evidence indicates that across Africa, mangrove forests are also being lost within protected areas.

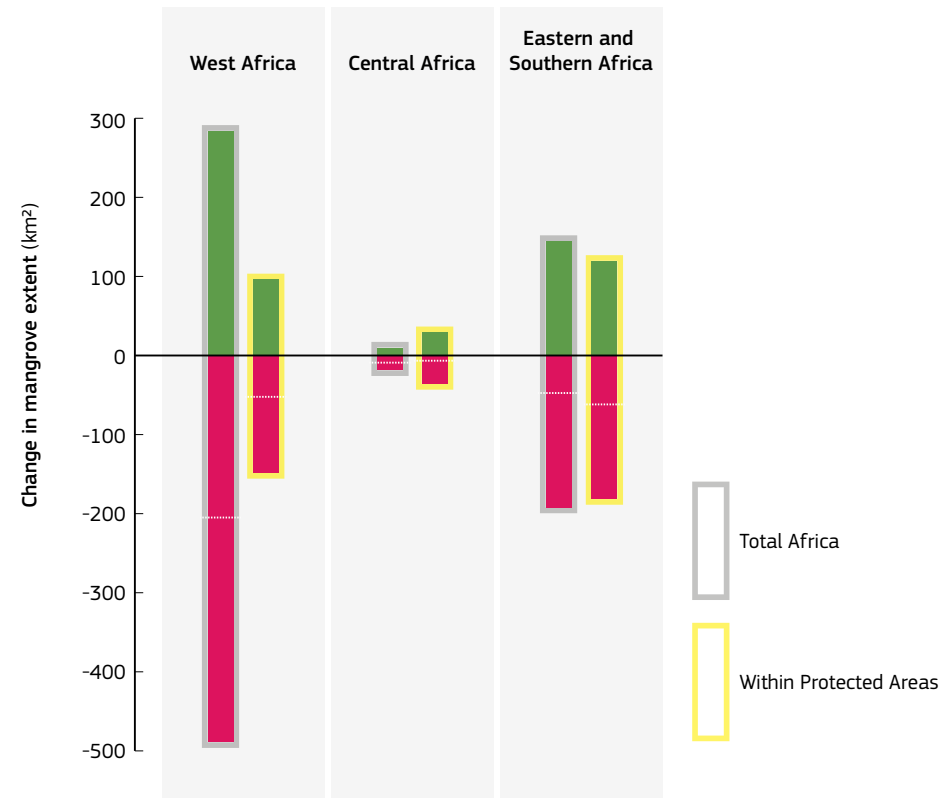


Indian Ocean coast

Mangroves provide habitat for coastal biodiversity.
Many species rely on mangroves as habitat, including these shorebirds. Beneath the water’s surface, marine fish and crustaceans use their submerged roots as breeding grounds and nurseries.
Source: GRID-Arendal on flickr CC BY-NC-SA 2.0.



The change in mangrove extent (2010–2020).
The loss and gain of mangrove extent over the period 2010–2020 across unprotected and protected sites, disaggregated by region. White lines denote the net change in mangrove extent (i.e. gains minus losses). Note: the total and proportional coverage of protected areas differ among regions.
Source: Own calculations based on data from Global Mangrove Watch³.



Mangrove forest, Lamu, Kenya.
Mangrove forests provide a natural barrier, protecting coastlines from storm surges.
Source: GRID-Arendal on flickr CC BY-NC-SA 2.0.

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2.2.6 Protected area coverage of warm-water coral reefs

African oceans are home to 9.7% of the world’s coral reefs. More than half of African coral reefs are within marine protected areas. In the Western Indian Ocean, indigenous peoples and local communities govern nearly one-third of marine protected areas, either on their own (23.6%) or in collaboration with other stakeholders (9%). Despite their protection, warm water corals are highly threatened, which may have detrimental effects on the communities who rely on these ecosystems.

Warm-water coral reefs are among the most biodiverse ecosystems on the planet. They provide important ecosystem services, such as food, employment, and coastal protection to millions of people living in coastal areas. Although coral reefs do not absorb carbon dioxide directly, they are associated with seagrass beds, mangrove forests, and lagoons that can serve as significant carbon sinks. Globally, the annual value of goods and services provided by coral reefs is estimated at US\$ 2.7 trillion, with coral reef tourism alone generating US\$ 36 billion¹. African oceans include 9.7% of the world’s warm-water coral reefs in 13 African countries. Of these, 60% are found in the Western Indian Ocean, and 40% in the Red Sea².

Coral reef ecosystems are threatened by both local and global anthropogenic pressures. Estimates show that up to 50% of the world’s coral reefs are already degraded, with 14% loss within the last decade³. Climate change impacts, such as rising sea surface temperature and ocean acidification, drive fundamental changes in the structure and function of coral reef ecosystems. Ocean warming triggers mass bleaching events that harm the status of coral reefs. For instance, significant thermal stress in the Western Indian Ocean between 1998 and 2016 led to two major coral bleaching events in the region¹. In addition, local anthropogenic pressures, including overfishing, marine pollution and coastal development, have jeopardised coral reef health, habitat quality, and the supply of ecosystem services. The aggregate effects of these stressors decrease resilience of the coral reefs worldwide⁴.

Preserving coral reef ecosystems is a primary conservation goal both nationally and internationally. Marine protected areas are one of the most important tools for conserving coral reef habitats. In recent decades, the protection levels of African warm-water coral reefs has increased. According to the World Database on Protected Areas⁵, more than 90 marine protected and conserved areas with coral reefs have been designated since 2000. Today, over 51% of Africa’s coral reefs are within protected areas.



🔗 Coral reefs as habitat for biodiversity.

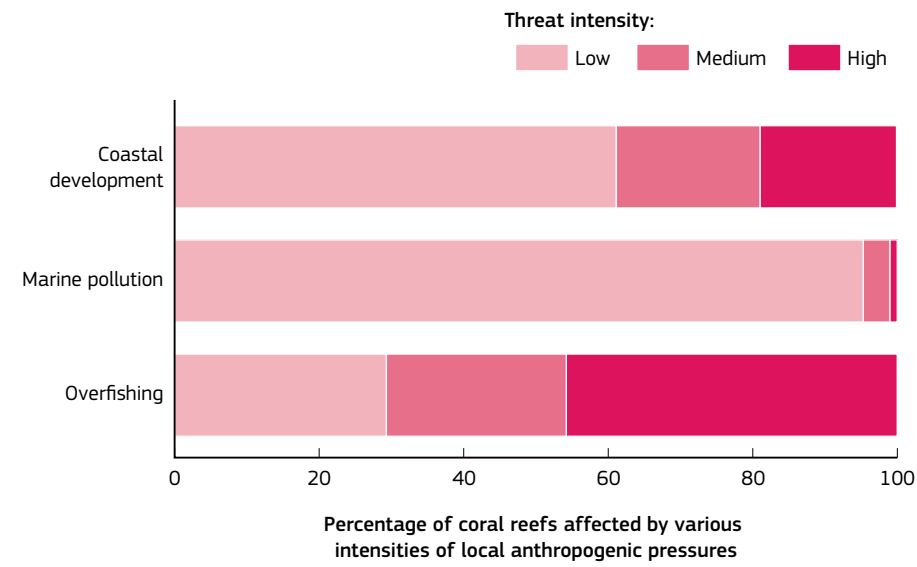
Warm-water corals are important habitats for species like this Seychelles anemonefish, *Amphiprion fuscocaudatus*, which only occurs on the reefs around the Seychelles Islands and the Albadra atoll.
Source: Greg Tee on flickr CC BY-NC 2.0.

Evidence is accumulating that involving local people in natural resource management and decision-making leads to better conservation and social outcomes. This is especially relevant for warm-water corals, which cannot be fenced from people who rely on these systems for their livelihoods. The Western Indian Ocean includes several successful examples of locally managed marine areas. In Kenya, for example, the Kuruwitu Conserved Area north of Mombasa became the first coral-focused locally managed marine area in 2003. In Madagascar, the Velondriake Area is the largest collaborative locally managed marine area in the Western Indian Ocean.



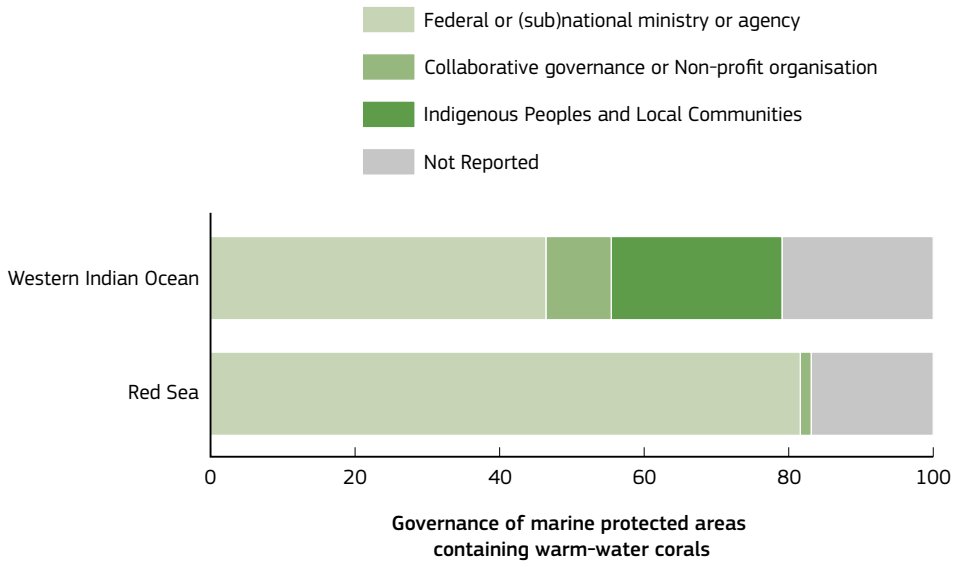
🔗 Kuruwitu Locally Managed Marine Area.

Local community members, who rely on ocean resources for their livelihoods, set up Kuruwitu Conservation and Welfare Association (KCWA) in 2003. The area extends approximately 12 kilometres along the coast of Kenya, north of Mombasa. Two years later, the community set aside a 30-hectare marine protected area. Estimates found that six years after establishing the locally managed marine area, live hard coral cover increased by nearly 30%, and fish numbers grew by 200%⁶.
Source: The International Institute for Environment and Development (IIED) on flickr CC BY-NC 2.0.



🔗 Local threats to warm-water coral reef ecosystems in the Western Indian Ocean.

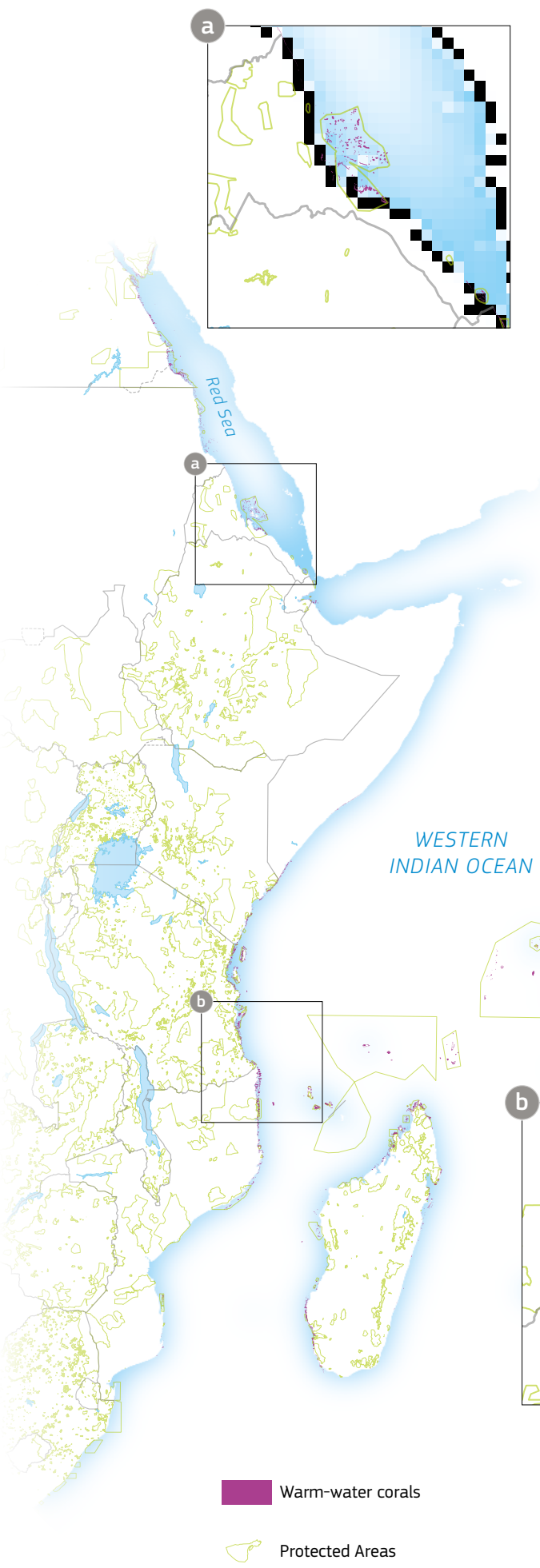
Percentage of coral reefs affected by various intensities of local anthropogenic pressures (Coastal development, Marine pollution, and Overfishing).
Source: World Resources Institute. 2011. Reefs at Risk Revisited. Accessed through Resource Watch, (February 2024). www.resourcewatch.org



🔗 The governance of marine protected areas containing warm-water corals.

The majority of African marine protected areas with coral ecosystems are governed by Federal or (sub)national governments. In the Western Indian Ocean, local communities govern approximately one-third of marine protected areas, either on their own (23.6%) or in collaboration with other stakeholders (9%).
Source: Own calculations based on the World Database on Protected Areas⁵.

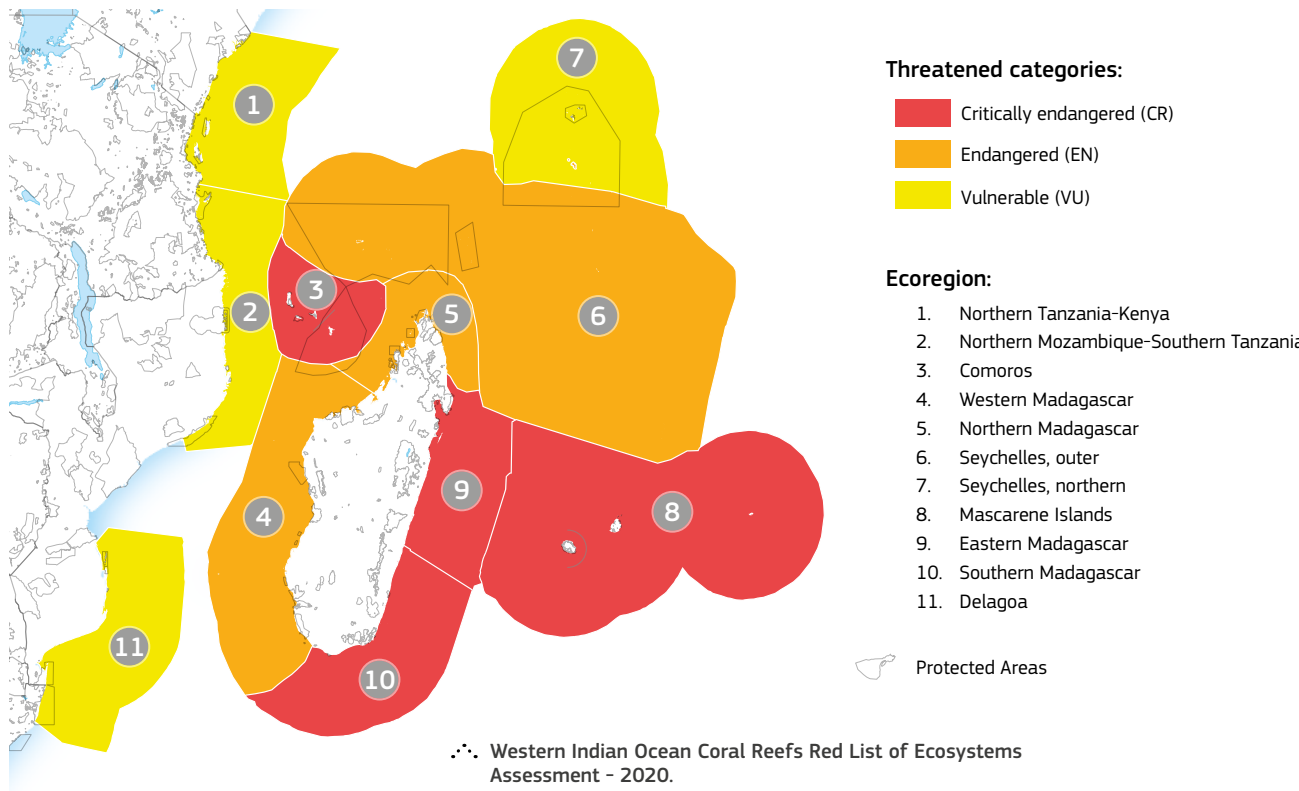
Coral reefs supply important ecosystem services to local coastal communities who rely on these ecosystems for food, jobs, and coastal protection. The capacity of coral reef ecosystems to supply these services changes over time due to natural cycles or anthropogenic stressors⁴. In the Western Indian Ocean, coastal communities depend heavily on coral reefs for fisheries and tourism, to an estimated asset value of US\$ 18.1 billion¹. The Red Sea region is one of the premier destinations for coral reef tourism in the world. Tourism associated with coral reefs constitutes an estimated 3.5% of Egypt’s Gross Domestic Product¹.



🔗 The distribution of African warm-water corals.

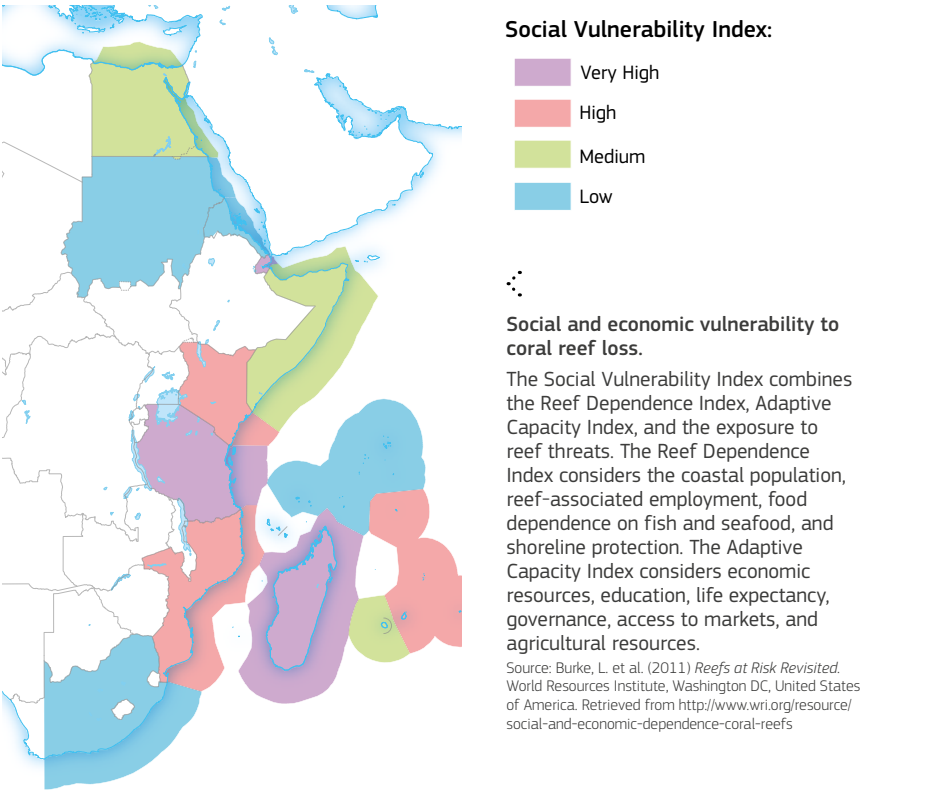
In Africa, warm-water corals occur in the Western Indian Ocean, along both the mainland (Somalia, Kenya, Tanzania, Mozambique, South Africa) and island states (Mauritius, Madagascar, Comoros, Seychelles); as well as in the Red Sea (Djibouti, Egypt, Eritrea and Sudan).
Source: UNEP-WCMC (2024). Ocean+ Habitats [Online], (February 2024). Available from: <https://doi.org/10.34892/pe3-ar97>

The decline in quality and health of coral reefs poses significant threats for both human livelihoods and marine biodiversity. A recent assessment quantified the vulnerability of coral reef ecosystem types across the West Indian Ocean and identified the main threats to coral health³. Using the Red List of Ecosystems Framework, the assessment identified the risk of collapse for coral reefs in eleven ecoregions and found that reefs surrounding island states and the east coast of Madagascar were more threatened than those nearer the mainland. The Comoros ecoregion, the Mascarene ecoregion, and the Eastern and Southern Madagascar ecoregions were all classified as ‘Critically Endangered’. The outer Seychelles ecoregion, and the Western and Northern Madagascar Ecoregion were classified as ‘Endangered’. None of the ecoregions could be classified as ‘Least Concern’³.



🔗 Western Indian Ocean Coral Reefs Red List of Ecosystems Assessment - 2020.

Coral reefs in the 11 ecoregions of the Western Indian Ocean assessed according to IUCN Red List for Ecosystems Criteria.
Source: Obura, D., et al. (2022) Vulnerability to collapse of coral reef ecosystems in the Western Indian Ocean. Nature Sustainability 5, 104–113. Also available from CORDIO East Africa http://maspawio.net/layers/geonode/34/red_list_wio_corals_2020.



Social Vulnerability Index:

- Very High
- High
- Medium
- Low

🔗 Social and economic vulnerability to coral reef loss.

The Social Vulnerability Index combines the Reef Dependence Index, Adaptive Capacity Index, and the exposure to reef threats. The Reef Dependence Index considers the coastal population, reef-associated employment, food dependence on fish and seafood, and shoreline protection. The Adaptive Capacity Index considers economic resources, education, life expectancy, governance, access to markets, and agricultural resources.
Source: Burke, L. et al. (2011) Reefs at Risk Revisited. World Resources Institute, Washington DC, United States of America. Retrieved from <http://www.wri.org/resource/social-and-economic-dependence-coral-reefs>

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